Mindfulness Exercises for Stress Reduction in Nursing Students

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Abstract

Purpose of Project: To improve the utilization of mindfulness exercises among undergraduate and graduate nursing students by using the Calm app for at least 10 minutes daily for four weeks.

Methodology: A non-randomized, convenient sample was recruited via email at a nursing school in a public university in New Jersey. Before, during and after implementing the mindfulness intervention, participants were asked to complete an electronic Perceived Stress Scale (PSS) survey in order to measure its effectiveness. The participants were also asked how much time was spent using the Calm app daily and what feature of mindfulness was used from calming, deep breathing and meditation.

***Results*:** The findings from the study showed that there was statistical significance between improvements in the nursing students perceived stress scores before and after implementing the mindfulness intervention. Additionally, the more time students spent using minduflness daily, the lower their PSS scores. There was no statistical significance beween using the different features of mindfulness on the PSS scores.

Implications for Practice: Significant results for nursing practice were obtained from this project. Using a mindfulness-based intervention for nursing students deemed beneficial in reducing stress levels. The stress of dealing with a highly demanding work and educational environment can lead to serious consequences. As a result, an intervention, such as mindfulness, is necessary to promote self-care, reduce burnout and as a result improve patient care outcomes.

Keywords: mindfulness meditation, nursing students, stress, and students.

Mindfulness Exercises for Stress Reduction in Nursing Students

Stress can be caused by numerous factors that can lead to a variety of undesirable emotions such as anxiety, anger and frustration. The different levels of stress are dependent on the situation and person involved. Higher levels of stress are negatively impacting our society at large, but is especially common for healthcare professionals as there is a narrow margin of error in the medical field. Unfortunately, for healthcare professionals, the result and consequences of high stress can lead to inaccuracies which can lead to fatal mistakes (Burger and Lockhart, 2017). Stress not only affects healthcare workers, but students as well. Nursing students experience a higher level of stress compared to students in other types of health professions (McCaffrey et al., 2009). Elevated levels of stress may negatively impact nursing student performance and general health, especially during clinicals, which is usually their initial encounter with direct patient care (Huberty et al., 2019).

Mindfulness is an intervention method shown to assist individuals in self-managing stress levels and is effective in promoting a balanced state of mind and body (van der Riet et al., 2018). Mindfulness applications are becoming increasingly helpful for educators and nursing students as a method for stress reduction (Cheli et al., 2020). Gaining access to mindfulness exercises is incredibly simple and at almost no financial cost. For example, free phone applications can be downloaded through smart phones or relevant content can be searched online. As society continues progressing towards a fully technological one, most individuals are now able to access updated, pertinent and accurate information. For this reason, this project will focus on undergraduate nursing students, and explore how the use of mindfulness exercises can impact their stress levels.

Background and Significance

High levels of stress are common in the nursing profession, beginning as a student. College students, in general, face increased levels of stress regarding graduating and their future careers. A study reported that over 85% of college students between the ages of 18 and 33 years, expressed the feeling of being overwhelmed (Huberty et al., 2019). A systematic review conducted on graduate students, including nursing graduate students, showed a reduction in perceived stress levels in all eight studies after a mind-body-stress-reduction technique was implemented (Stillwell et al., 2017). Another study measuring the effects of stress on Korean undergraduate nursing students found "over 29% of college students reported depression in Korea and the United States" (Song & Lindquist, 2015, p. 86). Depression is a condition that should not be taken lightly as it can lead to sleep disturbances, loneliness or even more severe problems such as suicide (Huberty et al., 2019). Globally, suicide is the most preventative cause of death; however, millions of people continue to die from this each year (Pullen et al., 2016). The Centers for Disease Control and Prevention (CDC) report 47,000 individuals died from suicide in the United States (U.S.), the second leading cause of death for people aged 10 to 34 years. A survey by the American College Health Association-National College Health Assessment (ACHA-NCHA) found college students are more vulnerable to develop mental health problems and found a strong association between stress and suicide attempts (Liu et al., 2019). For this reason, all college students should take measures in order to help reduce their stress levels.

In healthcare professions, making a mistake can disrupt safe patient care. Healthcare workers have very little room for error as any inaccuracy can result in a life or death situation. Two landmark reports, *To Err is Human* (IOM, 1999) and *Crossing Quality Chasm* (IOM, 2001),

report alarming statistics regarding how many patients are injured and even die in hospitals yearly due to preventable medical errors. *To Err is Human* report highlighted that tens of thousands of Americans die every year in the United States (U.S.) hospitals due to issues related to patient safety and inadequate quality of care (IOM, 1999). The second report in a series, *Crossing Quality Chasm* (IOM, 2001), demanded an urgent need for fundamental change to close the quality gap and further discusses a health care quality gap, recognizes practices that hinder patient safety, and investigates how systems approaches can be used to implement a whole health care system change. Additionally, the report conveys that partial factors responsible for the healthcare quality gap include inferior nursing practice, unrealistic workloads causing fatigue, and overwhelming stress (IOM, 1999; 2001). With the high level of occupational stress that nurses experience, patient care is adversely affected, which may negatively impact patient safety and quality of care (Nowrouzi et al., 2015). Nursing students carry an immense amount of pressure with the fear of harming an individual. In a study conducted among nursing students in Iran, 99.3% reported a moderate to high level of perceived stress which was related to the fear of making a mistake, working in an unfamiliar environment with sick patients and communicating with professionals (Rafati et al., 2017). It is important for nursing students, who are starting clinicals, to learn how to interact with ill patients and communicate with other healthcare workers with a clear mind. In addition, because the consequences of stress on nursing students are so high, it is important to manage the stress as a student, prior to getting into the professional setting.

There is an increased rate of students dropping out of nursing programs which can be linked to stress and the intensity of the program. Nationwide, undergraduate Bachelor of Science in Nursing (BSN) programs have high attrition rates, reported to be at 50% (Henderson et al.,

2019). There is a large gap between students being admitted into nursing schools and those who graduate from the program (Watson et al., 2017). According to the Office of the Secretary of Higher Education (2018), the graduation rate in 2017 for full-time students in a four-year bachelor's degree program, was only 47% in New Jersey and 46.3% in public institutions across New Jersey. Carrying a large amount of stress can result in "disease, changes in health, poor academic performance, student's withdrawal from the program, and can ultimately affect the quality of patient care" (Rafati et al., 2017, p. 6120). Student drop-out rates not only have negative consequences on the students, but for the academic institutions as well. If a large portion of nursing students are unable to complete the program and graduate, it leads to a decreased number of professional nurses working in the field. According to The World Health Statistics Report, there are approximately 3.9 million nurses in the U.S. (Slattery et al., 2016). The largest section of healthcare careers is nurses with an employment rate growing faster, at 15%, compared to all other professions through the years of 2016 to 2026 (Haddad & Toney-Butler, 2019). A possible solution to increase the number of nurses in the professional field is to increase the number of students graduating from nursing school. Nursing students experience higher levels of academic stress which is a factor that can influence the students' reason to drop out of nursing school (Henderson et al., 2019). There be more registered nursing jobs available compared to any other profession in North America (Haddad & Toney-Butler, 2019). This can ultimately impact patient safety, quality of care, outcomes and safe practices (Rafati et al., 2017).

The U.S. Bureau of Labor Statistics predicts that 11 million additional nurses will be needed to address the shortage (Aiken et al., 2009). Implications of the current nursing shortage, caused by the high attrition rate of nursing students, can lead to stress and burnout, for nursing professionals, related to the physical and intellectual demands of the job (van der Riet et al.,

2018). Nursing shortages can negatively affect the health care system as a whole as it can lead to medical errors, leading to higher morbidity and mortality rates (Aiken et al., 2009). Negative outcomes such as burnout are contributing towards job dissatisfaction and therefore resulting in a high turnover rate for nurses (Nantsupawat et al., 2017). Additionally, unreasonable workload, conflicts with physicians, tightened budget, staffing shortage, lack of support from unit administration, and increasingly complex patient needs are contributing factors to nurses' occupational stress (Knickman & Kovner, 2015). Nursing shortages can have a significant financial impact on healthcare facilities because if more nurses are required, health-based institutions are forced to spend more money on overtime or outside agencies in order to provide adequate staffing (Straw, 2017). In 2017 a study revealed, in a university hospital of Southern California, a cost of "approximately $5.8 million was attributed to overtime and extra shift bonuses while $15 million was spent on contract nurses" (Straw, 2017, p. 4). Additionally, if the professional nurses are being overworked or are unsatisfied it can lead to a high turnover rate, meaning nurses are either leaving their jobs or the profession all together. Estimated turnover costs per nurse in an inpatient setting can vary from $62,000 to $67,000 and can be as high as $1.4 billion to $2.1 billion for new nurses leaving their jobs within three years (Kovner et al., 2016). The turnover rate for nurses can be extremely expensive not only to the facility but also to society. Large institutions, such as hospitals can financially impact the economy because the turnover costs are paid using taxes from Medicaid and Medicare (Kovner et al., 2016).

Mindfulness Meditation

Mindfulness meditation (MM) originated from spiritual traditions involving the conscious control of the mind, both mentally and physically, and a variety of exercises such as deep breathing, body scan meditation and stretching (van der Riet et al., 2018). For healthcare

workers, MM has been effective for "preventing and managing stress, anxiety, and burnout, and enhancing resilience," even showing to improve the memory of undergraduate nursing students who are "involved in academic and clinical tasks" (van der Riet et al., 2018, p. 202). Studies focused on using mindfulness-based stress reduction (MBSR) interventions have found significant decreases in anxiety, stress, and depression in undergraduate nursing students (Song & Lindquist, 2015). Using stress management behaviors has also improved students competence and enhanced their practice performance in nursing education (Eng & Pai, 2015). Not only psychological advantages have been reported in performing mindfulness exercises, but also physiological benefits such as improvements in cortisol levels, immune response and reduction in blood pressure have been found (van der Riet et al., 2018).

