Studying the effects of touch and pressure therapy on the fingers of the hand for stress relief among college students

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Abstract

In the college environment, students are faced with many stressors, which can cause physical health problems, mental health diagnosis, and negative coping. The purpose of this study is to test the effects of touch and pressure therapy on the fingers of the hand for stress relief among college students. Multiple networks of neurons connect to pressure points on the body where applied touch and pressure activate a nervous system response that incites overall relaxation. The participants sit down and use their dominant hand to squeeze, or apply hand held pressure, to each of their fingers on the other hand for 15 seconds each. Physiological signs can be assessed for changes in stress level. Participants count their individual heart rate and respiratory rate before and after the therapy for physiological changes. A modified perceived stress index is used to assess stress on a minimal, moderate, or high level. In order to follow COVID-19 health guidelines and social distancing requirements, the research is a virtual group study. The results of the research are lower stress levels and decreased respiratory count. An increase in heart rate is noted in the population. Participant experiences are categorized into three domains: feeling calm, feeling odd, and the hand therapy needing improvement. Past studies show positive implications for touch and pressure on the body for stress relief. The implications for studying the effects of touch and pressure on the fingers of the hand are introducing a potentially new positive coping method that can help improve health outcomes in college students.

1. Introduction

The demanding college environment of academic commitments, independent management of life choices, and financial concerns cause the majority of college students to experience stress and be highly prone to experience stress throughout college (Ah et al., 2004). According to Harvard Medical School, strong associations between exposure to stress and mental health diagnosis, self-harm, and suicidal ideation exist (Younghans, 2018). Chronic stress decreases the body's defense systems by decreasing the production of antibodies, or components that protect the body from infection, thus increasing the body's vulnerability towards illness and disease (American Institute of Stress, n.d.). Likewise, a prolonged state of stress impacts cardiovascular health through the development of atherosclerosis, or the narrowing of blood vessels, and hypertension, or high blood pressure; both of which can increase risk for fatal health occurrences such as stroke, peripheral vascular disease, and pulmonary embolisms (Lewis et al., 2016). Chronic stress, additionally, impacts cognitive function in the way poor concentration, memory problems, and sleep disturbances can occur; changed eating habits, social withdrawal, and migraines can develop as well (Lewis et al., 2016).

The negative bodily responses that occur from unmanaged stress urge the importance of exploring therapies that can provide stress relief. While well-known therapies such as aromatherapy, acupuncture, massage therapy, and even meditation have been utilized for stress management, research shows adolescents resort to unhealthy coping methods (Böke et al., 2019). Stress can lead college students to seek stress-relieving outlets such as over-eating, alcohol abuse, or resorting to recreational drugs all of which potentially cause serious unhealthy habits and long-term health problems (American Institute of Stress, n.d.). Acupressure, which incorporates the concepts of touch and pressure on the body, has been shown to be effective in

promoting relaxation and stress relief (Deutsch, 2005). This article will investigate the effects of touch and pressure on the fingers of the hand in order to provide college students a potential new therapy that can help relieve stress and promote healthy coping behaviors. The concept of acupressure will be discussed mostly throughout the article as a foundation for the research. Doing so addresses the question about the effects of touch and pressure therapy on stress that is highly prevalent in college students.

2. Literature Review

Acupressure is a form of eastern medicine that focuses on reducing stress by applying pressure to pressure points on the body to calm disturbed Qi, or energy, flow (Horiuchi et al., 2015). See Figure 1a to understand acupressure more. Pressure points are pressure-sensitive areas of the body, such as the hand, that react to pressure by activating the parasympathetic nervous system (PNS), which promotes a relaxed state in the body (McFadden & Hernández, 2010). Networks of nerves extend to pressure points all over the body, and when touch and pressure are applied to these points, the nerves stimulate the brain and the brain activates the PNS, decreasing heart rate and muscle tension (Lewis et al., 2016). On the other hand, stress activates the sympathetic nervous system (SNS), or the "flight or flight" response, in which the body reacts to stress, or a perceived threat, by increasing heart rate, tensing muscles, and producing sweat (Lewis et al., 2016). Figure 1b shows the connection between squeezing, or handholding, the fingers of the hand and therapeutic responses that occur. A therapeutic response is achieved when pressure on the fingers of the hand activates a PNS response in the organs of the body. There are many studies in literature that provide support for the effectiveness of acupressure.

