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The Green RX: An Intervention in Nurse Anxiety and Depression

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The Green RX: An Intervention in Nurse Anxiety and Depression

by

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"You are going on a strange journey this time, my friend. I don't envy you. You'll have a hard time keeping your heart light and simple in the midst of this crowd of madmen. Instead of the music of the wind among the spruce-tops and the tinkling of the waterfalls, your ears will be filled with the oaths and groans of these poor, deluded, self-burdened men. Keep close to Nature's heart, yourself; and break clear away, once in a while, and climb a mountain or spend a week in the woods. Wash your spirit clean from the earth-stains of this sordid, gold-seeking crowd in God's pure air. It will help you in your efforts to bring to these men something better than gold. Don't lose your freedom and your love of the Earth as God made it"

~ John Muir

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Chapter One: Introduction to the Problem/Purpose

Nurses comprise the largest healthcare profession in the United States with more than 3.8 million registered nurses (RNs) nationwide (American Association of Colleges of Nursing [AACN], 2019). Nurses outnumber physicians 3:1, and there are 290,000 advanced practice registered nurses (APRNs) in the United States (American Association of Nurse Practitioners [AANP], 2020). Nurses have significantly more patient encounters than other healthcare professionals, work shiftwork, and often work in understaffed units. Due to the enormous challenges nurses face they suffer higher rates of burnout, moral injury, anxiety, depression, and suicide than the general population. Nurses are at the front lines of care across the country and, as a result, research must explore best practices to prevent these adverse realities. This scholarly project examines the effects of a two-pronged, targeted intervention using education and exposure to nature (i.e., green therapy) as a way to combat anxiety and depression among nurses.

Background and Significance of the Clinical Problem

Nursing shortages are due in part to aging Baby Boomers, increasing rates of chronic disease, and rising infectious agents such as SARS-CoV-2 (COVID-19; AACN, 2019). Beyond nursing shortages there is a shortage of primary care medical providers. In 2020 there was a projected shortage of 20,400 primary care physicians in the United States, and APRNs help fill this gap (Spring Arbor University, 2019). The transition from nurse to APRN helps solve the primary care gap but takes nurses from the bedside, intensifying nursing shortages and leading to poor outcomes for patients and nurses.

Nurses and APRNs face higher rates of workplace violence than other professionals. Twenty-five thousand workplace assaults are reported annually; 75% occur in healthcare and

social service settings and healthcare workers are more than 20% more likely to be assaulted than professionals in other fields (The Joint Commission, 2018). The actual number of assaults is likely much higher due to a voluntarily reporting system and a lack of tangible statistics regarding verbal abuse. Reasons for abuse toward healthcare workers include nursing shortages, receiving unfavorable news, intoxication, disease processes such as dementia and delirium, inadequate security, and systemic issues such as lack of mental health community resources (The Joint Commission, 2018).

> Burnout is defined by the World Health Organization (WHO) as
>
> a syndrome conceptualized as resulting from chronic workplace stress that has not been successfully managed. It is characterized by three dimensions; feelings of energy depletion or exhaustion, increased mental distance from one's job, or feelings of negativism or cynicism related to one's job and reduced professional efficacy. (WHO, 2019)

Forty-three percent of nurses working in United States hospitals have been reported to experience symptoms of emotional exhaustion and up to 37% report symptoms consistent with burnout (Reith, 2018). Burnout is linked to poor patient care outcomes and depression. In one study, 90% of participants who met criteria for burnout also met criteria for depression (Reith, 2018). Higher rates of burnout correspond to lower education level, gender (i.e., female), working in a high stress environment (e.g., Emergency Room/Intensive Care Unit), lack of spirituality, being single and/or unmarried, and having less experience (e.g., new graduates; Kim & Yeom, 2018).

In addition, nurses also suffer from moral injury. According to Dean, Talbot, and Dean (2019), "moral injury occurs when [… nurses] perpetrate, bear witness to, or fail to prevent an

act that transgresses […] deeply held moral beliefs" (p. 400). While there can be any number of events that trigger moral injury, the stress of managing daily institutional demands weighs heavily on the nurse's oath to "put the needs of patients first" (Dean, Talbot, & Dean, 2019, p. 400). Burnout can result from moral injury; however, both can occur simultaneously or independently. Moral injury differs from burnout in that the blame shifts from the individual to the system and systemic problems for which the nurse has no control over. Symptoms of moral injury include guilt, shame, spiritual crisis, loss of trust, post-traumatic stress disorder (PTSD), self-harm, anxiety, anger, and depression (Stovall, Hansen, & Van Ryn, 2020).

Depression rates are nearly doubled in nurses compared with individuals in other professions. Increased depression in this population is positively correlated with biological sex (i.e., females), marital status, length of employment, advanced age, mood disorders, burnout, job dissatisfaction, and shift-work (Brandford & Reed, 2016). In an Australian study, job dissatisfaction with the workplace significantly predicted a higher risk of nurses developing symptoms related to depression and stress (Maharaj, Lees, & Lal, 2019). Horizontal violence in the workplace can also contribute to poor mental health outcomes in nurses (e.g., depression; Becher & Vivovsky, 2012).

Suicide is the tenth leading cause of death in America, and nurses are not spared. In the United States, female nurse suicide rates are significantly higher at 11 per 100,000 as compared to 7.58 per 100,000 non-nurse females (Davidson, Proudfoot, Lee, & Zisook, 2019). In males, nurse suicide rates number 39.8 per 100,000 compared to 28.2 in the general male population. Although reasons nurses may take their own lives are similar to the general population, the stressors nurses face are amplified.

Given the multifaceted burdens nurses face it is imperative to heal those who heal others. Lifestyle medicine is the evidence-based practice of promoting healthy eating, increased physical activity, the management of stress, restorative sleep, avoidance of risky substances (drugs and alcohol), and the cultivation and maintenance of healthy relationships (American College of Lifestyle Medicine, 2019). Management of stress involves Cura Personalis, care of the entire person, and encompasses the aforementioned practices while taking into account the environment in which one lives and how interaction with one's environment affects physical and psychological health.

Current evidence supports the practice of forest bathing, Shinrin-Yoku (SY), in the treatment of mental health disorders, yet the United States lags in published research on this subject. Forest bathing differs from traditional hiking in that the goal is to stimulate all five senses, connect with nature as medicine, and practice mindfulness (Li, 2018). Aside from SY, exposure to plants (indoors and outdoors) yields positive human health benefits (American Horticultural Therapy Association [AHTA], 2020). Horticultural therapy and/or the exposure to plants is associated with decreased stress, lower levels of post-op pain, and improved concentration (Franco, Shanahan, & Fuller, 2017). Simply living in a geographical area with more greenness has been associated with decreased mortality rates (James, Hart, Banay, & Laden, 2016).

Specific Aims/Purpose

The purpose of this project was to assess whether or not green interventions in the form of a Green Prescription (RX), reduced the severity of anxiety and depression symptoms in nurses and APRNs.

Problem Statement with Objectives/Hypotheses

Nurses face increased risk of suicide, depression, burnout, and moral injury due to an increasing chronic disease burden, acute diseases like COVID-19, and systemic problems such as lack of access to basic human needs (e.g., health care, housing, education). Nurses and APRNs provide care and lifesaving measures on a daily basis, yet frequently neglect self-care due to their demanding roles. Keeping healthcare providers physically and psychologically healthy is imperative for protecting the welfare of United States patients and the healthcare infrastructure as a whole.

Health is a state of physical, mental, and spiritual wellbeing. To achieve wellness, a symbiotic relationship between the three must occur. Depression is linked to poor physical and mental health outcomes. As the United States continues to combat COVID-19 and rising rates of chronic disease, it is crucial to understand the mechanisms that keep healthcare workers healthy.

Modern medicine is practiced indoors, but historically, healers practiced their craft outdoors and provided nature as a cure in the form of herbs and plants. Edward Wilson, a prominent biologist, coined the Biophilia Hypothesis, which suggests “human beings are genetically programmed to have an affiliation with the rest of nature–and anchored in ideals of justice and fairness” (Louv, 2019). Thus, access to nature is a human right and should be considered in medical treatment and overall human wellness.

Clinical Question

Because the wellbeing of nurses is fundamental to all of healthcare, the clinical question for this scholarly project is as follows: In nurses and APRNs, does the Green RX reduce symptoms of anxiety and depression as evidenced by lower PHQ-9 and GAD-7 scores?

- Population: Nurses and APRNs

- Intervention: The Green RX
    - An outdoor walk in a green space for 30 minutes, three times weekly.
    - The inclusion of two plants in the living area where participants spend the most time.
- Comparison: The pre-/post-scores on both the seven-question Generalized Anxiety Disorder scale (GAD-7) and the nine-question Patient Health Questionnaire (PHQ-9).
- Outcome: Improved anxiety (GAD-7) and depression (PHQ-9) scores.
- Timeframe: 14 days

Theoretical Framework

The phenomenon and concepts of interest for this project include the benefits of nature therapy, specifically the SY methodology, and green therapy involving the exposure to houseplants in relation to decreased anxiety and depression symptoms in nurses and APRNs. SY has been found to decrease mental health symptoms and activate the parasympathetic nervous system, thus a framework that involves the patient's environment is essential (Li, 2018). To address this phenomenon, two nursing theories, Florence Nightingale's Environmental Theory and Martha Roger's Theory of Unitary Human Beings were used in combination with the Adventist Framework for Nursing (see Figure 1).

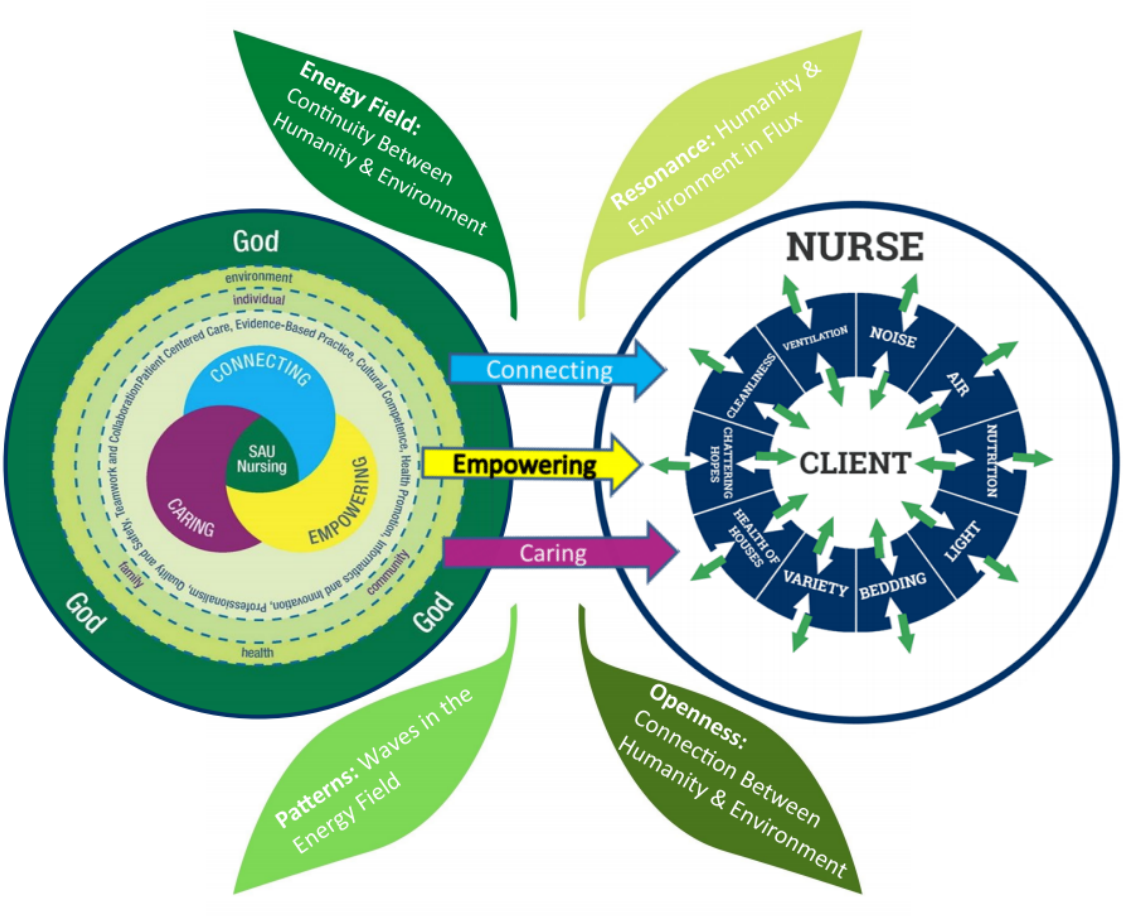

Figure 1. Integrated theoretical framework combining the Adventist Framework for Nursing (left), Martha Roger's Theory of Unitary Human Beings (middle) and Florence Nightingale's Environmental Theory (right).