Needs Assessment

Stress is extremely important to address in nursing students. Little research has been done to address the high levels of stress among nursing students (Belnavis, 2019). However, nationally, many colleges offer social support resources and counseling for students to help manage stress (Rafati et al., 2017). Therapy has shown to greatly improve mental health and increase relaxation techniques however, access to these services are usually only found on-campus, which can limit access to nursing students (Jenkins et al., 2019). Scheduling the time for counseling can add to the long list of challenges nursing students face when attempting to manage their stress. Even with resources such as counseling available to the students, there are many barriers to accessing them which include but are not restricted to clinical days, travel time and the high workload of nursing classes (Jenkins et al., 2019). Reyes et al. (2015) conducted an integrative review to explore the use and understanding of resilience in nursing education settings and identified the undergraduate nursing curricula does not provide students with

effective stress management techniques.

The American Nurses Association (ANA) discussed the stress that nurses experience and described it as one of the most underappreciated yet impactful problems that nurses experience. The nursing professions physical and emotional demands are endless. The stress not only has a negative impact on nurses and their wellbeing, but also adversely affects patient care and outcomes. Additionally, stress challenges nurse retention rates and impacts the financial security of the healthcare system as a whole. Nationally, the ANA encourages nurses to protect themselves and offers ways for nurses to cope with stress by providing many services. The ANA designated 2017 as the year of the Healthy Nurse and focused each month of the year to address special wellness and safety matters with several organizational partners. April was chosen to focus on the topic of stress and encourages nurses to practice stress management techniques such as mindfulness meditation and mindfulness webinars that explore mindfulness practices for self-care and nursing practice. The ANA also provides nurses with multiple resources such as books and articles to encourage nurses to engage in self care and prioritize their own health and wellness.

Educators implementing relaxation techniques such as mindfulness exercises and meditation in the classroom have shown to improve mental health and reduce stress and anxiety (Burger & Lockhart, 2017). However, this is rarely seen as faculty are under a lot of pressure to follow a particular curriculum in a limited amount of time (Burger & Lockhart, 2017). Using class hours to implement stress reduction exercises takes away from the time used to educate students on pertinent material related to the subject of matter. Moreover, relaxation exercises are generalized to the class as opposed to “tailored approaches” for each student (Jenkins et al., 2019, p. 14). As a result of not implementing MBSR strategies in the curriculum, the students’

high stress remains unaddressed (Petko, 2017).

The university chosen for the project has minimal resources dedicated to mindfulness-based exercises. Under the university's Counseling Health and Wellness Center website, when the topic of mindfulness was searched, only two options appeared. One was an alumni webinar about Mindfulness in the Classroom and Beyond which had taken place over five months ago. The second option provided information and resources on the topic of mindfulness, explaining what it is, and its benefits. Available resources included a list of various online mindfulness techniques. Although the website is practical and allows a method for students to reduce stress levels, the inconvenience of locating these resources and the lack of the university's awareness of the benefits for students may be an added disadvantage. Additionally, because the resources are simply listed on the website, utilization by the students could not be determined. Implementing a convenient mindfulness meditation strategy is a benefit to students (van der Riet et al., 2018).

Nursing students face many obstacles while in the program. From time management to financial restraints, stress reduction is not considered a high priority. This is concerning because of the negative ripple effect that inevitably results from high stress levels in this particular demographic. The widespread use of smartphones has created a great opportunity to utilize technology, by means of an app, to teach the techniques of mindfulness meditation to help alleviate the students stress levels (Huberty et al., 2019). Using mindfulness-based apps on the smartphone can be resourceful, and when searched, a total of 560 apps in English was available on Apple iTunes and Google Play Store (Huberty et al., 2019). The apps are always accessible to the student, no travel time is required, and the Calm app specifically is not only free, but also listed as the top mindfulness-based apps on Apple iTunes (Huberty et al., 2019).

SWOT Analysis

The strengths, weaknesses, opportunities, and threats (SWOT) analysis is a beneficial technique that can assist the action planning process while implementing a project focused on improving nursing students' stress levels in a university setting.

Strengths

Organizational strengths include the college offering a variety of resources such as online mindfulness meditation resources, recreational center, sports teams and athletic centers in order to support the students mental and physical well-being. Counselling services are also offered free of charge. The university's dedication and commitment to the students can be a motivation for success.

Weaknesses

Potential weaknesses include an increased workload, limited time in students' schedules due to the intensity of nursing school, few online programs being offered or courses available only once a year. A lack of faculty involvement in campus wellness programs and an increased number of working students, indicating less time to focus on studying are also some disadvantages.

Opportunities

External opportunities outside the organization include various options of NCLEX review courses offered to students and globalization, such as students being able to study abroad. Faculty attending developmental activities, staying up-to-date in practice, and enhancing teaching techniques are also benefits.

Threats

External threats involve the lack of time and training to teach and implement mindfulness

interventions. There is also a reduction in financial aid eligibility and limited resources to support faculty in facilitating mindfulness meditation. Other potential threats include the confusion between religious and spiritual stress management techniques, limited financial resources and insufficient funding for faculty, training and time.

Problem/ Purpose Statement

Increasing the levels of stress amongst undergraduate and graduate nursing students is a major concern and has shown to have a negative impact academically, physically, and mentally (Turner & McCarthy, 2017). Stress can lead to various other problems including anxiety and depression (Turner & McCarthy, 2017). Students experience stress at a heightened rate and are often ill-equipped to handle or overcome the symptoms in order to continue working (Turner & McCarthy, 2017). Limited educational tools are available to ensure the adequate functioning of nursing students. As such, it is important for nursing students to have a form of support that can be used and available whenever necessary to provide excellent services to patients while decreasing the turnover rate in this field.

Clinical Question

The clinical question guiding this project is, "In undergraduate and graduate nursing students, how does mindfulness exercises, through the use of the Calm app for at least 10 minutes daily, affect stress levels over a four-week time period?"

Aim and Objectives

The aim of this project is to improve utilization of mindfulness exercises among nursing students. The objectives of this project are to:

- Use mindfulness exercises, through the Calm app, with undergraduate and graduate nursing students for at least 10 minutes daily for four weeks.
- Measure the students stress levels using the 'Perceived Stress Scale' before, during and after implementing mindfulness strategies over a four-week period (Cohen & Janicki-Deverts, 2012).
- Compare stress levels between undergraduate and graduate nursing students.
- Compare the amount of time spent daily (less, greater or equal to 10 minutes) on the PSS scores.
- Compare the mindfulness techniques used (calming, deep breathing, meditation) on the PSS scores.

Review of Literature

A literature search was conducted to investigate the impact of mindfulness exercises on the stress levels of undergraduate nursing students. The search strategy consisted of using databases such as CINAHL, EBSCO, PubMed and PsychINFO, as well as Google Scholar and the Rutgers library website to find research articles and reviews. There was no general search of the internet, to avoid gray literature. A search using the keywords *mindfulness meditation, nursing students, stress,* and *students*, produced 17,753 results. The search was limited to articles conducted within the last five years and published in English reducing the results to 5,742 articles. The additional keyword *MBSR* was used to narrow the results to 145. Of the 145 articles examined, a total of 12 studies were chosen for this review based on their relevance to the topic of mindfulness-based stress reduction and their participant population from an academic institution. Inclusion criteria included studies whose participants were nursing students,

investigating a mindfulness-based intervention and using stress as the outcome measure. Exclusion criteria were participants who were healthcare professionals and studies delivering interventions that were not related to mindfulness. Filters were applied for full texts available online and duplicate articles from different databases were removed. In order to guide the personalization and relevance of the literature review, the nursing librarian assisted in the search through the online chat available on the university website, email and by phone. The remaining articles were critically analyzed, and the literature was synthesized.

A total of 12 studies were selected consisting of six randomized controlled trials (RCTs), a cross sectional study, two non-experimental research studies, and three systematic reviews. Four of the RTCs focused on traditional MBSR programs lasting eight weeks in length while two programs lasted four to six weeks. The 12 articles were appraised using the John Hopkins Appraisal tool and are included in the table of evidence (see Appendix A). All articles included participants who were at least 18 years of age. There were seven sources that involved undergraduate nursing students, one with graduate nursing students and two with both undergraduate and graduate students. Three papers also had other healthcare related students with the nursing students as participants. Minor inconsistencies were found on the literature review and a pattern was noted between implementing mindfulness exercises and stress reduction. All articles in the table of evidence showed a positive outcome with stress reduction when a mindfulness intervention was implemented except one, because of the insufficient sample size. The time frame for all studies was between 4 and 12 weeks. A limitation in eight sources included an insufficient sample size or too high of an attrition rate. Additionally, all included studies were carried out at the researchers' own university which can affect the generalizability of the results.

Multiple researchers reported coping strategies to help with stress and burnout (Halland et al., 2015; Karaca & Şişman, 2019; Noble et al., 2019). More specifically, improvements in clinical practice and the classroom manifest as student's increase their skills to problem-solve and manage struggles within the clinical environment (Burger & Lockhart, 2017; Huberty et al., 2019; O'Driscoll et al., 2017). Several researches support that mindfulness meditation and students' resilience, acquired through resources available in academic facilities, are significantly important factors in successfully managing stress (Song & Lindquist, 2015; Spadaro & Hunker, 2016; van der Riet et al. 2018). Additionally, implementation of mindfulness-based exercises positively improved stress levels in undergraduate nursing students, and eased the process of working with patients in a clinical environment (Karaca & Şişman; 2019; Noble et al., 2019; Said & Kheng, 2018).