McFadden and Hernández (2010) tested the effects of acupressure on 16 stroke survivors for eight weeks through a randomized, placebo-controlled, and single blind crossover study. The researchers observed stress as a cause for stroke and other illnesses due to the impacts stress makes on the cardiovascular system (McFadden & Hernández, 2010). After participants received acupressure at different sites on the body, researchers saw acupressure causes a greater (p-value = 0.043) and faster (p-value = 0.002) reduction in heart rates in the experimental group compared to those in the placebo group (McFadden & Hernández, 2010). Even though blood pressure changes were not observed, potentially due to most of the participants taking antihypertensive medications at the time, the researchers concluded that acupressure treatment activates a physiological response that reduces heart rate significantly and promotes relaxation (McFadden & Hernández, 2010). A separate study managed to observe blood pressure changes after acupressure therapy.

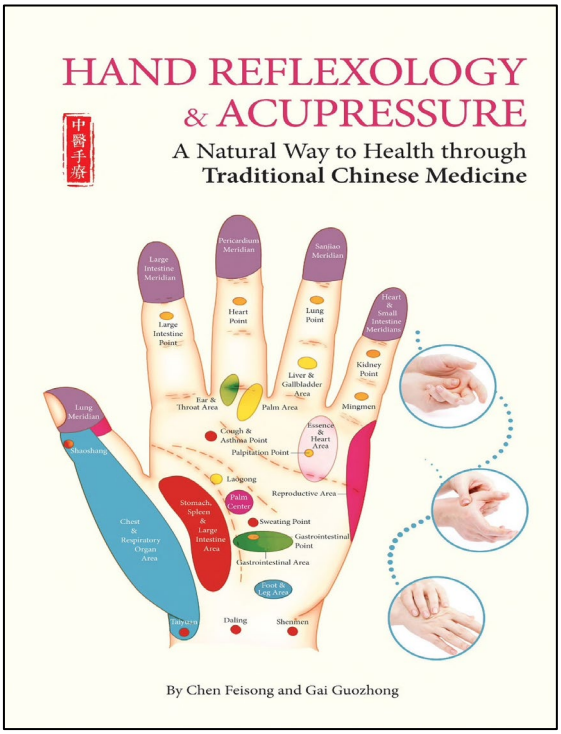


Figure 1a. Pressure point diagram that guides acupressure therapy.

Lin et al. (2016) studied the effects of acupressure in a randomized clinical trial involving 88 patients with hypertension. Through the use of electronic monitoring before and after the acupressure therapy, the researchers found participants' blood pressure decreased at zero, 15, and 30 minutes after receiving the therapy. The researchers concluded acupressure is an effective self-care technique that can help manage hypertension (Lin et al., 2016). Even though acupressure was applied to the Taichong acupoint, a pressure point located on the foot, the physiological results reveal acupressure as potentially effective for managing stress considering high blood

pressure relates to stress. Therefore, by lowering blood pressure, acupressure is able to provide stress relief (Lewis et al., 2016). The results of past research are important for college students, especially for those who utilize negative coping techniques for stress. A different study observed the effects of acupressure therapy on college students.

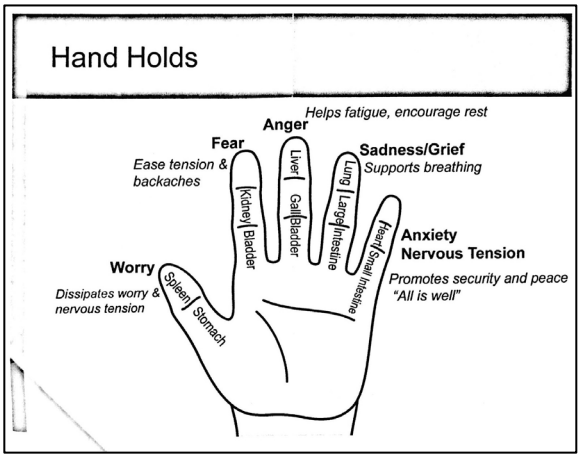


Figure 1b. Hand hold diagram by Carver, Stewart, and Dean (2019).