Florence Nightingale's Environmental Theory is composed of ten major concepts entitled Canons (Nursing Theory, 2016). The Canons include ventilation and warming, light and noise, cleanliness, health of houses, bed and bedding, personal cleanliness, variety, offering hope and advice, food, and observation. The Canons of ventilation and warming, light and noise, variety, offering hope, and health of houses support the concept that nature is essential to human health and that the patient's environment can be altered to affect health.

Martha Roger's Theory of Unitary Human Beings supports the idea that the human-being and the environment are connected. There are eight key concepts in Roger's theory: energy field, openness, pattern, pan-dimensionality, homeodynamic principles, resonance, helicy, and integrality (Nursing Theory, 2016). The energy field recognizes the human and their environment as a continuous whole. Openness suggests that both the environment and human are open and in constant connection, sharing energy. Patterns are the waves in the energy field. Resonance refers to the idea that the human and environment are in a constant symbiotic state of change. Integrality implies the human and environment are integrated but also unique to each other, much like a yin and yang. The paradigms related to clinical care include the unitary human being (i.e., the patient), the environment, health, and nursing. When assessing the benefits of nature and the concept that nature is a human right, it is paramount that nature be offered as a treatment modality. Roger's theory highlights the importance of the relationship of the environment to the human, and existing research on the benefits of nature to human health strengthen this notion. It therefore is not a reach to hypothesize that lack of nature itself might be a possible cause of disease.

The Adventist Framework for Nursing shares the same paradigms with Rogers and Nightingale: humans, health, environment, and nursing (Jones et al., 2017). The human concept acknowledges human beings are made in the image of God and are deserving of respect and dignity. The health concept encourages wellness and health promotion. The environmental concept stresses environmental protection and providing the patient with an environment that promotes healing and fosters spirituality. Finally, nurses using the Adventist Model are to offer holistic and compassionate care, including self-care.

Nightingale's Environmental Theory, Roger's Theory of Unitary Human Beings, and the Adventist Model collectively advocate for the importance of the patient environment in the promotion of human health—a concept Florence Nightingale devised at the inception of modern nursing. When assessing the benefits of green therapies in relation to a decrease in anxiety and depression symptoms, these three approaches form the ideal theoretical framework. The patient should be viewed as a spiritual whole made in the image of God and part of the energy field. Symptoms of anxiety, depression, and even PTSD are a reaction to the environment in which nurses and APRNs operate on a daily basis. When viewing APRN and RN depression and anxiety holistically, the totality of the patient's (i.e., the nurse's and APRN's) environment should be viewed as part of the treatment plan. In this way, the Principal Investigator can use connection and empowerment with the patient to assist them in altering and shaping their own environment.

Concepts and Definition of Terms

Shinrin-Yoku/Forest Bathing: The traditional Japanese practice of immersing oneself in nature by mindfully using all five senses (Hansen, Jones, & Tocchini, 2017).

Green Therapy: A diverse set of activities that use nature and nature-based activities as a form of behavioral health intervention (Working Group on the Health Benefits of Green Care, 2010).

Horticulture Therapy: Participation in horticultural activities (gardening or plant-based activities) to achieve specific goals within an established treatment, rehabilitation, or vocational plan (AHTA, 2017).

Nature Therapy: “A set of practices aimed at achieving ‘preventive medical effects’ through exposure to natural stimuli that render a state of physiological relaxation and boost the weakened immune functions to prevent diseases” (Song, Ikei & Miyazaki, 2016, p. 2).

Chapter Two: Literature Review

According to the EPA (2018), Americans spend about 90% of their lives indoors. This evolution from outdoor creatures to indoor beings has progressed since the Industrial Revolution. As mentioned in Chapter One, the Biophilia Hypothesis is a theory that suggests that human beings are biologically drawn to and connected to nature and thus, human health and satisfaction are substantially linked to time spent in nature and outdoors (Louv, 2019). Since evidence-based practices dictate a thorough examination of available literature in the conceptualization and formation of a research project, Chapter Two of this scholarly project presents the existing research surrounding nature-based care (i.e., SY, green therapy, and plant exposure) and the impacts on human health. Focusing on both the physical and psychological aspects of nature-based care, this chapter critiques and synthesizes project outcomes. Gaps in the evidence are also explained, thus establishing a context for the importance of this project as it relates to the overall body of scientific knowledge.

Search Methodology

A comprehensive search was conducted using multiple databases including CINAHL Complete, MEDLINE Complete, PubMed, and Google Scholar. Search terms included “forest bathing,” “Shinrin-Yoku,” “nature therapy,” “green therapy,” “horticulture therapy,” “nurse” “anxiety,” and “depression.” Inclusion criteria included peer-reviewed studies, or meta-analyses that included peer-reviewed studies, studies that were written or translated into the English language, and studies which had an available abstract. No year limitation was included in the search criteria as the Principal Investigator wanted to survey the full body of existing research.

Evidence

Physical health benefits. Although the purpose of this project is to examine the effects

of a Green RX on nurse anxiety and depression symptoms, human wellness is a combination of physical and mental health, and chronic disease often leads to poor mental health outcomes. The physiological effects of nature therapy must be explored, as they are symbiotic with mental health.

Cardiovascular system. SY and forest bathing have been extensively studied in Asia and have been found to have positive effects on the cardiovascular system. In elderly adult patients with congestive heart failure (CHF) a 4-day intervention of a twice-daily walk in a forested area yielded lower circulating levels of brain natriuretic peptide (BNP), ET-1, and IL-6 (Mao et al., 2017). In a follow-up study, Mao et al. (2018) again assigned elderly participants with CHF to a twice-daily forest bathing intervention for 4 days and then repeated the process after 4 weeks in an attempt to examine the optimal frequency of forest bathing in those with CHF. After the first intervention period the intervention group had significantly lower levels of BNP then the urban control group, but after four weeks BNP levels had reverted to baseline. Mao et al. (2018) concluded the intervention, a forest walk, should be performed more frequently then every 4 weeks. It is important to note that, while CHF is a physical condition, it is linked to depression in the elderly (Mao et al., 2018).

Forest bathing has also been shown to have a positive effect on blood pressure. Lee et al. (2014) reported that an intervention of self-paced walking in a forest environment yielded lower systolic blood pressure (SBP) compared to the study's control group, who walked in an urban environment. Song, Ikei, and Miyazaki (2017) also reported that office workers who participated in a 1-day intervention of forest emersion activities had significantly lower SBP which lasted upward of 5 days. Similarly, Ochiai et al. (2015) found that after a single 4-hour and 35-minute forest intervention (i.e., strolling, laying down, and breathing exercises), participants had

significantly lower SBP and diastolic blood pressure (DBP). Finally, Yu, Lin, Tsai, Tsai, and Chen (2017) investigated the effect of forest bathing on the autonomic nervous system in relation to a 2-hour forest bathing activity. They reported that heart rate, SBP, and DBP were all lower after a forest bathing activity.

Respiratory system. In a Korean study which investigated the role of forest walking on pulmonary function in elderly female participants, it was reported that after a 1-hour forest walk pulmonary artery stiffness and pulmonary function (FEV1) significantly improved (Lee & Lee, 2014). Jia et al. (2016) examined the role of forest bathing in elderly patients with chronic obstructive pulmonary disease (COPD) with a twice-daily forest walking activity and concluded that their intervention group had lower levels of inflammatory markers than an urban control group. Inflammatory markers are linked to COPD exacerbation.

Immune system. In a Japanese study, participants were taken into a forested area for a 3-day/2-night trip. Serum samples were obtained at day two, three, seven, and thirty (Li, 2010). Natural killer cells were measured and found to be higher after forest emersion. This increase lasted 30 days suggesting that even sporadic visits to the forest yield benefits when assessing immunity.

Endocrine system. Forest bathing has been shown to have an effect on salivary cortisol, a stress hormone. After a short, 15-minute intervention, Japanese participants had significantly lower salivary cortisol levels post intervention (Kobayashi et al., 2019). In a longitudinal study out of Japan, researchers found that over a period of 6 years, forest walks yielded significantly lower blood glucose levels in groups which walked for either three or six kilometers 9 times per week (Ohtsuka, 2013).

Neurological benefits. In a Chinese study where intervention participants arranged flowers verses a control group who downloaded research papers, increased alpha brain waves were noted with the horticultural activity. Alpha waves are linked to increased mental relaxation (Tao et al., 2020). In addition, SY has been shown to increase parasympathetic nervous system activity in multiple studies (Kobayashi et al., 2019; Kobayashi, Song, Ikei, Park, Kagawa & Miyazaki, 2015).

Mortality. In a prospective cohort study, female nurses living near the highest levels of greenness had a 12% lower rate of all-cause mortality with associations strongest for respiratory and cancer mortality (James et al., 2016).

Psychological health benefits. As this scholarly project focuses primarily on addressing the anxiety and depression of RNs and APRNs, a thorough search of existing literature exploring the connections between nature (i.e., green therapy) and psychological health is fundamentally important. The following studies investigate the effects of green therapy on life satisfaction, anxiety, and depression.

Life satisfaction. Chang et al. (2020) analyzed the relationship between experiences in nature and life satisfaction by using artificial intelligence to evaluate social media photographs from participants in 185 countries. The study revealed that nature was far more likely to appear in photographs depicting vacations, major life events (e.g., weddings or honeymoons), or leisure activities rather than photographs of daily routines (Chang et al., 2020). Ultimately, the researchers reported that a higher proportion of photographs with nature was associated with higher life satisfaction scores.

Anxiety and depression. The *Profile of Mood States* (POMS) questionnaire is a tool used to measure psychological wellbeing and is widely seen in studies which investigate SY (Li,

2018). Mao et al. (2017), Lee et al. (2011), Song et al. (2019), Mao et al. (2012), Lee et al. (2014), Ochiai et al. (2015), Horiuchi et al. (2015), Li et al. (2016), and Yu et al. (2017) all reported significant improvements in negative mood subscales after SY was utilized as an intervention.