In a randomized controlled trial, Aeamla-Or et al. (2015) examined whether an eight week mindfulness meditation program could decrease stress and anxiety levels as well as improve mindfulness and self-esteem in nursing students. Initially, the data consisted of self-reported scales, collected at eight, 16, and 32 weeks. The MBSR intervention group received eight weekly classes lasting 2.5 hours, with sessions designed to develop mindfulness. In the sixth week of the program, students were provided with eight hours of silent practice. A significant difference in the intervention group, in stress ($p = 0.0190$), self-esteem ($p = <0.0001$), and mindfulness ($p = 0.0002$) was observed. However, there was no significant difference between the intervention and control groups for depression ($p = 0.1904$). Based on these findings, MBSR showed to be a useful strategy in alleviating stress in nursing students.

Similarly, Halland et al. (2015) implemented a seven-week MBSR program with six weekly sessions for medical and psychology students in their second and third semester, aged 19

to 46 years.. The participants in the MBSR group displayed a significant amount of problem-focused coping ($p = 0.01$) and social support ($p = 0.02$) which were factors that eventually assisted with managing stress levels (Halland et al., 2015). Likewise, in a study performed by Karaca and Şişman (2019), 55% of the participants stated knowledge learnt from the mindfulness exercises would be applied towards educational stressors and 48% of the students would apply it to stressors encountered in their daily life. Numerous research studies support that mindfulness meditation produced higher resilience and self-compassion for students, which are important factors in managing stress (Huberty et al., 2019; Noble et al., 2019; O'Driscoll et al., 2017). Statistical significance was found with cognitive mindfulness scores ($p = 0.02$) and resilience ($p = 0.04$), where mindfulness awareness scores increased from a mean of 2.5 to 3.73 and resilience from 18.5 to 22.0 in students exposed to mindfulness therapy (Noble et al., 2019).

Burger and Lockhart (2017) discussed the effect of mindfulness meditation on nursing students. When mindfulness meditation was implemented in the classrooms, a significant improvement was seen in the students' stress and attention levels of a four week period ($p = 0.000$). Likewise, Noble et al. (2019) performed a study where medical and nursing students participated in five weekly sessions of mindfulness training in order to evaluate their psychological well being through their ability to be more mindful and resilient for a total of six weeks. The study resulted in significant findings for cognitive mindfulness scores ($p = 0.02$) and resilience ($p = 0.04$) and the students verbalized vast benefits from the mindfulness interventions such as ease with falling asleep, avoiding panic attacks and most participants stated their improved ability to cope with stress (Noble et al., 2019).

Mindfulness meditation exercises have shown effectiveness in reducing stress and promoting positive mental health in various populations (O'Driscoll et al., 2017; Song &

Lindquist, 2015). In Korea, nursing students joined an eight-week MBSR course and the results showed significant reduction in student's stress (Song & Lindquist, 2015). Similarly, Felver et al. (2018) showed there was an increase in mindfulness scores ($p = 0.01$) and decrease in psychological distress levels ($p < 0.01$) after students participated in an eight-week MBSR course. Mindfulness meditation mobile apps have also shown to be favorable for stress management. Huberty et al. (2019) examined college students using the Calm app for a four-week period. There was a significant increase in mindfulness, stress, and self-compassion ($p < 0.04$) after using the mobile app and even continued to be beneficial at follow-up after 12 weeks ($p < 0.03$). Another seven-week MBSR program found that students who practiced mindfulness meditation had more focus on their self-care behaviors and experienced greater awareness of stress by utilizing mindfulness techniques (van der Riet et al., 2015).

The review of literature revealed successful effects of mindfulness-based training for students' stress levels, with the length of the studies lasting four to eight weeks and the duration of the intervention lasting 10 to 150 minutes daily (O'Driscoll et al., 2017; Said & Kheng, 2018; van der Riet et al., 2018). O'Driscoll et al. (2017) reviewed studies that involved a mindfulness intervention implemented on health or social care undergraduate students. From 11 studies, all but one reported that mindfulness had short term benefits on stress and mood, with gender and personality being factors that could potentially affect the results (O'Driscoll et al., 2017). Similarly, Said and Kheng (2018) reviewed 19 research papers that found that the higher the level of mindfulness, the lower the nursing stress with improved psychological well-being. Likewise, in the review of literature, van der Riet et al. (2018) found that four out of five studies using MBSR exhibited positive outcomes in terms of stress reduction. Although mindfulness interventions are an effective, easy and cost-effective method of improving stress levels, majority

of the studies examined in the review of literature consisted of a smaller and more local sample size, limiting the generalizability of the results (O'Driscoll et al., 2017; Said & Kheng, 2018; van der Riet et al., 2018).

Theoretical Framework

The theoretical framework used to guide this project was the Plan-Do-Study-Act (PDSA) cycle. The model was developed in 1920s from the works of Shewart and can also be referred to as the Deming cycle (Crowfoot & Prasad, 2017). The PDSA cycle is a framework for change and is depicted as a cycle to signify the continuity for quality improvement (Langley et al., 2009). The *plan* stage involves identifying and defining the change that requires improvement and also stating the intended outcomes (Crowfoot & Prasad, 2017). For the project, the expected change was to reduce the stress levels of nursing students. An intervention used to improve stress levels was mindfulness exercises. The plan was to introduce and teach undergraduate and graduate nursing students about mindfulness with the intention of helping them manage their stress better. The *do* stage involves testing the change by carrying out the plan (Crowfoot & Prasad, 2017). Unplanned or unintended results, which can affect the change positively or negatively, should also be considered and documented (Crowfoot & Prasad, 2017). For the project, the *do* stage of the cycle consisted of implementing the mindfulness teaching to nursing students and gathering the data. The Perceived Stress Scale was used to monitor the students stress levels at intervals throughout the implementation period. The consequences, both good and bad, were also be noted throughout this process. The *study* stage of the cycle involves analyzing, comparing and examining the change to see whether it was successful, and an improvement was made, or if further development is needed (Crowfoot & Prasad, 2017). For the project, the *study* stage included analyzing the data collected from the Perceived Stress Scale survey to see if the nursing

students stress levels were improved as they performed daily mindfulness exercises. Lastly, the *act* stage of the cycle recognizes adjustments and changes needed based on the prior three stages and takes action towards the next steps for a new cycle (Crowfoot & Prasad, 2017). The focus of this phase is planning for the next PDSA cycle based on the improvements that have not occurred in the prior cycle (Crowfoot & Prasad, 2017). For the project, the *act* stage consisted of examining the entire cycle and identifying the changes that need to be made in order to repeat the cycle more successfully. This stage of the model will also determine whether the framework for change is valid enough to continue in the future. See Appendix B for the conceptual framework as it relates to this project.

Methodology

Design of the Project

The pilot project used a non-randomized, convenient sample to recruit a cohort of nursing students in a pre-licensure traditional baccalaureate nursing program (BSN), master of science in nursing program (MSN) and doctorate of nursing practice program (DNP) at a public university. The students were asked to participate in a mindfulness-based stress management program, for four weeks, using electronic surveys administered to the participants at the start, mid-, and end of the implementation period.

Setting

The project took place at a school of nursing at a public university in New Jersey. The college offers online courses as well as a variety of in-person undergraduate and graduate nursing programs. There are approximately 300 undergraduate students and 100 graduate

students in the nursing program.

Study Population

This project included a purposeful and convenient sample of undergraduate and graduate nursing students from a public university in New Jersey. Inclusion criteria includes undergraduate and graduate nursing students over the age of 18 years and able to read, understand, and speak English. Exclusion criteria includes those who do not own a smartphone capable of downloading apps. Raosoft, Inc. (2004) was used to calculate a desired sample size for the project. Having a 5% margin of error and 95% confidence level, the necessary sample size for the undergraduate program is 169 participants while the necessary sample size for the graduate program is 80 participants. As a result, the total desired sample size was 249 students.

Subject Recruitment

In light of the current COVID-19 restrictions on physical distancing and the likelihood of classes meeting remotely, recruitment occured via email. Once all Institutional Review Board (IRB) approvals were granted, students were recruited for voluntary participation in the mindfulness-based training program using email recruitment. Emails were sent by the university faculty on behalf of the co-investigators during the first week of classes of the Fall 2020 semester to students in both the undergraduate and graduate program through the use of a script (see Appendix C) and instructions for downloading the Calm app (see Appendix D). Course faculty were provided with contact information (email and telephone number) for the co-investigators for any concerns or questions. The participants were informed participation was voluntary and their decision on participation would not impact their grades in the nursing program.

Consent Procedure

The two graduate student co-investigators were responsible for obtaining the consent from the participants. Students choosing to participate in the project intervention were asked to sign an anonymous consent form (Appendix E) via Qualtrics, a web-based service that allows students to complete the project consents and surveys, due to social distancing as a result of the pandemic. The link for consent was sent via email by the approving faculty and was required to complete before the students could participate in the study or take the first PSS survey. The consent included information that explained the purpose, benefits and risks of the project, as well as the contact information for the principal investigator (PI) and the IRB Director for any questions or concerns. The consent also informed students that they could end their involvement at any time without concern.