McFadden et al. (2012) put into action their concerns for stressed college students by conducting a randomized and placebo controlled single blind design study. A sample size of 109 college students with no health conditions went through a 40-minute session of acupressure while lying face up on a massage table (McFadden et al., 2012). Electrodes were attached to the wrists, left ankles, and middle and index fingers of the participants for ECG (electrocardiogram) data (McFadden et al., 2012). The results revealed a decreased heart rate, increased heart rate variability, reduced skin conductance response, and reduced stress response (McFadden et al., 2012). While the study utilized auditory therapy such as crickets and beach sounds during the therapy session, it showed acupressure causes physiological change as observed in the other studies. Nevertheless, it is good to consider complementary therapy such as music as an adjunct that can promote the effects of acupressure.

3. Methods & Procedure

3.1. Design. A quantitative virtual group study was done.

3.2. Participants. The study population was recruited from the course, Professional Nursing, at CSU, Stanislaus during a time of perceived high stress levels, specifically during the time of final examinations in Fall 2020. A sample size of 19 CSU, Stanislaus students above the age of 18 was recruited as participants. Two students declined to participate.

3.3. Pre-Intervention. The researcher entered a virtual Zoom meeting with the students, and provided students access to a Google Form link that included an online informed consent form (Appendix A), a demographic survey (Appendix B), and a modified perceived stress index (Appendix C) that inquires the level of stress on certain factors in the college environment. Students who elected to become participants of the study completed these forms. Those who did not elect to be participants were given the opportunity to decline and exit the Google Forms. The researcher who produced the perceived stress index (PSI) gathered 302 college students ranging from freshmen to seniors to test the reliability of the PSI in regards to appropriately addressing particular stressors in student life (Avdija, 2018). The results of the article showed the PSI to be a reliable tool that produces reliable results in repeated testing based on the Crombach's Alpha level, which tests internal consistency of scales. A range of 0 to 1 measures the internal consistency of a measurable instrument with a score closest to 1 having high internal consistency. The PSI and its subsections scored internal consistency values of 0.08 or above, supporting the PSI as a reliable tool of measurement.

3.4. Intervention. The researcher instructed the participants to rate their current overall stress level using a 10-point stress scale (with 10 representing the highest stress level), and to palpate their heart rate (HR) and count their respiratory rate (RR) for 30 seconds each as a baseline of information. The researcher provided a timer for 30 seconds, and had the participants multiply their HR and RR by two after counting to represent a minute of assessment. The participants recorded their findings in the Google Forms.

The researcher then provided a live demonstration of the appropriate sequence for the hand therapy in front of the participants. The researcher firstly applied handheld pressure, or a squeeze, to the thumb for 15 seconds, and, then moved to the index finger, middle finger, ring finger, and pinky finger. It was only one hand that received the therapy.

After the demonstration, the researcher instructed the participants to perform the therapy on himself/herself by placing hand held pressure to each of their own fingers on one hand according to the demonstration. The researcher guided the participants with a timer by prompting participants to advance to the next finger every 15 seconds for every finger on the hand. This procedure took less than two minutes since 15 seconds of handheld pressure was permitted on each finger.

Finally, the researcher instructed the participants to palpate and count their HR and RR for any physiological changes after the hand therapy. The researcher provided a timer for 30 seconds, and had participants multiply their heart rate and respiratory rate by two to represent a minute of assessment. Then, the participants were invited to fill out a questionnaire that inquires about the current stress level after the hand therapy and their personal experiences from the therapy.

3.5. Data Collection. The Google Forms acted as a source for collecting recorded participant information from the demographic survey, the modified perceived stress index, and heart rate and respiratory rate readings. The researcher utilized Microsoft Excel spreadsheets to transfer and organize the data.

3.6. Ethical Considerations. The University Institutional Review Board (UIRB) at CSU, Stanislaus, approved the research. The UIRB approved the research's modifications that considered the COVID-19 restrictions. The participants were encouraged to ask questions through the private Zoom chat box. The researcher promoted the study as a voluntary opportunity that did not have repercussions for declining to participate. The researcher went over the informed consent with the students.

Table 1. The demographic survey results.