Song et al. (2019) examined the association between urban greenness and depressive symptoms in adults in Korea. They used the epidemiological Studies Depression Scale (CES-D) to measure depression symptoms and the Normalized Difference Vegetation Index (NDVI) and land-use data (i.e., forest area and forest volume) to determine greenness. The study concluded that the highest rates of depressive symptoms were found in those living in the areas of lowest greenness and the lowest rates of depressive symptoms were in those living in the highest levels of greenness (Song et al., 2019).

Like nurses, members of the Armed Forces have higher rates of mental illness than members of the general population. A study published in 2017 investigated the effects of participation in a greenhouse activity on depression and anxiety levels in U.S. Veteran university students (Kelley, Waliczek, & Due, 2017). A pre-/post-Depression Anxiety and Stress Scale (DASS-21) was given before and after a six-week intervention in which the Veterans participated in plant care activities. The intervention group was noted to have significantly lower levels of depression symptoms and stress compared to the study control group. An increased sense of belonging was also noted post-intervention.

Similar results were noted in elderly nursing home residents in Taiwan after they participated in an 8-week horticultural activity including planting evergreens (Chu, Chen, Tsai, Chan, & Wu, 2019). The Geriatric Depression Scale (GDS-15) was used to measure depression symptoms and the UCLA Loneliness Scale, version 3 (RULS-3) was used to assess loneliness.

At the end of the intervention period, the intervention group was noted to have decreased symptoms of depression and loneliness as evidenced by lower scores. The control group, however, was noted to have higher scores than baseline (Chu et al., 2019).

In a study out of China, female college students were assigned the task of arranging a flower basket with live flowers versus the control activity of downloading research papers (Tao et al., 2020). Both activities lasted twelve minutes and the participants served as their own control. Lower anxiety scores on the State-Trait Anxiety Inventory (STAI) were noted after the horticulture activity. In a similar investigation, Lee, Lee, Park, and Miyazaki (2015) used the Sematic Differential Method (SDM) to psychologically evaluate young Chinese males in a crossover study, participants reported feeling "comfortable," "soothed," and "natural" after completing a plant transplantation activity and "uncomfortable," "awakened," and "artificial" after completing a computer task (Lee, Lee, Park, & Miyazaki, 2015).

Soga, Gaston, and Yamaura (2017) conducted a meta-analysis on the effects of gardening on human health. Twenty-one articles were analyzed and the authors reported decreased anxiety and depression symptoms and increased life satisfaction in relation to gardening (Soga, Gaston, & Yamaura, 2017). Similarly, in a meta-analysis on SY numerous physical and mental health benefits were noted including reduced symptoms of anxiety and depression (Hansen et al., 2017).

Mechanisms of action. Forest settings are noted to have higher levels of negative ions and lower levels of air pollution, which have numerous positive effects on human health (Mao et al., 2017). Phytoncides are chemical substances released by various flora and are responsible for positive effects on human physical and psychological health (Li, 2018). Forest bathing allows for the stimulation of all five senses, which has profound effects on emotional health (Franco, Shanahan, & Fuller, 2017). In addition, indoor plants stimulate the sight sense and provide air

purification (Deng & Deng, 2018). Through the release of phytoncides, sense stimulation, and air purification, trees and plants induce various positive effects on the human body and mind.

Gaps in Evidence in the Current Literature

The current body of literature on SY, green therapies, and the health benefits of plants has limitations and gaps in evidence. The most notable of the limitations is small sample size as the majority of the studies involve less than 50 participants. The use of different evaluation tools across studies limits internal validity, whereas the lack of United States-based research may threaten external validity for clinicians who want to prescribe SY and green therapy in the United States. It is also difficult to generalize findings given the diversity of natural settings employed within the literature.

Furthermore, the lack of confounding variables creates a gap in the current evidence. Many of the studies employed meditation or exercise with green therapy. A number of the studies also involved group activities. Meditation, exercise, and time spent with others have all been shown to have effects on human mental health.

Participant age is an additional limitation. Although a few of the studies analyzed the effects of SY and/or green therapy on older adults, the majority of the studies utilized healthy, young people without any mental or physical health diagnoses. Finally, the majority of studies had a short study duration; long-term effects of SY and green therapy are not known.

Summary of the Chapter

Existing literature supports the efficacy of green therapy as a means to reduce the symptoms of anxiety and depression. Numerous physiological benefits were also reported. Moreover, there were no complications or injuries recorded as a result of green therapies in any of the participants across the existing literature. Overall, investigations of therapeutic approaches

and nature-based care yielded positive health outcomes for a majority of participants. Thus, the literature supports the premise and approach of the Green RX investigation.

In building upon the body of existing knowledge, this scholarly project filled two key gaps in the literature: United States-based research and the examination of the nurses. Since most of the studies were Asian in origin, the Green RX project brought the practice of green therapy under examination in an American context. The project offered a way to begin the investigation of cross-continental and cross-cultural generalizability. In addition, much of the research focused either on healthy and/or younger populations (Lee et al., 2015; Tao et al., 2020) or exclusively elderly populations (Chu et al., 2019; Lee & Lee, 2014; Jia et al., 2016). The Green RX design sought to gather data across a diverse population of nursing professionals.

Chapter Three: Project Description

Sutherland (2017) argues "designing [a research project] is a multistep endeavor that is the single most important component in producing a study that is appropriate to the discipline, well grounded, credible, precise, and useful" (p. 192). Since the clinical question asks whether or not using the Green RX reduces symptoms of anxiety and depression in nurses and APRNs, it is essential that the project design incorporate a targeted educational and experiential intervention, along with credible tools designed to measure anxiety and depression. Chapter Three presents the description, design, sample population, measurements, procedural analysis, and data evaluation plan of this scholarly project.

Evidence-Based Project Description

Purpose. Nurses work across the country in many settings, yet face similar stressors that affect their mental health. The purpose of this scholarly project was to assess the effect of green interventions in the form of a Green RX on anxiety and depression in nurses and APRNs. The project aimed to reduce symptoms of anxiety and depression through green therapy.

Objectives. The project had three main objectives:

1. To compare pretest and posttest anxiety and depression levels among RNs and APRNs measured using the Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001; see Appendix A) and the General Anxiety Disorder-7 (GAD-7; Spitzer et al., 2006; see Appendix B) to determine the effectiveness of green therapy in the form of a Green RX in this population.
2. To determine if age, race, sex, education level, or geographic location moderate the effectiveness of green intervention on depression and anxiety in RNs and APRNs.

3. To increase the body of research related to green therapy on United States participants.

The variables were chosen because culture and race influence coping strategies and being female is correlated with higher rates of burnout and depression as discussed in Chapter One (Powell, Wegmann, & Overstreet, 2019; Brandford & Reed, 2016). It was also hypothesized that more years in nursing exposes nurses to more trauma and thus, they might be at greater risk for negative outcomes such as anxiety, depression, moral injury, and burnout. Geographic location might influence the effectiveness of the green intervention as flora specific to different regions produce different phytoncides.

Design. A quasi-experimental, single-sample, pretest-posttest intervention design was utilized for this scholarly project. The intervention was a "Green RX," constructed by the Principal Investigator as a combination of green therapies. Concepts from SY, green therapy, and horticulture therapy were combined. Two main considerations were employed during construction of the Green RX: cost and ease of application. A pretest-posttest design was implemented to assess the overall effectiveness of the Green RX intervention in nurses and APRNs in an effort to reduce anxiety and depression scores and symptoms. Data were collected anonymously from November 2020 through January 2021 using surveys hosted by SurveyMonkey (see Appendix C).

Settings. There were two settings per participant: the participant's home/place of residence and a location near the participant's home that had green space. It would have been ideal to have all participants utilize the same setting, however that was implausible for this project since the participants were spread across the United States. For the purpose of this project, a definition of green space was shaped by the Environmental Protection Agency's (EPA)

definition of green space “land that is partly or completely covered with grass, trees, shrubs, or other vegetation. Green space includes parks, community gardens, cemeteries and schoolyards” (EPA, 2017, para. 1).

Sample/Target Population

Recruitment. A convenience sampling method was utilized using social media and word of mouth to recruit participants. The Principal Investigator is a military spouse who has lived and worked across the United States and thus, is well connected in many communities across the country. Nurse and APRN friends and colleagues were utilized to post notices announcing the project in their own local nursing groups to increase project participation and broaden the geographical scope of the project. Consideration was taken to ensure objectivity and lack of researcher influence. The Principal Investigator asked friends and colleagues who posted announcements not to take part in the project and not to exert any additional influence such as asking participants to participate in order to “help out” a fellow nurse or doctoral student. (It was subsequently discovered that one announcement violated this request by requesting participation in order to "help out a fellow nurse.”) A post was made in the following Facebook groups which catered to nurses and APRNs: *Blue Star Nurses*, *Nurse Practitioner Faith Community, Doctor of Nursing Practice, To Be or Not to Be*, *Adventures in RV Travel Nursing/Healthcare, Street Parking Nurses, MilSpouse Network for Nursing Professionals, Military Spouse Nurse Practitioners, and Command Sergeant Major/Sargent Major (CSM/SGM) Spouses Group*. Finally, in filling out IRB Form B, the Principal Investigator asked and received permission to email a project request to the Southern Adventist University’s School of Nursing students. Self-selection into the project was voluntary.

Data were collected at pretest and posttest using surveys hosted by the SurveyMonkey survey platform. Links to the pretest and posttest surveys were included in the Facebook groups' postings and emails were used to solicit research participants. Skip logic was used in both the pretest and posttest surveys to ensure that data were collected only from individuals who gave informed consent to participate and who met the inclusion criteria.

Inclusion criteria. Participants were required to be licensed practical nurses (LPNs), RNs, or APRNs currently working as nurses in the United States. In addition, they had to have access to a "Green Space." For the purpose of this project, the definition of a "Green Space" was shaped by the EPA's (2017) definition of green space: "land that is partly or completely covered with grass, trees, shrubs, or other vegetation. Green space includes parks, community gardens, cemeteries and schoolyards" (para. 1). Skip logic was used to deny project entry to any participant who did not meet the inclusion criteria.

Exclusion criteria. Exclusion criteria were chosen to mirror methodology found in the majority of studies on SY and other green therapies so as to increase project reproducibility (Hansen et al., 2017). The following exclusion criteria were used: nicotine use, consumption of more than one alcoholic drink per day in women, and more than two in males as per CDC (2019) guidelines. Participants were also excluded if they did not meet the inclusion criteria of working as an LPN, RN, or APRN, if they were not working currently and/or working outside of the United States, and if they did not have access to a green space. The author considered excluding participants who had received treatment, including counseling or medications, for mental health disorders in the last 24 months, but decided against it as it was hypothesized that these participants might need this intervention the most.

Protection of human subjects. Protection of human rights was implemented by obtaining informed consent in both the pretest and posttest surveys and by using skip logic to allow only those who gave informed consent to see survey contents beyond the informed consent (see Appendix C). Participants were informed of the voluntary nature of project, the risks and benefits of participation, and no data were collected which could identify individual participants. Code names that were used to match pretest and posttest responses were self-selected by project participants. Participants were told that they could withdraw from the project at any time for any reason.