Risks/Harms/Ethics

Participation in this study posed minimal risk. Participants may have experienced some mild discomfort and anxiety from filling out the PSS survey and questions asked may have caused the students to think about feelings or experiences that could make them sad or upset. Downloading the app on the smart phone could also be an inconvenience as it could take up some memory space on the participant's device. Using the mindfulness exercise app for at least 10 minutes daily could also be time consuming. The Co-I never had access to the students email address. The emails were sent by the faculty in the unveristy. Additionally, as the survey was anonymous, there was a minimal chance any identifiers were collected and there was no tracking of IP addresses.

Subject Costs and Compensation

Participants did not receive monetary compensation or cost to participate in the project. However, at the end of the program, participants were able to keep the mindfulness app, to help manage their stress and anxiety levels through its use of guided mindfulness meditation, in order to manage struggles within the clinical environment and increase the ability to problem-solve.

Study Intervention

Considering the current COVID-19 restrictions on physical distancing and the likelihood of classes meeting remotely, recruitment occurred via email.

- Recruitment emails were sent by the approving faculty to undergraduate and graduate nursing students during the first week of classes of the fall semester.
- The script in Appendix C was used and attached was the instructions for downloading the Calm app (Appendix D).
- The email also included a link leading to Qualtrics, where the participants were directed to the anonymous consent forms and then to the first PSS survey link.
- Participants were asked to engage in mindfulness exercises for 4 weeks, using the Calm app, for least 10 minutes daily.
- During week 3, participating students were emailed the link to the second survey.
- Participants were emailed in week 5, with the link to the post-intervention PSS survey.
- At the end of data collection, data analysis was completed, and the results obtained.

Outcomes to be Measured

The outcomes required from this project was to measure the nursing students stress levels. The participants perceived stress levels were obtained using the Perceived Stress Scale (Appendix F), which is a simple and easy to use questionnaire. The PSS consists of 10 questions that measure psychological stress using a Likert scale. The total score of all 10 questions are calculated and categorized as either low stress, moderate or high perceived stress based on a range. The greater the number, the higher the stress level. It is a self-reported questionnaire that is designed to measure the degree to which individuals assess or perceive situations in their lives as stressful. The PSS is a valid and reliable instrument in measuring and scoring participants' stress levels. The PSS was completed by the participants a total of three times; pre-intervention on week 1, after two weeks, and post-intervention, on week 5, to assess the effectiveness of mindfulness at the end of the project. Additional demographic information asked from the students was which relaxation choice was used for mindfulness and how much time was spent using the Calm app daily. The aggregate mean scores at the start, midway, and end of the four week implementation period were analyzed using paired t-tests to compare the means of the PSS scores for both unergraduate and graudate students. The independent variable was the mindfulness meditation intervention, while the dependent variable was the perception of stress, as measured by the Perceived Stress Scale.

Project Timeline

The proposal development was completed in the Spring of 2020 and presentation of the proposal to the team in May 2020. The proposal was submitted to the International Review Board (IRB) in July 2020. The participant recruitment was during the first week of classes in Fall

2020, and during this time the participants were required to do the pre-intervention survey. The implementation of the intervention took place for a total of four weeks, after which the post-intervention survey was done. During week three, the mid-way survey was completed by the participants. All data was collected after the third and final PSS survey was completed. Data analysis occurred in October 2020. The evaluation and final writing of the paper started in October 2020 until the point of presentation for the final project in November 2021. Finally, graduation is expected in May 2021. Refer to Appendix G for a complete timeline.

Resources Needed/Economic Considerations

The costs associated for this project was the sole responsibility of the Co-I. There was an anticipated cost of $40 for making the poster. Qualtrics web-based service was free of charge and was used to distribute the participant consents and the Perceived Stress Scale questionnaire. The co-investigators incurred the cost of time and effort that was needed to implement and evaluate the project.

Evaluation Plan

The nursing students' stress levels was assessed in this project, in addition to relaxation choice and time spent on app daily. The participants were required to do the PSS survey before, during and after the mindfulness intervention. The scores were then compared from the start, middle and end of the four weeks to see if there was an improvement in stress levels while performing the MBSR activity. The PSS scores were also compared in relation to the relaxation choice and time spent using mindfulness.

Data Analysis Plan

Analytical statistics were used to determine the efficacy of the project interventions by comparing the mean scores from the three surveys. Ordinal data (pre-intervention, mid-intervention and post-intervention scores) was collected on the participants stress levels based on their PSS score. All the results from the questionnaires was entered into a spreadsheet and categorized. The data was then moved from Excel into SPSS. Here, aggregate data analysis was done by calculating the mean results from each category and then comparing them. The expected trend was to see a decrease in the mean numeric values from the pre-intervention to the post-intervention meaning a decrease in the participants' stress levels. The findings among the time spent and relaxation choices was also compared to see if there were any differences in stress levels after implementing mindfulness. The statistical software Microsoft Excel and SPSS were used for completion of data analysis and the statistical significance of the project. The paired t-test showed the difference in the scores before, during, and after the intervention to determine whether they were statistically significant. Pearson correlation coefficients was calculated to test for associations between the time participants spent using the Calm app for meditation and difference in PSS scores. P-values less than 0.05 is considered statistically significant. The ANOVA test was computed between the two groups of nursing students at baseline, mid-intervention, and post-intervention to determine if there is any difference between the undergraduate and graduate students.

Data Maintenance

As this was an anonymous project, there is no link to any identifiable information. During the project, the data and consent forms were kept in Qualtrics which is username and password

protected. The PI, Co-I, and the team member of the project have access to the data and consents. Qualtrics servers are protected by firewall systems, which guarantee securing the collected data. Access to the consents and surveys are restricted to the project team members only. Upon completion of the project, closure of the IRB, and final writing of the manuscript all data will be destroyed in accordance with Rutgers University guidelines.

Results

Demographics

A total of 105 nursing students participated in the project. From this, 61 participants were undergraduate students and 41 were graduate students. Three nursing students who completed the PSS survey chose not to specify whether they were undergraduate or graduate students (see Appendix H). For the undergraduate students, a total of 29 students participated in week 1; 15 students in week 3; and 17 students in week 5. For the graduate students, a total of 16 students participated in week 1, 14 students in week 3 and 11 students in week 5.

Relaxation Choices

When observing the relaxation choices for the entire student nurses population over the four week period, 44 used meditation, 32 used deep breathing and 21 used calming. There were eight students who did not specify which technique was used (see Appendix I). No statistically significant differences were noted between the relaxation techniques ($p = 0.073$).

Time Spent

Students were asked about the amount of time they used the Calm app for daily. A total

of 58 students spent at least 10 minutes daily, while 29 used more than 10 minutes and 11 used mindfulness for less than 10 minutes per day. A total of 88.8% of all nursing students used the Calm app daily for at least 10 minutes throughout the project (see Appendix J).

When looking at the PSS scores in comparison to the time spent on the Calm app daily, the mean PSS score for students using mindfulness for less than 10 minutes was 23.91. The mean score for students using the Calm app daily for at least 10 minutes was 21.28. Lastly students who practiced mindfulness for more than 10 minutes daily had a mean PSS score of 18.79 (see Appendix K). When making multiple comparisons, statistical significance was seen between less than 10 minutes and more than 10 minutes ($p = 0.032$).

PSS Scores

The overall mean PSS score throughout the four week period, and for all participants, was 21 (see Appendix L). When analyzing the PSS scores over the four week period, week 1 had a mean PSS score of 24.09 while weeks 3 and 5 had a mean PSS score of 18.13 and 9.32, respectively (see Appendix M).

Undergraduate nursing students had a statistically significant change in their PSS score from week 1 to week 3 to week 5 according to the Kruskal-Wallis, $p = 0.000$. However, this test did not tell, specifically, which of the individual comparisons are significant. Mann Whitney U tests were used to examine the statistical difference between the weeks, which showed statistically significant results between week 1 compared to week 3, with $p = 0.000$, and between week 1 compared to week 5, with $p = 0.002$. However, there was no statistical significance seen between week 3 and week 5, with $p = 0.576$.

When analyzing the data for graduate nursing students, very similar results were observed. There was a statistically significant change in the PSS score from week 1 to week 3 to

week 5 according to the Kruskal-Wallis, $p = 0.008$. However, this test did not tell, specifically, which of the individual comparisons are significant. Mann Whitney U tests were used to examine the statistical difference between the weeks, which showed statistically significant results between week 1 compared to week 3, with $p = 0.017$, and between week 1 compared to week 5, with $p = 0.003$. However, there was no statistical significance seen between week 3 and week 5, with $p = 0.893$.

The Bonferroni correction tests were used to analyze the individual weeks because there were multiple comparisons for both the undergraduate and graduate nursing students groups. It adjusts probability (p) values due to the increased risk of a type I error when making multiple statistical tests, it suggests that the p-value for each test must be equal to its alpha divided by the number of tests performed. As a result, (.05/3=.0167), which results in a more rigorous level of significance when the results are summarized.