Demographic Data	Percentages
Gender	
Female Gender	84.20%
Male Gender	15.80%
Age	
18 - 29 Years Old	89.50%
30 - 44 Years Old	10.50%
Present College Experience	
Academic Commitments (full time/part time)	100%
Work Responsibilities (full time/part time)	63.20%
Club Memberships	26.30%
Campus Program member	0%
Sports Commitments	0%
Ethnicity	
Hispanic	47.40%
Caucasian	36.80%
Asian/Pacific Islander	10.50%
African American	5.30%
Religion	
Catholicism	36.80%
Christianity	36.80%
No religion	21.10%
Inter/non-denominational	5.30%
Protestantism	0%
Judaism	0%
Islam	0%
Buddhism	0%
Hinduism	0%
Native American	0%
Decline to state religion	5.30%

Table 2. Paired t-test results for statistical significance.

Variables	Mean	Paired t	P - value
Stress Level	-1.2105	-4.652	9.91E-05
RR	-0.8421	-1.7143	0.0518
HR	1.4737	0.6231	0.7295

4. Results

4.1. Participant Information. Of the 36 students in the nursing course, 21 students accessed the Google Forms link and 19 students elected to participate. The reason for declining participation is

unknown. Table 1 reveals the participant population to be mostly female (84.2%), Hispanic (47.4%), between the ages of 18 – 29 years old (89.5%), a full or part-time student (100%), working full time or part time (63.2%), and Catholic or Christian (36.8%). Table 4 reveals exam preparation (7.79) to be the college stressor that produces the highest stress level among the participants. The course load (7.63) follows as the secondary college stressor that produces high stress levels. The stress of keeping up with required readings (7.37) follows as the tertiary college stressor that produces high stress levels.

4.2. Data Analysis. Using a TI-84 calculator, a paired *t*-test was done to calculate the statistical significance (*p*-value) of the differences in HR, RR, and stress level before and after the hand therapy (Table 2). The average differences in HR, RR, and stress level before and after the hand therapy were firstly calculated for the paired t-test. An average difference of zero represented the null hypothesis, while an average difference less than zero represented the alternative hypothesis. This alternative hypothesis meant HR, RR, and stress levels decreased after the hand therapy.

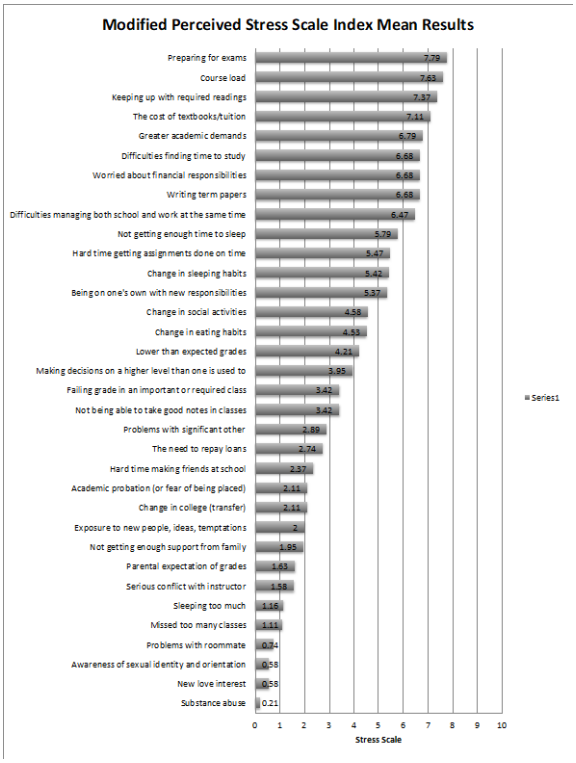
4.3. Data Results. The hand therapy decreased the average stress level by 1.21 among the participants (Table 5). A paired *t*-test revealed the change in stress level before and after the hand therapy as highly significant ($p < 0.000$). Similarly, the hand therapy decreased the average respiratory rate by 0.85 breaths per minute (Table 6). A paired *t*-test revealed the decrease in respiratory rate as significant as well ($p = 0.05$). The alternative hypothesis is proven by the changes in stress level and respiratory rate; the hand therapy is effective in reducing stress. However, after the hand therapy, the participants experienced an increase in heart rate based on an average increase of 1.47 beats per minute (Table 7). There was no statistical significance found for this change ($p > 0.05$), rejecting the alternative hypothesis. The heart rate trends are analyzed in the discussion section. Regardless of the trends in heart rate, the hand therapy shows effectiveness in reducing stress levels and relaxing the breathing rate.