The participants implemented the green intervention in their own home/place of residence and in their own community. The main identified risks were accidental poisoning to children or pets from houseplants placed in the home. There was also a risk of dehydration and/or injury during time spent outdoors. Participants were asked to carry water and look both ways before crossing any streets. Safety hazards were presented in the presurvey video tutorial.

Instruments/Measures

Demographics. Demographic data included age, gender, race, degree/certificate level (e.g., LPN certification, associate's degree, bachelor's degree, master's degree, or doctorate of nursing practice), and number of years in nursing. Participants were also asked what region of the country they resided in to evaluate if flora specific to geographical locations moderated the effects of the treatment (see Appendix C). Regions were defined by the United States Forest Service (n.d.): Alaska Region, Eastern Region, Intermountain Region, Northern Region, Pacific Northwest Region, Pacific Southwest Region, Rocky Mountain Region, Southern Region, or the Southwestern Region.

Measures. Data on anxiety and depression were collected in both the pretest and posttest surveys using the GAD-7 (Spitzer et al., 2006) and PHQ-9 (Kroenke et al., 2001). These measures are described next.

Patient Health Questionnaire-9 (PHQ-9). The nine-item Patient Health Questionnaire (PHQ-9) was administered at both pretest and posttest to assess the severity of depression symptoms (see Appendix A). The PHQ-9, developed by Kroenke et al. (2001), is one of the most validated tools in mental health, and is a screening tool used to diagnose depressive disorder, measure severity of depressive symptoms, and gauge a patient's response to treatment. The instrument consists of nine, 4-point rating scale items which ask the patient how often they have been bothered by each of seven symptoms of depression over the past the past two weeks, 0 = *not at all,* 1 = *several days,* 2 = *more than half the days,* 3 = *nearly every day.* The instrument is scored by summing ratings across the nine items, producing a theoretical score range of 0-27. Higher scores are indicative of greater depression. The PHQ-9 was validated in a study of 2,642 primary care patients by Arroll et al. (2010). Using a cutoff score of 10, the instrument showed a sensitivity of 74% and specificity of 91% in diagnosing major depressive disorder (MDD). In another study using the same cutoff score, the PHQ-9 showed a sensitivity of 88% and a specificity of 88% (APA, 2011). A meta-analytic study by Levis, Benedetti, & Thombs (2019) involving 6,725 patients representing a wide variety of subgroups found 88% sensitivity and 85% specificity in diagnosing MDD.

Generalized Anxiety Disorder Scale (GAD-7). The seven-item Generalized Anxiety Disorder Scale (GAD-7), developed by Spitzer et al. (2006), was administered at both pretest and posttest to assess severity of anxiety symptoms (see Appendix B)**.** The instrument was used to diagnose and measure the severity of anxiety symptoms and to gauge a patient's response to

treatment for generalized anxiety disorder, panic disorder, social anxiety, and PTSD in an out-patient population (Williams, 2014). The GAD-7 consists of seven 4-point rating scale items which ask the patient how often they have been bothered by each of seven symptoms of anxiety over the past the past two weeks, 0 = *not at all,* 1 = *several days,* 2 = *more than half the days,* 3 = *nearly every day.* The instrument is scored by summing ratings across the seven items, producing a possible score range of 0-21. Higher scores are indicative of greater anxiety. The instrument was initially validated in a study of 2,149 patients (Spitzer et al., 2006). Using a cutoff score of 10, the instrument accurately identified 89% of patients who were independently diagnosed with generalized anxiety disorder (sensitivity) and correctly identified 82% of patients without a diagnosed anxiety disorder (specificity). The GAD-7 is considered moderately good at screening for panic disorder (sensitivity 74%, specificity 81%), social anxiety disorder (sensitivity 72%, specificity 80%), and PTSD (sensitivity 66%, specificity 81%; Williams, 2014). Test-retest reliability of the GAD-7 is good, with an intraclass correlation coefficient of 0.83 (Spitzer et al., 2006).

Procedure

IRB approval. All Southern Adventist University IRB protocols were followed accurately. The Principal Investigator met with the Chair of the IRB on September 3, 2020. The project was approved October 5, 2020 (see Appendix D). IRB Form B was provided to the IRB on January 8, 2021 as a strategy to recruit more project participants. After submitting IRB Form B, the IRB allowed the Principal Investigator to repost the project announcement on social media and gave permission to contact Southern Adventist University nursing students regarding potential participation.

Necessary resources. The student's Scholarly Project Advisor and the IRB chair were involved in the design of the project. IBM SPSS statistical software (Version 27.0) was used in data processing and statistical analysis and G*Power software (Version 3.1.9.2; Faul, Erdfelder, Lang, & Buchner, 2007) was used in performing a priori power analyses to determine sample size requirements. Social media was used to solicit research participation and an online tutorial video was used to provide pertinent safety information and green intervention implementation instructions to project participants. The SurveyMonkey survey platform was employed to obtain informed consent from project participants and to collect pretest and posttest data.

The only cost to project participants was the purchase of two houseplants. The Principal Investigator found that two small houseplants could typically be purchased for less than twenty dollars at both Lowes and Walmart in the Southern California area. The low cost of project implementation could potentially increase feasibility to pilot across institutions, even if the research team was to purchase the houseplants themselves.

Feasibility and sustainability. The project was feasible in that the researcher had access to participants through social media and Southern Adventist University. There was no external cost to any healthcare institution, and participants completed the pre- and posttest surveys outside of their workday schedules. The PHQ-9 (Kroenke et al., 2001) and GAD-7 (Spitzer et al., 2006) were both free instruments without restrictions on use.

The project was considered to be sustainable in that it could endure over time given its web-based nature. SurveyMonkey is a web-based application and, once recorded, there is no need to recreate online video content. In addition, since the project was not housed within an institution, it has great potential to be used in longitudinal studies spanning longer periods of time. Additional geographic studies could also focus on how nurses from different geographic

regions respond to the Green RX intervention. At the same time, an institution could easily adopt the project design for a program designed for a specific group of nursing professionals with little to no cost involved.

Identifying eligible subjects. As previously stated in the Sample/Target Population section above, participants were recruited via word of mouth and social media outreach through Facebook. A posting was made on multiple Facebook groups which outlined the project and included links to the surveys. Participants then could comment to ask questions or go to the link provided. Several of the participants emailed and/or utilized the Facebook messenger application to ask the Principal Investigator if they could email the project details to colleagues where they worked. In this way, participants also helped recruitment efforts.

Project description. Prior to participating in the project, participants were asked to complete an informed consent form via SurveyMonkey. Participants also answered questions to make sure they met the following inclusion criteria to participate (see inclusion and exclusion criteria in the Sample/Target Population section of this paper). After consenting to participate and satisfying the inclusion criteria, participants self-selected a code name or number to enable pairing their pretest and posttest responses. Each participant was asked to complete a demographic questionnaire, PHQ-9 (Kroenke et al., 2001), and the GAD-7 (Spitzer et al., 2006) online via SurveyMonkey.

Green RX: educational intervention. After completing the pretest informed consent, demographic questionnaire, PHQ-9 (Kroenke et al, 2001), and GAD-7 (Spitzer et al, 2006), the pretest survey provided participants with a link to view a recorded training video produced via Zoom (see Appendix E). The training provided basic safety tips for use during the project (e.g., bug bites, COVID-19, tripping, sunburn, etc.). It also explained the two project interventions and

advised participants that they must obtain two houseplants within the next 48 hours. The two plants needed to be placed in an area of their home/living quarters where they spent the most time (e.g., kitchen, office, living room, bedroom). A list of plants with proven health benefits (i.e., NASA's top ten purifying plants) was provided (Wolverton, Johnson, & Bounds, 1989). There was not an established requirement for the type of plants the participants obtained as it was not guaranteed the participants would have access to these specific plants. Participants were reminded to look up poison concerns/safety regarding plant ingestion to children or pets. The video lecture also included education on the definition of SY and tips on how to incorporate SY-like methodologies from *Forest Bathing: How Trees Can Help You Find Health and Happiness* by Dr. Qing Li (2018) and *Your Guide to Forest Bathing* by M. Amos Clifford (2018). Lastly, the video contained a national suicide hotline number as both education and for patient protection.

The intervention period lasted 2 weeks and began 2 days after the participants took the pretest PHQ-9 (Kroenke et al., 2001) and GAD-7 (Spitzer et al., 2006). The 2-day/48-hour time period was chosen as both the PHQ-9 and GAD-7 asked for self-reporting of symptoms within the previous 14 days and participants were given 48 hours to obtain their houseplants.

Green RX: Green space and houseplants interventions. After receiving the educational intervention, participants were asked to use an outdoor green space for 30 minutes of walking three times weekly (during daylight hours). Days were not set or standardized (e.g., Monday, Wednesday, Friday) as nurses work various shifts and days. Participants were asked to utilize the education they received on SY techniques and practices for their walks in green spaces. As an additional intervention, participants were asked to purchase and place two houseplants in the

room where they spend the most time. The houseplants were to remain in place during the two weeks of the intervention.

Post-intervention procedure. Following the 2-week intervention period, participants accessed the posttest survey using a link that was provided in the pretest survey and which participants were instructed to write down (at the time of the pretest survey). After two weeks, they typed the link into an Internet browser to access the posttest survey. Once they accessed the posttest survey, they were asked to provide informed consent and confirm that they completed the pretest survey. Using skip logic, only those who provided these confirmations continued in the survey to complete the posttest GAD-7 (Spitzer et al., 2006) and posttest PHQ-9 (Kroenke et al., 2001). The posttest survey asked participants for the same self-selected code name or number they used at pretest to enable pairing their pretest and posttest data.

Data collection procedures. Participant confidentiality was ensured by identifying surveys only with participant-chosen code names or numbers. Master lists and participant information was limited to the principal researcher and statistician and did not contain any information that would identify individual project participants. All research data were kept in a locked drawer to which only the principal researcher has access. Files that contained electronic data were also password-protected, encrypted, and stored securely on a password-protected computer in the drawer. All data will be destroyed when no longer needed, after the project and presentation are complete (University of Nevada, 2019).

Data Evaluation Plan

Statistical power, sample size, and methods of analysis. Sample sizes that are necessary to provide an acceptable level of statistical power in support of inferential statistical analyses depend upon the type of inferential analysis that is to be performed. A series of eight

mixed-subjects factorial ANOVAs were planned for use in evaluating the statistical significance of pretest-posttest changes in GAD-7 (Spitzer et al., 2006) and PHQ-9 (Kroenke et al., 2001) scores and to assess the degree to which several variables might moderate those pretest-posttest changes. In each of those ANOVAs, the within-subjects (i.e., "repeated measures") factor was to be the green intervention with two levels, pretest and posttest, and the between-subjects factor (i.e., represented by independent samples) was one of four variables being investigated as potential moderators of the green intervention: race (with five categories), gender (two categories), geographical location (nine categories), and years as a nurse (to be measured continuously and then categorized, with the number of categories to be determined such that all categories are of approximately the same width while still capturing at least 10% of the available sample size). The dependent variable in four of the ANOVAs was scores on the GAD-7 and scores on the PHQ-9 served as the dependent variable in the remaining four ANOVAs. The tests of the effects of the green intervention on GAD-7 and PHQ-9 scores was evaluated by the ANOVA *F* tests of the within-subjects main effects. Determining whether race, gender, geographical location, or years as a nurse moderate the effects of the green intervention was evaluated by the *F* tests of the interaction effects in the ANOVAs.