Discussion

Studies performed on nursing students that used mindfulness showed a positive outcome in terms of reducing stress levels (Henderson et al., 2019; Huberty et al., 2019; Rafati et al., 2017). Similarly, in this project, when looking at the PSS scores and comparing them through weeks 1, 3 and 5, the students' stress levels decrease from week 1 to 3. This is represented by a higher PSS score of 24 in week 1, decreasing to 18 in week 3, followed by a slight increase in stress levels compared to week 3 (mean PSS score increases from 18 to 19). On the other hand, if pre-intervention results (week 1) and post-intervention results (week 5) are compared, an overall decrease in nursing students' stress levels is seen, as they utilize mindfulness exercises through the Calm app daily. The results show statistical significance from week 1 to 3 and week 1 to 5 for all students however, there is no significant seen from week 3 to 5 for both undergraduate and

graduate students. A possible explanation for this is the students are beginning to implement mindfulness during week 1, when it can be assumed they never used mindfulness in their daily routine in the past. As the students use mindfulness for the next two weeks, their stress levels decrease. However, as they continue using mindfulness through week 5, their stress levels maintained at similar levels to week 3. Therefore, another big change is not observed for the last two weeks compared to the first two weeks. Given there was statistical significance when comparing the PSS scores from week 1 and 3, or week 1 and 5, this signifies if another sample was used, it will be likely to get the same results given this project was implemented elsewhere. Higher *p* values seen in the graduate nursing students may be due to the very small sample size compared to the undergraduate students, which can be explained as a type II error since this is not seen when comparing the entire population of all nursing students as it is a much larger sample.

The overall PSS scores noticeably decreased in relation to the time spent on the Calm app daily. In other words, the PSS score was lower, signifying less stress, in students who practiced mindfulness for at least 10 minutes daily compared to a higher mean PSS score in students who spent less than 10 minutes doing mindfulness exercises. This directly relates to a study performed by Spadaro and Hunker (2016), who concluded the more time undergraduate and graduate nursing students spend on mindfulness meditiation, the greater the stress reduction. When comparing the relaxation choices, no statistically significant results were observed between the calming, deep breathing and meditation groups. This shows that it really does not matter which of the relaxation methods were selected by the students in relation to the PSS scores.

The project was successful in reducing both undergraduate and graduate nursing students

stress levels after using mindfulness exercises daily as the literature suggests (Karaca & Şişman; 2019; Noble, 2019; Said & Kheng, 2017). Similar studies reviewed prior to doing this project showed that doing mindfulness exercises for at least 10 minutes daily would reduce participants' perceived stress levels. However, a downward trend was seen for the number of all participants when comparing week 1, 3 and 5.

The primary objective of this project to use mindfulness exercises, through the Calm app, with undergraduate and graduate nursing students for at least 10 minutes daily for four weeks was implemented. Additionally, the students stress levels were also successfully measured using the 'Perceived Stress Scale' before, during and after implementing mindfulness. However, the objective of comparing the stress levels between undergraduate and graduate nursing students as this was difficult to achieve due to the very small sample size of the graduate students. A vast number of research articles reviewed prior to this project, with a similar concept, also included a small sample size as a limiation (Aeamla-Or et al., 2015; Burger & Lockhart, 2017; Felver et al., 2018; O'Driscoll et al., 2017).

Advantageous unintended consequences of this project arose from changing the project's location and population. Although this appeared to be negative at first, due to the difficulty of finding a new site to implement the project, multiple benefits appeared from this opportunity. The project was able to use both undergraduate and graduate nursing students and gained a valuable team member from the new site. Additionally, although the original plan of the project to be implemented in person was unable to occur due to the pandemic, doing the project virtually helped in faster and more efficient communication.

Factors that contributed to the success of this project was the students' ability to follow the guidelines and maintain using the Calm app for at least 10 minutes daily throughout the four

weeks. The participants also needed to do the PSS survey all three times in order to obtain results. Negative influences of the project included difficulty with recruitment amid the COVID-19 pandemic and also considering the changes to work with the current situation. However, although this was a stressful time for nursing students, the goal of this project was to help assist the participants with finding a method to reduce stress; therefore, choosing to be part of this project positively impacted the individuals in the long run.

Limitations

A limitation in this DNP project is the small sample size. The use of a convenience sample of 61 undergraduate and 41 graduate nursing students limits the generalizability of project results. Additionally, it was found that the Calm app has limited free resources and the more it was used, the more it required paid options. However, there are multiple mindfulness-based phone apps that can be used instead. Lastly, only one link was used for the Qualtrics surveys for weeks 1, 3 and 5. This in turn made separately the data from the different weeks more difficult. Using three separate Qualtrics links for each week would have made analyzing the results on Qualtrics much easier.

Implications/Recommendations

Clinical Practice

Stress is a significant problem facing students, especially those in healthcare. More specifically, nursing students are confronted with a demanding and stressful educational environment as a result a stress-reduction intervention is necessary to help students cope with their stress. Many students do not prioritize spending time on interventions for stress reduction due to their hectic schedule. It is extremely important that nurses, nursing students, and all

members of the healthcare team utilize mindfulness meditation to help manage stress.

In order to assist nurses and nursing students, mindfulness-based exercises can be found on cell phones. Even while in clinical practice, most individuals have access to their phones which in turn means access to mindfulness. The convenience of having mindfulness based phone apps so readily available is beneficial if de-stressing activities are required in a moment's notice.

The project can also be advantageous to recent nursing graduates feeling stressed, nervous and anxious working in an unfamiliar environment. Having the skills to manage stressful situations can give the nurse a clear mind in order to provide effective nursing practice.

As a result, it is recommended nurses are aware and have access to mindfulness-based exercises while in clinical practice. Additionally, nurses who are aware of mindfulness mediatiation and its benefits, can recommend this intervention to their patients and as a result, provide an outlet for stress reduction to sick individuals. The use of mindfulness can then increase both staff and patient satisfaction, which is essential to improving the nursing practice.

Healthcare Policy

The Affordable Care Act (ACA) highlights the importance of moving the nation's health care towards health promotion and disease prevention (Rawal, 2016). With such goals, this mindfulness meditation project highlights the ultimate goals of the ACA. Taking action and initiating mindfulness meditation in academic and clinical health care settings is also an effective way to help improve the nation's healthcare workforce. Mindfulness can lead to improvements in the nurses well-being which in turn can have a positive impact on social change by leading to better patient outcomes. In addition, higher quality patient outcomes can be achieved through safe care by the healthcare staff, which is more likely if there is more care, engagement and improved health.

Research revealed that mindfulness meditation strengthens the immune system and reduces the risks of practicing unhealthy behaviors, such as smoking and overeating as a means of coping with stress (van der Riet et al., 2018). Practicing mindfulness meditation can transform the healthcare system and help healthcare professionals cope with stress in healthy ways to the body and mind. Doing so may decrease the demand for health care services, and increase quality patient care.

Publishing and presenting the project can bring awareness to the multiple stressors nursing students experience. Understanding the problem and solution can lead to a greater demand for implementing mindfulness exercises in nursing programs and healthcare institutions which can potentially affect health policy.

Quality & Safety

Nurses are often required to cope with very challenging situations that involve precision and time-sensitive decisions that can affect patient lives on a daily basis. Nurses are often required to multitask and juggle several tasks at a time, which may impact their overall attention, stress level, productivity, injury risk and safety. Other serious consequences such as medication errors and patient safety issues are hugely impacted by stress inherent to nurses. Unsuccessful management of such stress can lead to burnout, depression, reduced job satisfaction and psychological distress (Song & Lindquist, 2015). Stress management is critical as it can help reduce job related stress, which may result in improving job satisfaction (Nantsupawat et al., 2017).

This project shows the value of a mindfulness meditation intervention and how it can tremendously help to manage stress. This may translate into a meaningful treatment option to suggest in the healthcare system. This project's findings will also support that meditation

enhanced healthcare professional self-efficacy as it will offer protection from mental distress and stress. Various research studies measured burnout and stress, and found a significant portion of nurses and nursing students were dangerously fatigued, which may have a negative impact not only on the nurses mental and physical health, but also on the patient care outcomes and on the healthcare system as a whole (van der Riet et al., 2018). This strengthens the support for mindfulness as the appropriate intervention in reducing stress.

Implementing mindfulness meditation programs in health care facilities can positively impact the future of healthcare, lead to positive outcomes, promote resilience, as well as improve employee wellness enormously. Moreover, mindfulness exercises used by nursing students can be applied when working as registered nurses to manage stress more effectively. As a result, stress reduction through mindfulness meditation can lead to high quality of care and safe patient practices.

Education

Literature shows numerous successful interventions using mindfulness meditation to manage stress in many settings and populations. Multiple qualitative data revealed feasibility and acceptance of using mobile app interventions to relieve stress; however, as with any technological devices, there can be malfunctions which can potentially influence the effectiveness of stress reduction (Reyes et al., 2015).

Implications of exposing and teaching nursing student's mindfulness strategies can decrease stress and emotional exhaustion and as a result improve educational outcomes. It is recommended students are exposed to mindfulness and informed about resources (Burger & Lockhart, 2017). Educational programs should also make mindfulness activities more available to students in order to learn about managing stress before becoming professionals. The effect of

stress on nursing students is concerning when considering potential negative effects. As a result, education on mindfulness meditation should be a key component of nursing education to help students cope with stress and decrease its negative effects on their wellbeing (Petko, 2017). Moreover, mindfulness meditation has proven to reduce stress and demonstrated effectiveness for stress management purposes.

Economic

Effectively reducing stress levels in nursing students can ultimately increase the number of graduating students (Rafati et al., 2017). The economic impact will be far reaching as students will have developed a healthy stress management technique, through mindfulness, eliminating the high attrition rate of nursing students and therefore leading to a larger number of registered nurses entering the workforce (Henderson et al., 2019).

Mindfulness meditation can improve the health care system and keep health care affordable and accessible to all. Stress in the workplace may have an economic impact on employers due to concerns related to employee well-being, metal and physical health van der Riet et al., 2018). Stress is related to employee absence, turnover, medical costs, short- and long-term disabilities (Nantsupawat et al., 2017). Mindfulness meditation is proven to help individuals live healthier by helping them cope with stress (Song & Lindquist, 2015). This may help decrease the demand for health care services, reduce the costs, and increase the quality of care (Noble et al., 2019).