4.4. Participant Experiences. Out of the 19 participants, 16 participants provided descriptions on their experience. Three domains were produced to categorize the experiences: *feels relaxing, feels odd,* and *needs improvement.* The researcher analyzed all of the participants' descriptive experiences and found these three common characteristics (Table 3).

Table 3. Three common characteristics analyzed from the participants' descriptions of the hand therapy.

Domains	Participant Experience
Feels relaxing	Participant 12: "During this experience, I felt like it was a good way to clear my mind from any stressors. I feel like I will likely try this method in the future." Participant 7: ""I thought it was a good skill that I would like to try again when I'm feeling stressed during finals…[it] was a good experience." Participant 9: ""It was a nice method to relieve any stress that I have currently been experiencing. I did not have any negative experiences."
Feels odd	Participant 3: "It felt odd and I did feel a slight decrease in stress." Participant 4: "It feels a little silly."
Needs Improvement	Participant 15: "No negative experience only improvement is that counting your own respiratory rate can effect how the participant may breathe. We are thinking about it." Participant 16: "While doing the therapy I felt as though I needed to feel relaxed while applying the pressure on my fingers, so I closed my eyes while doing my therapy and focused on my breathing. I felt as though I was relaxed but after the therapy I still realize my stressors and think of how they are not going anywhere." Participant 18: "I think the 15 seconds of squeezing my finger was difficult. I will probably implement intermittent squeezing."

Table 4. Average stress level of each college stressor based on a stress scale of one to 10 with 10 being the highest level of stress.



Significance

Past research articles have focused on alternative therapies such as the effects of body massage, acupuncture, herbal remedies, guided medication, aromatherapy, and even hypnosis as methods for stress relief and relaxation. The effects of touch and pressure on the fingers of the hand have been explored within the limits of alternative therapy called acupressure. By studying the effectiveness of hand and pressure on the fingers of the hand for stress relief, a new coping therapy was investigated.

The introduction of a new therapy for college students that can help manage stress is able to provide more options in stress relief, and promote better health outcomes such as decreased health conditions related to stress and decreased use of negative coping behaviors. While the hand therapy increased heart rates, it produced lowered stress levels and a calmer breathing rate. The results of the study support the effectiveness of acupressure, showing college students may be able to utilize touch and pressure therapy on the fingers of the hand for stress relief.

Table 5. Average stress levels before and after hand therapy.

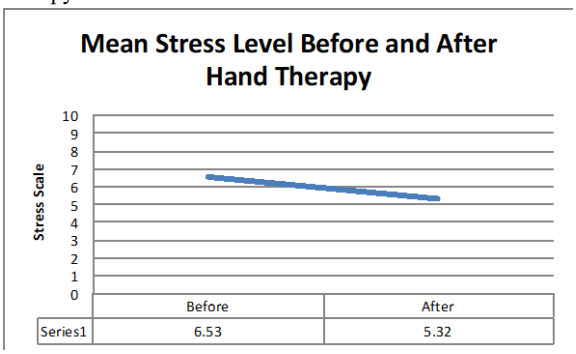


Table 6. Average breathing rate before and after hand therapy.

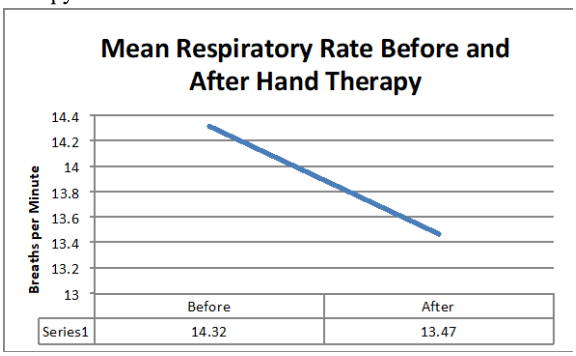
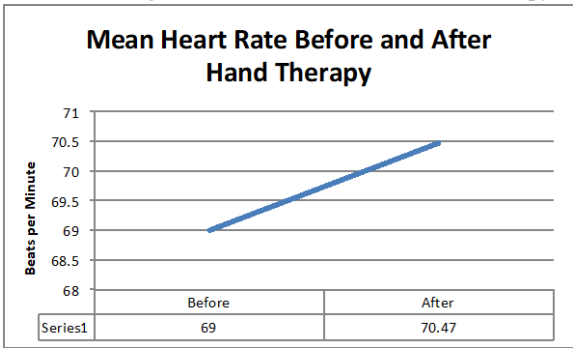


Table 7. Average heart rate before and after hand therapy.