G*Power software (Faul et al., 2007) was used to perform a priori power analyses to determine sample size requirements for the within-subjects main effects and within x between interaction effects for these mixed-subjects factorial ANOVAs. With that type of ANOVA, sample size requirements are calculated separately for tests of the significance of: (a) the main effect of the between-subjects factor, (b) the main effect of the within-subjects factor, and (c) the interaction effect (also called the moderator effect). The necessary sample size was then determined as the largest of these calculated sample sizes.

In the present project, the two effects of interest were the main effect of the within-subjects green intervention factor (i.e., whether GAD-7 and PHQ-9 scores change significantly from pretest to posttest) and the interaction or moderator effects (i.e., whether race, gender, geographical location, or years as a nurse moderate the effect of the green intervention). The main effects of the potential moderators were not of interest. In calculating sample sizes to support significance tests of the two relevant effects, the number of groups that define the levels of the between-subjects factor (the potential moderator variables) must be specified. The geographical location variable, with nine levels, represents the between-subjects moderator variable with the greatest number of levels. To ensure that sample size requirements were not underestimated, the power analysis was performed with the assumption that all nine geographic regions would be included as levels of the geographical location variable.

The sample size required for the tests of the main effect of the within-subjects green intervention was estimated first. Parameters input into this analysis were as follows. It was assumed that a population effect of medium strength (Cohen's $f = 0.25$) would be of sufficient strength to be worthwhile detecting in an analysis of sample data. The level of significance to be used (i.e., the probability of a Type I error) was set at 0.125 representing a Bonferroni adjustment used to hold the Type I error rate at .05 across the series of four ANOVAs involving each dependent variable. Statistical power (i.e., the probability that a medium strength population effect would be detected as statistically significant in a sample from that population) was set at 0.80, which is considered standard for research in the social and behavioral sciences (Dattalo, 2008). The number of groups in the between-subjects factor was set at nine, equal to the number of levels in the moderator variable with the largest number of levels—geographical location. The number of levels of the within-subjects factor was two (i.e., pretest and posttest). Finally, it was

assumed that participants' pretest and posttest scores would be fairly strongly related, $r = 0.50$. Within these parameters, the estimated total sample size was $n = 54$, approximately equally distributed across the groups defining the levels of the moderator variable.

The sample size required to support tests of moderator effects was estimated next. With nine groups defining the levels of the between-subjects geographical location moderator variable and leaving all other parameters as specified above, a sample size of $n = 90$ was calculated to provide 80% statistical power for the test of the interaction or moderator effect.

With a sample of $n = 54$ required for the within-subjects main effects and a sample of $n = 90$ required for the moderator effects, the larger of these two samples was the starting point for determining the sampling goal. That sampling goal also had to take into consideration, however, the likely loss of some sample data during data cleaning and screening. To allow for the loss of 10% of the data in these screening processes, the sampling goal was set at $n = 99$ participants. As noted previously, the sample size that was ultimately obtained fell far short of any of the sample sizes estimated using the a priori power analysis, and the planned mixed-subjects ANOVAs could not be performed. Instead, two nonparametric analyses (sign tests) were used to evaluate pretest-posttest changes in GAD-7 (Spitzer et al., 2006) and PHQ-7 (Kroenke et al., 2001) scores.

Metrics to measure progress. This project used a quantitative methodology and a quasi-experimental, single-sample, pretest-posttest intervention design to assess the effects of a green intervention, in the form of a Green RX, on anxiety and depression. The PHQ-9 (Kroenke et al., 2001) and the GAD-7 (Spitzer et al., 2006) were administered at pretest and again at posttest following completion of the two-week Green RX intervention. The PHQ-9 was used to measure participants' depression and the GAD-7 was used to measure anxiety. A questionnaire was

administered at pretest only to provide information about the demographic and professional characteristics of the sample.

Chapter Four: Analysis of Results

Chapter Four begins by describing the preliminary data processing steps taken to prepare the data for analysis. Demographic and professional characteristics of the sample are presented next, followed by reliability and descriptive statistics for the GAD-7 and PHQ-9 at pretest and posttest. The chapter also presents the results of nonparametric sign tests that were used to evaluate changes in GAD-7 and PHQ-9 scores from pretest to posttest. The chapter concludes with ancillary analyses. These ancillary analyses focused on the plentiful pretest data that were available and explored the anxiety and depression symptoms of the sample. In addition, the ancillary analyses compared pretest data from project completers and non-completers in an effort to identify participant characteristics that might differentiate between participants who completed the project and those who did not.

Description of the Sample

Preliminary data processing. Following the completion of data collection, data were downloaded from the SurveyMonkey pretest and posttest survey collectors as IBM SPSS data files. All subsequent data processing and statistical analyses were accomplished using IBM SPSS (Version 27.0). The pretest data file included 48 records, but six records were deleted because respondents did not meet inclusion criteria as follows: two were not working in the U.S. as LPNs, RNs, or APRNs; two did not indicate if they had access to a green space; one indicated using nicotine; and one did not answer a screening question pertaining to alcohol use. Ten additional records were deleted from the pretest data file because four did not provide a code name to enable pairing pretest and posttest records, one record was created by the researcher in testing the survey, one participant opened the survey twice on two consecutive days and gave somewhat different responses on those two occasions, leading to the deletion of the first of those

two records, and four did not complete either the GAD-7 or PHQ-9. These deletions left 32 records remaining in the pretest data file. The posttest data file contained 10 records, but two records were deleted because those respondents completed neither the GAD-7 nor the PHQ-9. These deletions left eight records in the posttest data file.

The pretest and posttest data files were then merged, with records matched by the respondent's self-chosen code name which was entered on both surveys. It was discovered in this file merge that two records appeared in the posttest data file with codenames that had no match in the pretest data file. In the absence of matching pretest data, these two cases were deleted from the merged file, leaving records for six participants. Data from these six participants were used in all subsequent analyses of pretest-posttest changes. One of these six participants contacted the researcher to say that she had violated the Green RX protocol by not introducing any plants into the area of her home where she spent the most time. However, the participant reported that she had two plants in other areas of her home and she complied with all other components of the intervention. For those reasons, that participant's data were retained for further analysis.

Sample Demographic and Professional Characteristics

All six participants in the sample were females with ages ranging from 33 to 52 years (M = 42.50, SD = 7.69) whose tenure as nurses ranged from 6 to 23 years (M = 14.83, SD = 6.11). The interval between completing pretest and posttest surveys ranged from 16 to 22 days for all participants, confirming that they had followed the Green RX timeline. Additional demographic and professional characteristics of the sample are provided in Table 1.

Table 1

Sample Demographic and Professional Characteristics Descriptive Statistics (N = 6)

Variables	*f*	%
Race		
White or Caucasian	4	66.7
Black or African American	1	16.7
Hispanic or Latino	1	16.7
Total	6	100.0
Educational Level		
Bachelor's Degree	2	33.3
Master's Degree	3	50.0
Doctorate of Nursing Practice	1	16.7
Total	6	100.0
Geographic Location		
Eastern Region	1	16.7
Pacific Northwest Region	1	16.7
Southern Region	2	33.3
Southwestern Region	2	33.3
Total	6	100.0

Description of Variables

The independent variable whose potential effects were evaluated in this project was the Green RX intervention. Compliance was assessed through self-report of participants. Two dependent variables were examined: the GAD-7 (Spitzer et al., 2006) measuring anxiety and the PHQ-9 (Kroenke et al., 2001) measuring depression. GAD-7 and PHQ-9 total scores were calculated by summing ratings across the items forming those instruments. The GAD-7 consisted of seven 4-point rating scales (0 = *not at all,* 1 = *several days,* 2= *more than half the days,* 3 = *nearly every day*) yielding total scores that could range from 0 to 21. GAD-7 items were worded

such that higher scores indicated greater levels of anxiety. The PHQ-9 consisted of nine items and used the same four-point rating scale as the GAD-7. Total scores on the PHQ-9 could range from 0 to 27, with higher scores indicating more severe depression. It was originally planned to evaluate race, sex, geographical location, and nursing tenure as potential moderators of the effects of the Green RX intervention on anxiety and depression. The very small sample size that was available, however, made those moderator analyses impossible. Those variables thus served exclusively as sample descriptors.

GAD-7. The internal consistency reliability of the GAD-7 was evaluated using data obtained at posttest from the six participants from whom complete data were obtained. The instrument showed good reliability, with Cronbach's $\alpha = 0.81$. Additional descriptive statistics for the GAD-7 are shown in Table 2 at pretest and posttest.

PHQ-9. The internal consistency reliability of the PHQ-9 was also evaluated using posttest data from the six participants who provided complete data. The reliability of the PHQ-9 was acceptable, with Cronbach's $\alpha = 0.72$. Additional descriptive statistics for the PHQ-9 are shown in Table 2.

Table 2

Descriptive Statistics for the GAD-7 and PHQ-9 at Pretest and Posttest (N = 6)

	Pretest				Posttest			
Variables	Min	Max	*M*	*SD*	Min	Max	*M*	*SD*
GAD-7[a]	3	16	9.00	5.33	1	8	5.00	2.83
PHQ-9[b]	3	10	6.67	2.94	1	9	4.67	3.44

[a] Scores on the GAD-7 could range from 0-21, with scores reflecting anxiety as follows: 0-4 = minimal anxiety, 5-9 = mild anxiety, 10-14 = moderate anxiety, and 15-21 = severe anxiety.

[b] Scores on the PHQ-9 could range from 0-27, with scores reflecting depression as follows: 0-4 = none/minimal, 5-9 = mild depression, 10-14 = moderate depression, 15-19 = moderately severe depression, and 20-27 = severe depression.

Analysis of Research Questions and Hypotheses

The purpose of this project was to evaluate the impact of the Green RX intervention on two facets of nurses' mental health—anxiety (measured by the GAD-7), and depression (measured by the PHQ-9). It was hypothesized that both anxiety and depression would decrease from pretest to posttest. It was also hypothesized that changes in anxiety and depression would be moderated by several demographic and professional variables, but the small sample available for analysis obviated any of the planned analyses of moderator variables. Consequently, only changes in anxiety and depression from pretest to posttest were evaluated for statistical significance.

Paired-samples *t*-tests are commonly used to assess the statistical significance of pretest-posttest changes on continuous dependent variables (Tokunaga, 2019). However, Warner (2013) has emphasized that that statistical procedure is only valid if the data being analyzed display two characteristics. First, change scores (calculated as posttest minus pretest scores) should not

include any extreme outliers. Second, the distribution of change scores should approximate the normal curve. The first of these statistical assumptions was evaluated as suggested by Tabachnick and Fidell (2013) by standardizing GAD-7 and PHQ-9 change scores and screening for *z*-scores exceeding $\pm$3.0. No outliers were identified on either variable. The assumption of normally distributed change scores was evaluated visually, through inspection of frequency histograms of the change scores, and statistically, using measures of skewness and kurtosis and the Shapiro-Wilk test of normality (Meyers, Gamst, & Guarino, 2017). Figure 2 shows frequency histograms for change scores on the GAD-7 (top figure) and the PHQ-9 (bottom figure). It is clear from a visual inspection that the distribution of GAD-7 scores was extremely platykurtic. Although a Shapiro-Wilk test failed to identify this deviation from normality as statistically significant (S-W = 0.89, *df*= 6, *p* = .331) the kurtosis statistic (kurtosis = -2.15) exceeded the critical value of $\pm$1.0 that has been suggested by Meyers et al. (2017) for identifying distribution kurtosis. It was concluded that the distribution of GAD-7 change scores violated the assumption of normality.