There was no cost associated with this project or with mindfulness in most situations which is financially beneficial. For example, the mobile app “calm” is downloaded for free and has some free meditation features that students can use. This costless project has a huge benefit for the students as well as for the organization. The expected benefits of implementing this

intervention into practice can help students accept or adjust to stressful circumstances and promote resilience as well as enhancing the student's abilities to accept the usual stress and manage it better. Therefore, it is recommended colleges embed this concept of mindfulness into their nursing curriculum which can also be beneficial to them as there is no financial burden.

Sustainability/Translation to Broader Group

This project intends to encourage the use of mindfulness meditation to decrease stress in nursing students. The project findings were significant and the participants showed some positive outcomes and learned skills to manage and self-regulate their stress in the future. Sustainability of this project is beneficial as mindfulness training can improve the mental health of nursing students. Recent evidence suggests that nursing students are more likely to develop mental health problems when compared with other healthcare professionals (Straw, 2017). The sustainability plan for the school of nursing at the university site will involve taking initiative with addressing school related stress by adding private spaces in the academic setting, where students can go to distress. Students will also be encouraged to use mindfulness at home during their own free time. Future recommendations include using a randomized control trial (RCT) with a larger sample size in a similar setting and compare the findings and address limitations in the future mindfulness interventions. Future recommendations for the continuation of this project includes using a larger sample size and offering incentives in order to recruit more participants. Additionally, more mindfulness based resources should be made available for students as opposed to only using the Calm app. Continuity of this project is to ensure as many nusing students use mindfulness in order to assist them with managing their stress levels. This can be done in future projects by possibly instilling a 'mindfulness minute' during actual class time and measure its effectiveness.

Dissemination and Professional Reporting

Dissemination of this evidence-based project is critical in order to implement effective change that encourages best practices. The project and its findings will be disseminated to Rutgers University via an academic paper, formal presentation, and poster presentation. Additionally, a poster will be created on the project and will be displayed during the annual DNP Poster Day. The results of this project will also be shared with the project site with the hopes and intention of applying mindfulness exercises in the curriculum and classrooms for all nursing students. Another opportunity to disseminate the project information would be through publication. Publishing DNP projects can be adventitious to the healthcare system as it may offer new findings that confirm best practices and nursing interventions. Journals for publication that will be considered are the *Journal of Nursing Research*, the *Journal of Nursing Care Quality* and *Nurse Education Today*. The National Student Nurses Association will also be considered as a possible site to share the project with as it can be beneficial to all nursing students. The 16th Annual Clinical Nursing Research Conference will also be targeted as a location for dissemination after the project is completed. Additionally, the American Association of Colleges of Nursing (AACN) conference "Exploring the Disruption and Innovation in Nursing Education" from and Sigma Global Nursing Excellence will be considered as opportunties for presentation of this project.

Summary

The project focused on undergraduate and graduate nursing students. The intervention implemented was based on the concept of mindfulness by using the Calm app. The mindfulness techniques focused on relaxation, meditation and deep breathing. The participants used the calm

app for at least 10 minutes daily, for four weeks. Their level of perceived stress was evaluated through a survey, before, during and after this time period. The relationship between the intervention and decreased perceived stress over time was significant. Findings from this project suggests that mindfulness exercises help reduce perceived stress among nursing students. Additionally, the more time students spent using mindfulness daily, the greater the reduction in the perceived stress levels. These results are consistent with the literature reviewed and researches implemented among nursing students from around the world. It is therefore extremely important to bring awareness to a technique as simple and cost effective as mindfulness.

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Appendix A

Table of Evidence

EBP Question: "In undergraduate and graduate nursing students, how does mindfulness exercises, through the use of the Calm app for at least 10 minutes daily, affect stress levels over a four-week time period?"

Date: February 29, 2020

Article	Author, Date	Evidence Type	Sample, Sample Size, Setting	Study Findings that help answer EBP question	Limitations	Evidence Level & Quality
#1	Aeamla-Or, N., Hazelton, M., & Rossiter, R. (2015).	Randomized control trail.	Nursing students in the first and second year of nursing school between the ages of 19 and 20 years. N = 140 n = 127 MBSR program was offered at a university in northern Thailand, [redacted]	Findings show that nursing students experience improved levels of stress, depression, and self- esteem due to using the MBSR program. Also, a significant difference between participants in the intervention group over the control for change over time in stress (p=0.0190), self-esteem (p=<0.0001), and mindfulness (p=0.0002).	Small sample size; findings may not be generalizable.	Research Level I, A, High quality
#2	Burger, K. G., & Lockhart, J. S. (2017).	Randomized control trail	Associate degree nursing students enrolled in	After 4 weeks, the mindfulness meditation (MM) group showed lower	A more diverse group of participants was lacking in the study as most	Research Level I, A, High quality

			their first semester. N = 60 n = 52 A college in the northeastern United States	perceived stress levels and improved mindfulness compared to the control group. Statistically significant, p = 0.002. Higher efficacy and function was seen in the MM group compared to the control (p = 0.044).	participants were Caucasian women. A sample size of 82 was calculated however, only 52 students completed the study. The intervention consisted on online modules only with no face-to-face mindfulness sessions. Lack of full treatment adherence (14%).	
#3	Felver, J. C., Morton, M. L., & Clawson, A. J. (2018).	Non-experimental longitudinal design	Mostly graduate and some undergraduate students. N = 21 n = 14 Counseling center of a private research university.	After an eight week MBSR course, the level of mindfulness scores increased between pre-MBSR and post-MBR (p = 0.01). Decreases in psychological distress levels of the participants was seen between pre-MBSR and follow-up after two months (p < 0.01).	The small sample size may have resulted in multiple non-significant results. Repeated measures of ANOVA were required in order to yield statistically significant results.	Research Level III, C, Low quality

#4	Halland, E., De Vibe, M., Solhaug, I., Friborg, O., Rosenvinge, J. H., Tyssen, R., Sorlie, T., & Bjorndal, A. (2015).	Randomized control trail	Medical and psychology students enrolled in the second or third semester, aged 19 to 46 years. N = 704 n = 288 [redacted]	Participants in the MBSR group displayed a significant amount of problem-focused coping ($p = 0.01$) and social support ($p = 0.02$) compared to the control group.	Individual mindfulness practice for the participants was not monitored. Only 288 students, out of 704 students, participated in the study. Participants were randomly selected resulting in majority women and few male students.	Research Level I, B, Good quality
#5	Huberty, J., Green, J., Glissmann, C., Larkey, L., Puzia, M., & Lee, C. (2019).	Randomized, wait-list, control trail	Full-time undergraduate students at least 18 years old. N = 109 n = 88 [redacted]	Participants in the intervention group, consisting of using the mindfulness exercises mobile app Calm daily, had significantly reduced perceived stress levels ($p = 0.002$), increased mindfulness ($p < 0.001$) and increased self-compassion ($p < 0.001$) compared to the control group, with results persisting through week 12 at the time of follow-up.	Majority of the participants were young white females which affects generalizability. The phone app Calm was only offered in English; therefore, the number of participants from a more diverse background was limited. The data collected for the results was self-reported, which can lead to bias.	Research Level I, B, Good quality

					The minutes of the meditation was tracked but the frequency of the sessions was not monitored. The estimated sample size of 104 was not achieved and only 88 participants were used in the data analysis. External variables such as homework and exams were not considered as stress factors that could affect the results.	
#6	Karaca, A., & Şişman, N. Y. (2019).	Randomized control trail	Nursing students enrolled int heir second year of the program. N = 114 n = 98 MBSR program was offered as an elective course for the students in a college in Turkey.	After implementing MBSR program, the experimental group was more effective in reducing stress and increasing mindfulness and self-confidence compared to the control group ($p < 0.01$).	The results cannot be generalized because the study was performed at only one nursing school. Majority of the participants were female. The data collected on whether the MBSR group completed their assignments was based on self-reporting.	Research Level I, A, High Quality

#7	Noble, H., Reid, J., Walsh, I. K., Ellison, S. E., & McVeigh, C. (2019).	Qualitative study and a descriptive cross-sectional design.	Undergraduate medical students in their fifth year and PhD nursing students in their first and second year. N = 10 n = 10 [redacted]	Significant findings for cognitive mindfulness scores (p = 0.02) and resilience (p = 0.04) resulted after the implementation of a mindfulness-based workshop. Mindfulness Attention Awareness Scale (MAAS) and Brief Resilience Scale (BRS) showed significant improvement suggesting the training was effective in maintaining mindfulness practice, increase wellbeing and improve in academics.	Small number of participants in the study. Findings are not generalizable as the study was performed at one university. Participants were PhD nursing students and are therefore not a representation of all nurses when considering their background in clinical practice or academics.	Research Level I, B, Good quality
#8	O'Driscoll, M., Byrne, S., Mc Gillicuddy, A., Lambert, S., & Sahm, L. J. (2017).	Systematic review of literature	Undergraduate students enrolled in a health or social care program.	Evidence available concerning mindfulness-based stress reduction was identified and	There was a low number of eligible studies (n = 6).	Non-Research Level V, A, High quality