Discussion

The limitations of the research relate to a small sample size of students from one academic major that cannot be generalizable to a large college population. The sample size would need to include a larger number of students with diverse backgrounds in order to be generalizable to larger college settings. Another limitation includes potential inconsistencies in hand-held pressure in the hand therapy that can produce inaccurate data. The amount of appropriate hand-held pressure for each finger can be studied in

the future. A standardized pressure amount can help avoid inconsistencies.

Pre-COVID-19 research planning included utilizing an automatic wrist blood pressure cuff to obtain blood pressure count, an automatic pulse oximeter to assess heart rate, and nursing training to assess respiration count. An implication for future research is monitoring the effects of the hand therapy on blood pressure. High blood pressure is associated with stress. Another implication for future research is calculating the impact of each stressor in the college environment on the heart rate and respiratory rate. This would promote further investigation on the impact of stress on students. A statistical analysis of the demographic characteristics can be done as well to observe any potential effects on the heart rate and respiratory rate.

The validity and reliability of the study is weakened by the lack of medical equipment such as a calibrated pulse oximeter to monitor heart rate and respiratory. Even though the participants are nursing students with trained assessment skills, human error must be accounted for the heart rate and respiratory count. A calibrated monitoring machine may be able to accurately record physiological responses.

The increase in heart rate could be attributed to a rebound effect as a result of the blood vessels in the fingers experiencing increased pressure. Potentially, pressure that changes the breadth of the blood vessels changes the blood flow and induces a sympathetic nervous system response that increases the heart rate. An increase in heart rate can improve circulation and oxygen delivery to the body's tissues such as the brain, heart, and lungs. The difference between this response and the responses observed in the studies discussed in the literature review that have observed a decrease in heart rate from acupressure therapy is hand-held pressure has not been investigated until now; the studies in the literature review have focused on finger-point pressure on the pressure points on the fingers of the hand. In other words, while the research states pressure points activate the PNS upon receiving pressure and the heart rate decreases, the effects of applying pressure through hand holding has yet been investigated.

Overall, studying the effects of touch and pressure therapy on the fingers of the hand can help students find stress relief and obtain wellness while handling academic, financial, and or work priorities in the college environment. The study contributes to the field of education in the way it opens up the topic of alternative stress relief for future research.

The sources utilized for the study are reliable for the reason the resources were obtained from the California State University, Stanislaus library database. Likewise, resources were obtained from health-conscious websites that are sponsored by well-known health organizations specializing in human health.

With further research on the effectiveness on the hand therapy, the study may have the potential of impacting a population beyond colleges and universities. This stress relieving method can be introduced to hospitals where costly methods of stress relief such as medication, acupuncture, and massage therapy are done. Applying touch and pressure on the fingers of the hand can replace these costly methods considering it is a cost-effective method that can be utilized by anyone who can be taught it.

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Appendix A

California State University, Stanislaus
Online Consent to Participate in Research

California State University, Stanislaus
Mikaela Magwili (mmagwili@csustan.edu)

Studying the effects of touch and pressure therapy on the fingers of the hand for stress relief

Purpose of the Research
The Principal Investigator, Mikaela Magwili, is a student at California State University, Stanislaus conducting research for an honor's thesis in the honors program.

The purpose of this research is to discover the effects of applying momentary handheld touch and pressure to individual fingers of the hand. The hopeful outcome would be a perceived lower stress level in the individual.

Procedures
Your participation will require approximately *30* minutes and is completed online at your computer.