Visual inspection of the distribution of PHQ-9 change scores indicated both positive skewness and leptokurtosis. That impression was confirmed by the skewness statistic (skewness = 2.25) which exceeded the critical value of $\pm$1.0 recommended by Meyers et al. (2017) for identifying skewed distributions, and by a strong kurtosis statistic (kurtosis = 5.13). The Shapiro-Wilk test also identified the deviation from normality as statistically significant (S-W =0.61, *df*= 6, *p* = .001). It was concluded that the distribution of PHQ-9 change scores violated the normality assumption of the paired-samples *t*-test. With these findings in mind, it was determined that the nonparametric sign test, which makes no distributional assumptions, would be used in place of the paired-samples *t*-test to evaluate changes in GAD-7 and PHQ-9 scores

from pretest to posttest (Sheskin, 2011). The sign test counts and compares the signs of the change scores across cases in the analysis to determine if there is a significant imbalance between negative signs (indicating a decrease in scores from pretest to posttest) and positive signs (indicating an increase in scores from pretest to posttest). In the present project, a significantly greater number of negatively signed change scores would be consistent with the hypothesized decreases in anxiety and depression from pretest to posttest.

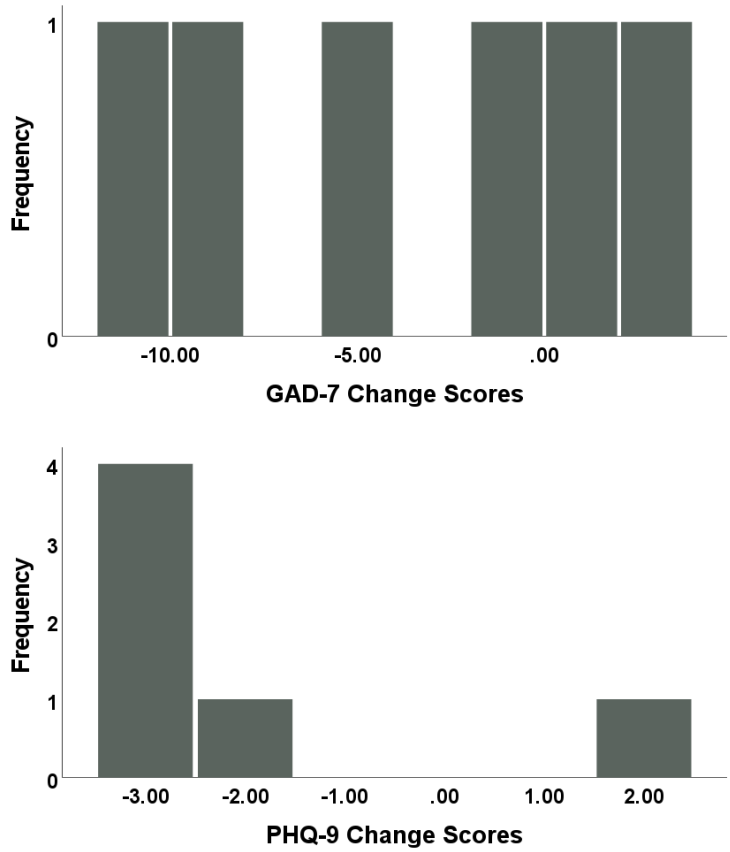

Figure 2. Frequency Histograms for Change Scores on the GAD-7 (Top) and PHQ-9 (Bottom) GAD-7 and PHQ-9 change scores were calculated as posttest scores minus pretest scores. $N = 6$ for both frequency histograms.

Pretest-posttest changes in GAD-7 scores. Descriptive statistics on the GAD-7 at pretest and posttest were presented previously in Table 2. Scores on the GAD-7 decreased from pretest (*M* = 9.00, *SD* = 5.33) to posttest (*M* = 5.00, *SD* = 2.83). Those means are depicted graphically with 95% confidence interval error bars in Figure 3.

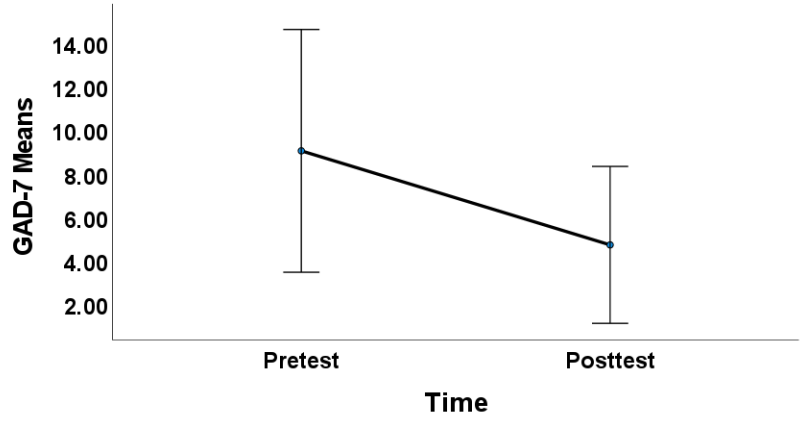

Figure 3. GAD-7 Means at Pretest and Posttest with 95% Confidence Interval Error Bars

N = 6 at pretest and posttest.

A sign test was used to evaluate changes in GAD-7 scores from pretest to posttest. Four project participants (66.7%) showed the predicted negatively signed change scores and two participants (33.3%) showed positively signed change scores. While this pattern was in the predicted direction, it failed to reach statistical significance, *p* = .344 (one-tailed).

Pretest-posttest changes in PHQ-9 scores. Descriptive statistics on the PHQ-9 at pretest and posttest were presented previously in Table 2. Scores on the PHQ-9 decreased from pretest (*M* = 6.67, *SD* = 2.94) to posttest (*M* = 4.67, *SD* = 3.44). Those means are depicted graphically with 95% confidence interval error bars in Figure 4.

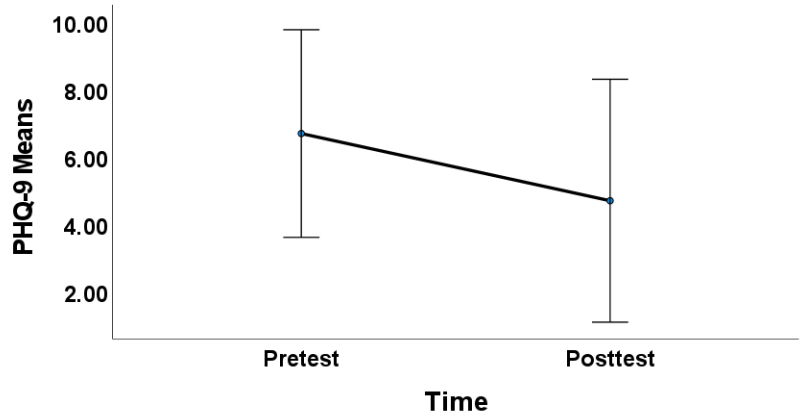

Figure 4. PHQ-9 Means at Pretest and Posttest with 95% Confidence Interval Error Bars

N = 6 at pretest and posttest.

A sign test was used to evaluate changes in PHQ-9 scores from pretest to posttest. Five project participants (83.3%) showed the predicted negatively signed change scores and only one participant (16.7%) showed a positively signed change score. While this pattern was in the predicted direction, it failed to reach statistical significance, $p = .110$ (one-tailed).

Ancillary Analyses

Much potentially useful pretest data was lost in this project because so many participants who completed the pretest survey failed to finish the project by completing the posttest survey. Data from both surveys were needed in order to evaluate the effectiveness of the Green RX intervention in this single-sample, pretest-posttest design. The ancillary analyses presented in this portion of the chapter focus on pretest demographic, GAD-7, and PHQ-9 data from the 32 individuals who provided valid pretest data. These ancillary analyses begin with a description of the sample's demographic and professional characteristics. Next presented are detailed data on participant's responses to the individual items of the GAD-7 and PHQ-9 to better understand the symptoms of anxiety and depression that project participants found most troublesome. Finally,

those participants who completed both pre- and posttest surveys are compared to those who completed only the pretest survey in an effort to identify any characteristics that may have distinguished those who were sufficiently motivated to complete the project from those who did not.

Sample demographic and professional characteristics. Of the 32 cases used in the ancillary analyses of pretest data, almost all were female. There was only one male (3.1%), one participant (3.1%) who did not report their gender, and 30 females (93.8%). The ages of the 28 participants in the pretest sample who chose to report their ages ranged from 19 to 63 year (M = 41.89, SD = 11.08). Among the 30 participants who reported their tenure as nurses, tenure ranged from 1 to 39 years (M = 14.77, SD = 9.94). Additional demographic and professional characteristics of the pretest sample are summarized in Table 3.

Table 3

Sample Demographic and Professional Characteristics Descriptive Statistics (N = 32) for Pretest Sample Used in Ancillary Analyses

Variables	*f*	%
Race		
White or Caucasian	23	71.9
Black or African American	1	6.3
Hispanic or Latino	5	15.6
Multi-Racial	1	3.1
Missing	1	3.1
Total	32	100.0
Educational Level		
Associate's Degree	1	3.1
Bachelor's Degree	12	37.5
Master's Degree	14	43.8
Doctorate of Nursing Practice	4	12.5
Missing	1	3.1
Total	32	100.0
Geographic Location		
Eastern Region	10	31.3
Inter-Mountain Region	1	3.1
Pacific Northwest Region	4	12.5
Pacific Southwest Region	2	6.3
Rocky Mountain Region	1	3.1
Southern Region	9	28.1
Southwestern Region	4	12.5
Missing	1	3.1
Total	32	100.0

GAD-7 characteristics in the pretest sample. Table 4 provides pretest descriptive statistics for GAD-7 item ratings and for GAD-7 total scores. That table also provides upper and lower boundaries for 95% confidence intervals to estimate population mean values on GAD-7 items and total scores. One can be 95% confident that the population means fall between those

boundaries. The 95% CI for the GAD-7 total score population mean [3.73, 6.89] indicated that the level of anxiety experienced by the population represented by this sample was between "minimal" and "mild," using the criteria provided by the instrument's authors.

Figure 5 shows GAD-7 item means with 95% confidence interval error bars. A within-subjects one-way ANOVA was performed to determine if there were significant differences in the severity of various anxiety symptoms as measured by ratings to the seven items of the GAD-7. The results of that analysis indicated that one or more differences were significant, $F(6, 186) = 6.66$, $p < .001$. Bonferroni-adjusted post-hoc comparisons were used to identify the source(s) of the significant *F* test, (i.e., which pairs of items differed significantly). Pairs of GAD-7 item means that were found to differ significantly are listed in Table 5. All significant differences involved item 5 (being so restless that it's hard to sit still), which was rated significantly less troublesome than items 1 (feeling nervous, anxious, or on edge), 2 (not being able to stop or control worrying), 4 (trouble relaxing), and 6 (becoming easily annoyed or irritable). The difference between item 5 and item 3 (worrying too much about different things) also closely approached statistical significance ($p = .062$, two-tailed).