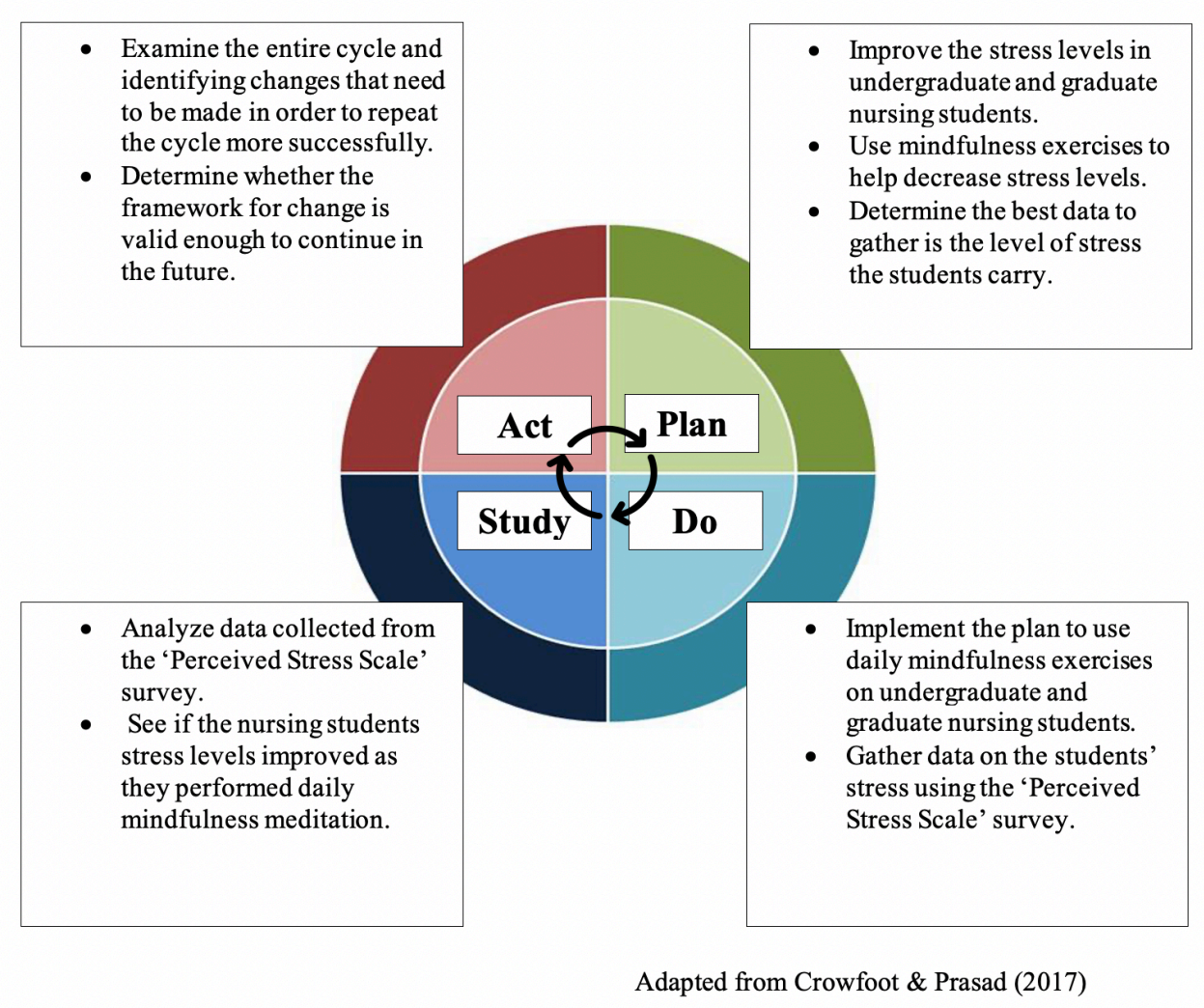
			Sample size and setting not applicable.	critically appraised. Significant reduction in stress levels were seen in the groups where mindfulness was implemented compared to the control groups.	Overall there was a high risk of bias. There were multiple types of study designs. The studies lacked long term follow-up.	
#9	Said, Z., & Kheng, G. L. (2018).	Literature review	Nurses and nursing students. Sample size and setting not applicable.	The studies found that mindfulness-based training programs had a positive effect on the stress levels and also the psychological well-being of the participants. Most studies reviewed were interventional and showed that higher mindfulness is correlated with lower nursing stress.	The studies reviewed had methods were the intervention was non-standardized, small sample sizes, lack of follow-up on the intervention and insufficient research designs.	Non-Research Level V, A, High quality
#10	Song, Y., & Lindquist, R. (2015).	Randomized controlled trial	Undergraduate nursing students. N = 50 n = 44 [redacted]	After the MBSR intervention, the mean stress levels for the MBSR group decreased by 27.1 while the control group decreased by 16.3.	Most participants were female in the study making it difficult to generalize the results to other settings.	Research Level I, A, High Quality

			[redacted] in South Korea.	There was a significant decrease in stress ($p < 0.001$), depression ($p = 0.002$) and anxiety ($p = 0.023$) levels and an increase in mindfulness ($p = 0.010$) for the experimental group that practiced mindfulness compared to the control group.	The MBSR group were given assignments and whether these were completed was not confirmed by the researchers. Interaction between the MBSR group and the control group was not monitored. Outside variables that could affect stress, depression and anxiety levels were not considered.	
#11	Spadaro, K. C., & Hunker, D. F. (2016).	Descriptive, exploratory study	All nursing students from undergraduate and graduate programs, aged 18 years or older, in any semester except the last one. N = 26 n = 26 Online MBSR program at the mid-Atlantic US university.	A significant reduction in stress levels ($p = 0.019$) and a decrease in anxiety ($p = 0.015$) was seen with the implementation of mindfulness exercises. The more time spent on mindfulness meditation, the greater the stress and anxiety reduction.	A sample size of 50 would be most desirable however the study had 26 participants. Broad inclusion criteria and outside/personal factors that could affect stress, anxiety and depression was not considered. Since the study was online,	Research Level I, B, Good quality

					there was no controlled environment to monitor the intervention or survey.	
#12	van der Riet, P., Levett-Jones, T., & Aquino-Russell, C. (2018).	Integrated literature review	Nurses and nursing students. Sample size and setting not applicable.	The most common outcome for the reviewed articles was stress reduction for the MBSR intervention. Four out of the five studies that used MBSR strategies demonstrated positive outcomes for stress reduction.	The studies consisted of small sample sizes which limits generalizability. Only English studies were selected which limits options in Eastern countries where mindfulness is more commonly practiced. The intervention for mindfulness meditation is an independent activity which makes it difficult to monitor.	Non-Research Level V, B, Good quality

Appendix B

Conceptual Framework



Adapted from Crowfoot & Prasad (2017)

Appendix C

Email Recruitment Script

Hello, our names are Sofia and Ruhi and we are family nurse practitioner students at Rutgers. We are currently working on our DNP project, which focuses on Mindfulness Meditation exercises. We know as nursing students you are under very high levels of stress, especially with the worldwide pandemic that we are currently experiencing. High levels of stress can lead to serious consequences such as anxiety, depression and even suicide. The Calm app is a free resource that helps with managing stress levels through mindfulness-based exercises.
The reason we are emailing you is to invite you to participate in our project which entails using the Calm for at least 10 minutes daily for four weeks. You will be asked to answer a short, 10-item questionnaire, perceived stress scale survey a total of 3 times, before, during and after the project. Although this may seem to add more work to your schedule, mindfulness-based exercises have shown to have positive outcomes on stress levels in many researches, particularly for nursing students. This being said, participating in this project is completely voluntary and will not affect your performance in this class. You may also choose to end your involvement at any time.

If you are interested in participating in our project, please click on the Qualtrics link to take you to the first anonymous survey. Please also download the Calm app, instructions to do so are attached to this email. The first survey will need to be completed this week before starting to use the Calm app. The second survey will be done after 2 weeks of using the app, and the third survey 2 weeks after that. The subject of the email will be “Mindfulness-Based DNP Project” so please be sure to look out for it.

We really appreciate your time and are hoping this project will help you improve your stress, not only for the rest of your nursing program but more importantly as practicing nurses.
If you have any questions or concerns, please feel free to email us.

Thank you!

Appendix D

Instructions on How to Download the Calm Application

1. Start by clicking on the “App Store” or “Google Play” application on your smartphone.
2. Go to “search” and type in “Calm”. You will see a blue square with the writing “Calm” in white script.
3. Press “Get” in order to download the free app.
4. Open the Calm app and select the goals you are looking to achieve.
5. Choose from the options to “Sign up with Email” or “Continue with Facebook”.
6. Feel free to look at the resources the app has to offer and be sure to use the app and perform mindfulness exercises for at least 10 minutes daily.

Appendix E

Consent Form

CONSENT TO TAKE PART IN ANONYMOUS RESEARCH

TITLE OF STUDY: Mindfulness Exercises for Stress Reduction in Nursing Student
Principal Investigators: Tracy Vitale, DNP, RNC-OB, C-EFM, NE-BC

This consent form is part of an informed consent process for a research study and it will provide information that will help you decide whether you want to take part in this study. It is your choice to take part or not. Your alternative to taking part in the research is not to take part in it.

Who's conducting the study and what is it about?
You are invited to take part in a research study that is being conducted by Ruhi Brys and Sofia Eyakem, in the DNP family track at Rutgers University. The purpose of the research is to reduce stress levels in undergraduate nursing students through mindfulness meditation exercises using the mobile application, Calm.

Dr. Tracy Vitale may be reached at [redacted]. Dr. Vitale is the specialty Director for the DNP Projects. Her role in this project is to collaborate, communicate and mentor the Co-I throughout the preparation of the DNP project process.

What will I be asked to do if I take part in the study?
You will be asked to engage in mindfulness-based exercises, using the Calm app for at least 10 minutes daily. During this time, you will be asked to answer a 10-item questionnaire, using the perceived stress scale (PSS), a total of three times. No one will know which responses are yours. Your participation in the study will be about 4 weeks. We anticipate up to 249 subjects will take part in the study.