- Before testing, you will be asked to access a zoom link to participate in the study. The study will be conducted in a group setting. Then, you will be asked to access a Google Forms link to complete a demographic survey that asks about your age, gender, etc., which will take approximately less that 5 minutes to complete.
- After completion, the researcher will ask you to fill out a modified perceived stress scale on the same Google forms link that asks you to rate particular stressors that cause low, moderate, or high stress for you such as the cost of tuition, difficulties managing both school and work, problems with roommate, course load, etc.
- Next, the researcher will ask you to count your own heart rate and respiration for 30 seconds each using palpation.
- The researcher will then demonstrate the proper hand maneuvers to perform for the study, which will involve the dominant hand applying momentary hand held pressure on each finger of the other hand.
- Afterwards, you will be asked to perform the maneuver, which will take less than 2 minutes (15 seconds of hand held pressure would be permitted on each finger of the hand).
- At the end, the researcher will ask you to count your own heart rate using palpation and respiration again for 30 seconds each.
- You will be given an online questionnaire afterward regarding the effects of the procedure and your experience.
- Total time commitment will be 25 – 30 minutes. Participants aged 18 and over may only participate in the study. Participants with any medical conditions that affect their heart rate and or respiratory count may not participate in the study due to the effects on the study's results.

Potential Risks or Discomforts
The risks to you for your participation in the study relates to discomfort from having pressure be applied to the wrist and doing the procedure in front of other participants. Another risk to you may relate to reflecting on stress during the questionnaire. If needed, call the Psychological Counseling services on campus with this number (209) – 667 – 3381 for psychological relief from any discomforts. If needed, call the Student Health Center on campus with this number (209) – 667 – 3396 for health-related concerns.

Potential Benefits of the Research

The benefits to you for your participation in the study relates to potentially obtaining spontaneous stress relief from the procedure, and contributing to research for stress relief methods.

Confidentiality
The information collected by the researcher will be protected from all inappropriate disclosure under the law. All information, including the questionnaire responses, will be kept in a secure location on a password-protected device. Only the researcher, and her faculty sponsor, will have access to the data.

The researcher **will** keep your research data to use for (future research or other purpose.) We may share your research data with other investigators without asking for your consent again, but it will not contain information that could directly identify you.

Costs
There is no cost to you beyond the time and effort required to complete the procedure(s) listed above.

Compensation
There will be no compensation for participating in this research.
There is no anticipated commercial profit related to this research.

Participation and Withdrawal
Your participation is voluntary. You may refuse to participate or stop participation at any time without penalty or loss of benefits.

Questions
If you have any questions about this research, you may contact me, **Mikaela Magwili,** at **(925) – 984 - 0348** or my faculty sponsor, **Jennifer Peltier** at **+1 (209) – 996 – 4521.**

If you have any questions regarding your rights and participation as a research subject, please contact the IRB Administrator by phone (209) 667-3493 or email IRBadmin@csustan.edu.

Consent
Clicking the "Next" button below indicates that you are 18 years of age or older, and indicates your consent to participate in this survey. Please feel free to print a copy of this consent page to keep for your records.

Appendix B

Demographic Survey Questions

1. What is your gender?
2. What is your age?
3. Select all that apply to your college experience.
4. What race/ethnicity best describes you?
5. Do you identify with any of the following religions?

Appendix C

The Modified Perceived Stress Index is a Likert scale of one to 10 that includes college-life related statements for participants to rank based on the level of stress each college-related stressor produces. The number zero is not applicable. The number one is no stress. The number 10 is high stress.

1. Worried about financial responsibilities
2. The cost of textbooks/tuition
3. The need to repay loans
4. Difficulties managing both school and work at the same time
5. Difficulties finding time to study
6. Hard time getting assignments done on time
7. Missed too many classes
8. Not getting enough time to sleep
9. Sleeping too much
10. Change in eating habits
11. Change in sleeping habits
12. Being on one's own with new responsibilities
13. Awareness of sexual identity and orientation
14. New love interest
15. Hard time making friends at school
16. Problems with boyfriend/girlfriend/significant other
17. Change in social activities
18. Making decisions on a higher level than one is used to
19. Substance abuse
20. Exposure to new people, ideas, temptations
21. Problems with roommate
22. Greater academic demands
23. Failing grade in an important or required class
24. Change in college (transfer)
25. Not being able to take good notes in classes
26. Academic probation (or fear of being placed)
27. Serious conflict with instructor
28. Lower than expected grades
29. Course load
30. Preparing for exams
31. Writing term papers
32. Keeping up with required readings
33. I do not get enough support from family
34. My parents' expectations of my grades