Table 4

Descriptive Statistics for Pretest GAD-7 Item Ratings and Total Scores (N = 32)

GAD-7 Items[a]	Min	Max	*M*	*SD*	95% CI for μ [Lower, Upper]
1 Feeling nervous, anxious, or on edge	0	3	0.88	0.71	[0.62, 1.13]
2 Not being able to stop or control worrying	0	2	0.78	0.75	[0.51, 1.05]
3 Worrying too much about different things	0	2	0.75	0.76	[0.48, 1.02]
4 Trouble relaxing	0	3	0.81	0.78	[0.53, 1.09]
5 Being so restless that it is hard to sit still	0	2	0.34	0.55	[0.15, 0.54]
6 Becoming easily annoyed or irritable	0	3	1.13	1.04	[0.75, 1.50]
7 Feeling afraid, as if something awful might happen	0	3	0.63	0.87	[0.31, 0.94]
GAD-7 Total Score[b]	0	16	5.31	4.39	[3.73, 6.89]

[a] GAD-7 items were prefaced, "Over the past two weeks, how often have you been bothered by each of the following problems. Items were rated on a 0-3 scale, with 0= *not at all,* 1 = *several days,* 2 = *more than half the days,* 3 = *nearly every day.*

[b] Total scores on the GAD-7 could range from 0-21, with scores reflecting anxiety as follows: 0-4 = minimal anxiety, 5-9 = mild anxiety, 10-14 = moderate anxiety, and 15-21 = severe anxiety.

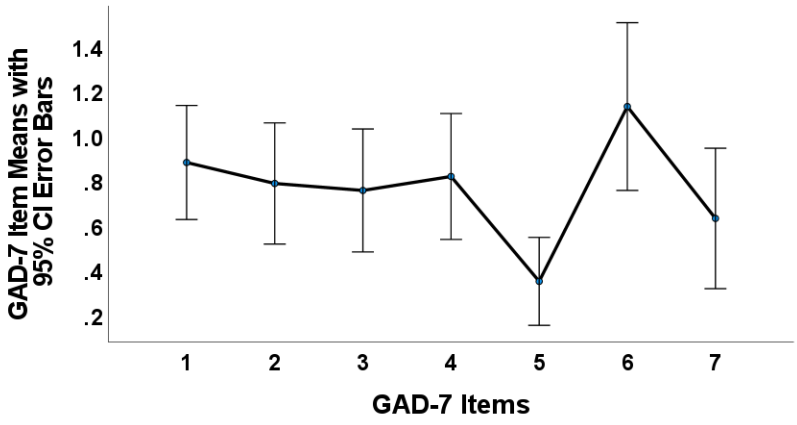

Figure 5. Plot of Pretest GAD-7 Item Means with 95% CI Error Bars (*N* = 32)

Table 5

Pairs of Pretest GAD-7 Items with Significantly Different Mean Item Ratings (N = 32)

GAD-7 Item Pairs	Mean Difference	Std. Error	Bonferroni-Adjusted Significance (two-tailed)
1 vs. 5	0.53	0.10	<.001
2 vs. 5	0.44	0.13	.034
4 vs. 5	0.47	0.11	.004
6 vs. 5	0.78	0.16	.001

PHQ-9 characteristics in the pretest sample. Table 6 provides pretest descriptive statistics for PHQ-9 item ratings and for PHQ-9 total scores. That table also provides upper and lower boundaries for 95% confidence intervals to estimate population mean values on PHQ-9 items and total scores. One can be 95% confident that the population means fall between those boundaries. The 95% CI for the PHQ-9 total score population mean [4.44, 7.31] indicated that the level of depression experienced by the population represented by this sample was between "minimal" and "mild," using the criteria provided by the instrument's authors. Figure 6 shows PHQ-9 item means with 95% confidence interval error bars. A within-subjects one-way ANOVA was performed to determine if there were significant differences in the severity of the various symptoms of depression as measured by ratings to the nine items of the PHQ-9. The results of that analysis indicated that one or more differences were significant, $F(8, 248) = 14.02$, $p < .001$. Bonferroni-adjusted post-hoc comparisons were used to identify the source(s) of the significant F test. Pairs of PHQ-9 item means that were found to differ significantly are listed in Table 7. Differences were relatively numerous, with the two most troublesome symptoms reported by participants being represented by items 4 (feeling tired or having little energy) and 5 (poor

appetite or overeating), and the two least troublesome symptoms represented by items 8 (moving or speaking so slowly that other people could have notice, or the opposite, being so fidgety or restless that you have been moving around a lot more than usual) and 9 (thoughts that you would be better off dead or of hurting yourself in some way).

Table 6

Descriptive Statistics for Pretest PHQ-9 Item Ratings and Total Scores (N = 32)

PHQ-9 Items [a]	Min	Max	*M*	*SD*	95% CI for μ [Lower, Upper]
1 Little interest or pleasure in doing things	0	2	0.66	0.60	[0.44, 0.87]
2 Feeling down, depressed, or hopeless	0	3	0.56	0.67	[0.32, 0.80]
3 Trouble falling asleep, staying asleep, or sleeping too much	0	3	0.88	0.79	[0.59, 1.16]
4 Feeling tired or having little energy	0	3	1.16	0.68	[0.91, 1.40]
5 Poor appetite or overeating	0	3	1.13	0.87	[0.81, 1.44]
6 Feeling bad about yourself	0	3	0.63	0.71	[0.37, 0.88]
7 Trouble concentrating on things, such as reading a newspaper or watching television	0	3	0.66	0.87	[0.34, 0.97]
8 Moving or speaking so slowly that other people could have noticed. Or the opposite, being so fidgety or restless that you have been moving around a lot more than usual	0	3	0.19	0.64	[0.00, 0.46]
9 Thoughts that you would be better off dead or of hurting yourself in some way	0	1	0.03	0.18	[0.00, 0.12]
PHQ-7 Total Score [b]	0	21	5.88	3.97	[4.44, 7.31]

[a] PHQ-9 items were prefaced, "Please indicate how often you have been bothered by each of the following problems over the last two weeks." Items were rated on a 0-3 scale, with 0= *not at all,* 1 = *several days,* 2 = *more than half the days,* 3 = *nearly every day.*

[b] Total scores on the PHQ-9 could range from 0-27 with scores reflecting depression as follows: 0-4 = none/minimal, 5-9 = mild depression, 10-14 = moderate depression, 15-19 = moderately severe depression, and 20-27 = severe depression.

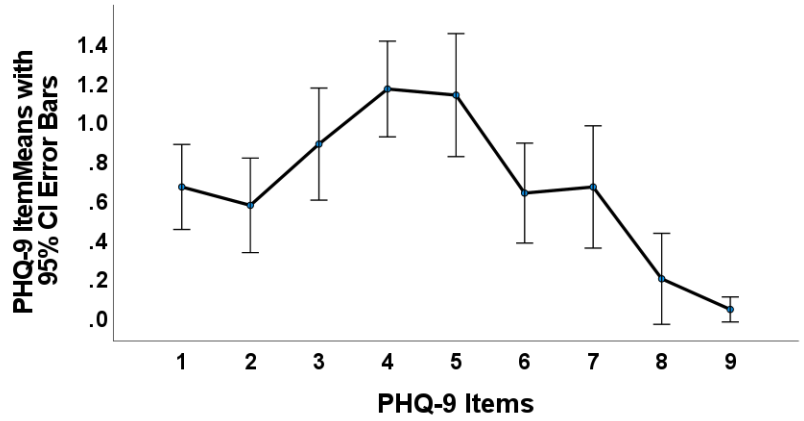

Figure 6. Plot of Pretest PHQ-9 Item Means with 95% CI Error Bars ($N = 32$)

Table 7

Pairs of Pretest PHQ-9 Items with Significantly Different Mean Item Ratings (N = 32)

PHQ-9 Item Pairs	Mean Difference	Std. Error	Bonferroni-Adjusted Significance (two-tailed)
1 vs. 4	0.50	0.13	.016
1 vs. 8	0.47	0.12	.015
1 vs. 9	0.63	0.11	<.001
2 vs. 4	0.59	0.13	.004
2 vs. 5	0.56	0.15	.024
2 vs. 8	0.38	0.10	.021
3 vs. 8	0.69	0.16	.005
3 vs. 9	0.84	0.14	<.001
4 vs. 6	0.53	0.15	.043
4 vs. 8	0.97	0.14	<.001
5 vs. 6	0.50	0.14	.049
5 vs. 8	0.94	0.16	<.001
5 vs. 9	1.09	0.15	<.001
6 vs. 9	0.59	0.12	.001
7 vs. 9	0.63	0.15	.011

Comparisons of project completers and non-completers. Project participants who completed both pre- and posttest surveys (called "project completers" here) and those who completed only the pretest survey (called "project non-completers" here) were compared in an effort to identify any characteristics that might have motivated some participants, but not others, to complete the project. The 32 individuals who met all project inclusion criteria and provided valid pretest data consisted of 26 project non-completers and six project completers. Completers and non-completers were compared on the pretest data that were available from both groups.

Comparisons on the continuous variables of age, nursing tenure, GAD-7 scores, and PHQ-9 scores used nonparametric Mann-Whitney *U* tests because that procedure does not make any assumptions about group outliers, distribution characteristics, or similarity of group variances that are associated with *t*-tests. Comparisons of the groups on the categorical variables of race and education were made using chi-square tests. No comparisons were made on the variable of gender since virtually all project participants were female. Similarly, geographical location was not used in the comparisons of project completers and non-completers given the lack of representation among project completers in most categories of that variable. Given that only six completers could be identified, statistical comparisons between completers and non-completers described in this portion of the chapter suffer from low statistical power, inflated Type II error rates, and are also somewhat unstable in the sense that the addition or deletion of just a few cases from the completer group might alter the results of the analyses substantially. Therefore, the results of analyses presented here should be taken only as suggestive and conclusions should be drawn cautiously.

Age of project completers and non-completers. Twenty-eight individuals from the sample provided information about their age. A Mann-Whitney *U* test used to compare the age

ranks of project completers and non-completers found that completers did not differ significantly in age (n = 6, M = 42.50, SD = 7.69, mean rank = 14.58) from non-completers (n = 22, M = 41.73, SD = 11.98, mean rank = 14.48), U = 65.50, p = .978.

Nursing tenure of project completers and non-completers. Thirty individuals from the sample provided information about their tenure as nurses. A Mann-Whitney U test found no significant difference in nursing tenure between project completers (n = 6, M = 14.83, SD = 6.11, mean rank = 16.92) and non-completers (n = 24, M = 14.75, SD = 10.79, mean rank = 15.15), U = 63.50, p = .667.

Race of project completers and non-completers. All 32 individuals in the sample provided information about their racial identity. The sample largely identified themselves as White or Caucasian (71.9%) with other races (28.1%) sparsely represented across several racial categories. These findings closely align with current demographic data pertaining to RNs in the US, where 68.4% of RNs identify themselves as "white (Non-Hispanic)" (Data USA, n.d.). To reduce the occurrence of cells with low expected frequencies and improve the statistical power of the chi-square analysis, all racial categories other than White/Caucasian (i.e., Black/African American, Hispanic/Latino, Multi-Racial) were combined into a single category labeled "Non-White/Caucasian" prior to analyzing the data. Table 8 summarizes the race distributions of project completers and non-completers. A chi-square analysis of the data found no significant relationship between race and project completion, $\chi^2(N = 32, 1) = 0.10$, p = .753.