What are the risks of harm or discomforts I might experience if I take part in the study?
The risks and discomforts you might experience by taking part in this research include mild discomfort from answering questions from the PSS. Additionally, there may be a possibility of your email address being inadvertently shared.

Are there any benefits to me if I choose to take part in this study?
The benefits of taking part in this study may be learning about a tool, like the Calm app, and engaging in mindfulness exercises to provide successful management of stress and increase your ability to problem-solve. However, it is possible that you may receive no direct benefit from taking part in this study.

Will I be paid to take part in this study?
You will not be paid to take part in this study.

How will information about me be kept private or confidential?

The research is anonymous. No information will be collected that can identify who you are. Additionally, to keep the data safe, it will be stored at Rutgers University School of Nursing, 11th floor, Office 1126, 65 Bergen Street, Newark NJ 07107. Only the DNP project team will have access to them. The collected data will be kept for 3 years after the project completion.

What will happen to information I provide in the research after the study is over?
After the study is over the information collected for this research will not be used or distributed to investigators for other research. The research team and the Institutional Review Board at Rutgers University are the only parties that may see the data, except as may be required by law. If the findings of this research are professionally presented or published, only group results will be stated.

What will happen if I do not wish to take part in the study or I later decide not to stay in the study?
It is your choice whether you take part in the research. You may choose to take part, not to take part or you may change your mind and withdraw from the study at any time. If you do not want to enter the study or decide to stop taking part, your relationship with the study staff will not change, and you may do so without penalty and without loss of benefits to which you are otherwise entitled. Please note, however, that once you have submitted your responses, you may no longer withdraw them as we will not know which ones yours are.
If you have questions about taking part in this study, you can contact the Principal Investigator: Tracy Vitale, specialty director for the DNP project, [redacted].

If you have questions about your rights as a research subject, you can contact the IRB Director at: Newark HealthSci IRB (973)-972-3608 or the Rutgers Human Subjects Protection Program at (973) 972-1149 or email us at humansubjects@ored.rutgers.edu.

Please print a copy of this consent form for your records.

If you are 18 years of age or older, understand the statements above, and consent to take part in the study, click on the "I Agree" button to begin the research. If not, please click on the “I Do Not Agree” button which exits you from this screen/program.

Appendix F

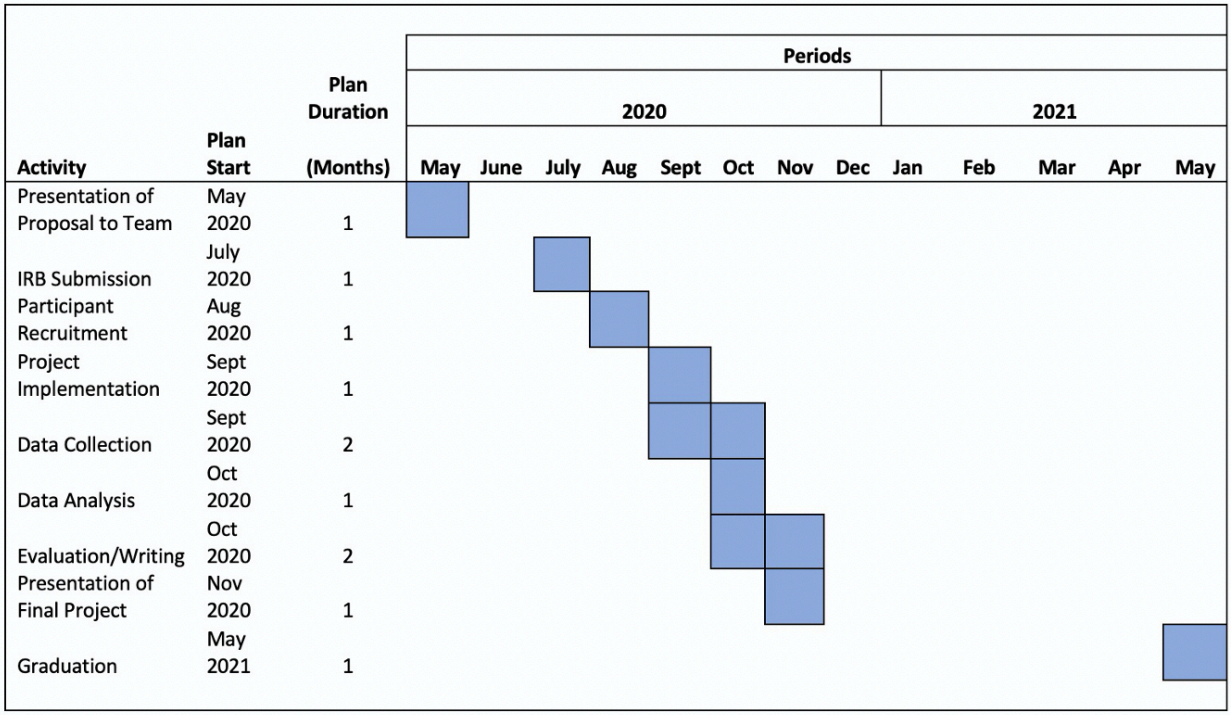
Cohen Perceived Stress Scale

For each statement, please state if you have had these thoughts or feelings: never, almost never, sometimes, fairly often, or very often.

Question	Never	Almost never	Sometimes	Fairly Often	Very Often
1. In the past month, how often have you been upset because of something that happened unexpectedly?	0	1	2	3	4
2. In the past month, how often have you felt unable to control the important things in your life?	0	1	2	3	4
3. In the past month, how often have you felt nervous or stressed?	0	1	2	3	4
4. In the past month, how often have you felt confident about your ability to handle personal problems?	0	1	2	3	4
5. In the past month, how often have you felt that things were going your way?	0	1	2	3	4
6. In the past month, how often have you found that you could not cope with all the things you had to do?	0	1	2	3	4
7. In the past month, how often have you been able to control irritations in your life?	0	1	2	3	4
8. In the past month, how often have you felt that you were on top of things?	0	1	2	3	4
9. In the past month, how often have you been angry because of things that happened that were outside of your control?	0	1	2	3	4
10. In the past month, how often have you felt that difficulties were piling up so high that you could not overcome them?	0	1	2	3	4

Appendix G

Project Timeline



Activity	Plan Start	Plan Duration (Months)
Presentation of Proposal to Team	May 2020	1
IRB Submission	July 2020	1
Participant Recruitment	Aug 2020	1
Project Implementation	Sept 2020	1
Data Collection	Sept 2020	2
Data Analysis	Oct 2020	1
Evaluation/Writing	Oct 2020	2
Presentation of Final Project	Nov 2020	1
Graduation	May 2021	1

Appendix H

Number of Participants

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Undergraduate	61	58.1	59.8	59.8
	Graduate	41	39.0	40.2	100.0
	Total	102	97.1	100.0	
Missing	System	3	2.9		
Total		105	100.0		

Appendix I

PSS Score Related to Relaxation Choices

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Calming	21	20.0	21.6	21.6
	Meditation	44	41.9	45.4	67.0
	Deep Breathing	32	30.5	33.0	100.0
	Total	97	92.4	100.0	
Missing	System	8	7.6		
Total		105	100.0		

Appendix J

Time Spent on Calm App Daily

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 10 minutes	11	10.5	11.2	11.2
	at least 10 minutes	58	55.2	59.2	70.4
	more than 10 minutes	29	27.6	29.6	100.0
	Total	98	93.3	100.0	
Missing	System	7	6.7		
Total		105	100.0		

Appendix K

PSS Score Related to Time Spent

	Time Spent			Statistic	Std. Error
PSS Score	less than 10 minutes	Mean		23.91	1.371
		95% Confidence Interval for Mean	Lower Bound	20.85	
			Upper Bound	26.96	
		5% Trimmed Mean		23.79	
		Median		24.00	
		Variance		20.691	
		Std. Deviation		4.549	
		Minimum		17	
		Maximum		33	
		Range		16	
		Interquartile Range		4	
		Skewness		.212	.661
		Kurtosis		.845	1.279
	at least 10 minutes	Mean		21.28	.686
		95% Confidence Interval for Mean	Lower Bound	19.90	
			Upper Bound	22.65	
		5% Trimmed Mean		21.34	
		Median		20.00	
		Variance		27.326	
		Std. Deviation		5.227	
		Minimum		10	
		Maximum		33	
		Range		23	
		Interquartile Range		6	
		Skewness		-.190	.314
		Kurtosis		.014	.618
	more than 10 minutes	Mean		18.79	1.118
		95% Confidence Interval for Mean	Lower Bound	16.50	
			Upper Bound	21.08	
		5% Trimmed Mean		18.35	
		Median		17.00	
		Variance		36.241	
		Std. Deviation		6.020	
		Minimum		10	
		Maximum		39	
		Range		29	
		Interquartile Range		7	
		Skewness		1.346	.434
		Kurtosis		3.282	.845

Appendix L

Mean PSS Score

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PSS Score	105	100.0%	0	0.0%	105	100.0%

			Statistic	Std. Error
PSS Score	Mean		21.00	.535
	95% Confidence Interval for Mean	Lower Bound	19.94	
		Upper Bound	22.06	
	5% Trimmed Mean		20.94	
	Median		20.00	
	Variance		30.019	
	Std. Deviation		5.479	
	Minimum		10	
	Maximum		39	
	Range		29	
	Interquartile Range		8	
	Skewness		.194	.236
	Kurtosis		.405	.467

Appendix M

Average PSS Scores in Week 1, 3 and 5