Table 8

Race Distributions of Project Completers and Non-Completers (N = 32)

			Race		
			White/Caucasian	Non-White/Caucasian	Total
Group	Project Non-Completers	Count	19	7	26
		Column %	82.6%	77.8%	81.3%
	Project Completers	Count	4	2	6
		Column %	17.4%	22.2%	18.8%
	Total	Count	23	9	32
		Column %	100%	100%	100%

Education of project completers and non-completers. Thirty-one individuals from the sample provided information about their educational level, with responses spread sparsely across several categories. To reduce the occurrence of cells with small expected frequencies and improve the statistical power of the chi-square analysis, the associate's degree and bachelor's degree categories were combined into an "Undergraduate Degrees" category, and the master's degree and Doctorate of Nursing Practice degree were combined into a "Graduate Degrees" category. Table 9 summarizes the education distributions of project completers and non-completers. A chi-square analysis of the data found no significant relationship between education and project completion, $\chi^2(N = 31, 1) = .23$, $p = .634$.

Table 9

Education Distributions of Project Completers and Non-Completers (N = 31)

			Education		
			Undergraduate Degrees	Graduate Degrees	Total
Group	Project Non-Completers	Count	11	14	25
		Column %	84.6%	77.8%	80.6%
	Project Completers	Count	2	4	6
		Column %	15.4%	22.2%	19.4%
	Total	Count	13	18	31
		Column %	100%	100%	100%

GAD-7 levels of project completers and non-completers. All 32 individuals in the sample provided information about their pretest GAD-7 scores. A Mann-Whitney *U* test was used to compare GAD-7 total score ranks of project completers and non-completers. That analysis found that project completers were more anxious ($n = 6$, $M = 9.00$, $SD = 5.33$, mean rank = 22.83) than non-completers ($n = 26$, $M = 4.46$, $SD = 3.77$, mean rank = 15.04). This difference closely approached statistical significance using a two-tail test, $U = 40.00$, $p = .065$, and reached significance using a one-tail test, $p = .033$. A two-tail test is appropriate when no prediction has made regarding the direction of the difference being tested for significance, while a one-tail test can be used to enhance the statistical power of the test when a directional prediction has been made (Tokunaga, 2019). It would seem reasonable in this project to predict that more anxious participants would be more motivated to complete the project than less anxious participants, justifying the use of the one-tail test. A Glass rank biserial correlation coefficient (Glass, 1966) calculated using Kerby's formula (Kerby, 2014) was used as a nonparametric measure of the strength of the relationship between anxiety and project

completion. That coefficient yielded a value of .487. The squared rank biserial correlation, .237, indicated that 23.7% of the variability in project completion was explained by GAD-7 ranks. Using Cohen's (1992) standards for interpreting measures of effect strength, the Glass rank biserial correlation obtained in this project would be considered to represent a strong and potentially important statistical effect.

PHQ-9 levels of project completers and non-completers. All 32 individuals in the sample provided information about their pretest PHQ-9 scores. A Mann-Whitney *U* test used to compare PHQ-9 total score ranks of project completers and non-completers found so significant difference in PHQ-9 scores between completers ($n = 6$, $M = 5.00$, $SD = 2.83$, mean rank = 15.67) and non-completers ($n = 26$, $M = 5.69$, $SD = 4.21$, mean rank = 16.69), $U = 73.00$, $p = .832$. Although anxiety may have motivated participants to complete the Green RX intervention, no evidence was found in this project that depression had the same effect.

Chapter Five: Discussion of Findings

The purpose of this quasi-experimental single-sample pretest-posttest intervention project was to evaluate the clinical question: "In nurses and APRNs, does the Green RX reduce symptoms of anxiety and depression as evidenced by lower GAD-7 (Spitzer et al., 2006) and PHQ-9 (Kroenke et al., 2001) scores?". This project is the first of its kind to investigate green interventions in relation to nurses' mental health. It is equally noteworthy in that it took place during a pandemic—a time of heightened demand on the nursing profession. Chapter Five of this scholarly project presents the relationship of project outcomes to existing research and explains overall observations and project limitations. Implications for future research, as well as those for improving nursing practice, are also presented.

Observations

It was hypothesized that both anxiety and depression scores would decrease from pretest to posttest with the introduction of the Green RX intervention. It was also hypothesized that several factors would moderate the pretest-posttest declines in anxiety and depression among the nurses including race, sex, geographical location, education level, and years of experience in nursing. Unfortunately, due to the small sample size, it was impossible to perform the statistical analyses needed to evaluate the significance of these potential moderators. However, changes in GAD-7 and PHQ-9 scores from pretest to posttest were evaluated statistically despite the small sample.

As previously noted, four out of six project participants (66.7%) showed negatively signed change scores on the GAD-7 (consistent with the hypothesized declines in scores from pretest to posttest), while two participants (33.3%) showed positively signed change scores on the GAD-7 (indicating increases from pretest to posttest), $p = .344$. An even larger majority of

participants showed the expected declines in severity of depression symptoms, with five out of six participants (83.3%) showing the predicted negatively signed change scores (indicating pretest-posttest declines) and only one participant (16.7%) showing a positively signed change score (indicating a pretest-posttest increase), $p = .110$. Although the changes in GAD-7 and PHQ-9 scores were largely in the predicted direction, with overall declines seen in both anxiety and depression symptoms from pretest to posttest, these pretest-posttest changes failed to achieve statistical significance due to the small sample size.

Ancillary analyses were also performed which focused on the more plentiful pretest data. These analyses sought to identify variables that discriminated between those who completed the project and the many more who did not complete the posttest. It was not possible to contact project dropouts for explanations of their decision to not complete the project since no contact information was collected. It is hypothesized that the SARS-CoV-2 global pandemic might have affected the nurses' workloads and ability to participate in the project.

The ancillary analyses, however, revealed an interesting trend. Those who completed the Green RX were significantly more anxious than those who did not. This finding may suggest a strengthened desire on the part of these nurses to reduce their anxiety through the Green RX, though further research is needed to verify this hypothesized correlation.

Conversely, results reflected no significant difference between project completers and non-completers in terms of the severity of depression symptoms. Thus, even though those with depression symptoms have lower neurochemicals that can contribute to lack of motivation (Chong, 2018), there was no evidence that depression played a part in the decision to participate or drop out of participation in the Green RX. This observation, however, is inconclusive. Further

research incorporating more robust population sampling may yield more definitive results linking levels of depression to project participation.

Further ancillary analyses which compared project completers and non-completers revealed that age, length of time in nursing, education level, and race did not differ significantly between the two groups. No comparisons were made based on the variables of sex or geographic location as nearly all participants were female and the sample of project completers was spread too thinly across the various geographic locations to support comparisons involving that variable. Related to sex, a 2017 survey revealed that in the United States there are 9.5 female nurses to every one male nurse (Rappleye, 2017). Thus, it is not surprising that the vast majority of project participants were female.

On the GAD-7, mental health symptoms were the most troubling and on the PHQ-9, physical symptoms were most troubling. The most troubling symptoms on the GAD-7 were items 1 (feeling nervous, anxious or on edge), 2 (not being able to stop or control worrying), 4 (trouble relaxing), and 6 (becoming easily annoyed or irritable). On the PHQ-9, the most significant symptoms were item 4 (feeling tired or little energy) and item 5 (poor appetite or overeating). These observations point to a treatment approach which can target both psychological and physiological symptoms. In this respect, the Green RX is an ideal option.

Conversely, on the GAD-7, least troubling to participants was item 5 (being so restless that it's hard to sit still) and on the PHQ-9, item 8 (moving or speaking so slowly that other people have noticed verses the opposite), and item 9 (thoughts one would be better off dead or thoughts of harming oneself). Nurses must adapt to their environment to be successful and thus, it might be hypothesized that symptoms related to item 5 on the GAD-7 and item 8 on the PHQ-9 would hinder work performance.

Relationship of Outcomes to Research

In line with project results, sex and education level were not associated confounding factors as seen in a meta-analysis on SY and nature therapies (Hansen et al., 2017). Hansen et al., (2017) also pointed out that across published data on the subject, limitations included small sample size (often less than 20 participants) with inclusion criteria favoring young and healthy participants. Multiple physiological and psychological health benefits in humans, including improved psychological markers on both the POMS scale and Hamilton Depression Scale were found in SY and nature therapies. The results of the Green RX support these findings and align with common limitations, namely small sample size.

Nurses living in areas with the highest levels of greenness, thus more exposure, had the lowest levels of mortality (James et al., 2016). The Green RX produced results that support the research of Hansen et al. (2017) and James et al. (2016).

Although the findings of this project are not unexpected, they are noteworthy given the timing of the project. The SARS-CoV-2 global pandemic is not yet over, but studies from across the globe point to increasing rates of healthcare worker depression and anxiety. Participants in the present project also displayed signs of depression and anxiety, with four out of 32 pretest participants (12.5%) reporting moderate to severe anxiety and three out of 32 pretest participants (9.4%) reporting moderate to severe depression. In Chinese healthcare workers treating SARS-CoV-2 patients, female nurses were disproportionately affected by symptoms of depression and anxiety, measured by the PHQ-9 and GAD-7 (Lai et al., 2020). Although it might not be entirely feasible to generalize findings globally, nurses have faced the same burdens while combatting the pandemic. The human experience transcends culture and language and thus, it is hypothesized that nurses globally are facing the negative effects of anxiety and depression. This

project contributes to the body of evidence on nurse anxiety and depression treatment during this historic time and adds to the body of evidence on green therapies in the treatment of psychological symptoms.

The findings of this project, although not statistically significant, are relevant to the mental health treatment of nurses. New knowledge was gained due to the timing of this project. Globally, nurse anxiety and depression rates are climbing and this project provides evidence consistent with the conclusion that both depression and anxiety can be managed or co-managed with green interventions (e.g., the project interventions: spending time outdoors in a green space and incorporating indoor plants into the home environment).

In conclusion, results of the project align with preexisting research. Findings support the hypothesis that, with the Green RX intervention, symptoms of anxiety and depression would decrease from pretest to posttest. Due to small sample size, however, the project was unable to evaluate the hypothesis regarding how moderating variables might affect PHQ-9 and GAD-7 scores post-intervention.

Limitations

Limitations of this project were consistent with past studies regarding green therapies. These included a short intervention period, small sample size, lack of long-term follow-up, lack of participant variability, and an inability to pinpoint a specific mechanism that mediates the benefit of the green therapy intervention (i.e., which sense involvement or mechanism of action precipitated the improvement in PHQ-9 and GAD-7 scores). Specific to this project, post-intervention attrition was the primary limitation. Though many factors could have contributed to the high attrition rate, features of the project design may be to blame.

The SurveyMonkey platform used in the project did not have the ability to email or send a reminder to project participants to complete the follow-up posttest after the intervention period had passed. Rather, the participants were asked to place a reminder on their calendar or in their phone. They also had to manually write down or take a picture of the link to the posttest survey. This is hypothesized to be a main contributing factor in participant loss, as participants may have forgotten about the posttest and/or lost the posttest survey link.

The use of self-chosen code names or numbers for use in pairing pretest and posttest data may also have contributed to failure to complete the project because some participants may have forgotten their code names and failed to write them down. Though mismatched survey codes were not an issue in the data collection, participants may have opted not to complete the posttest because they could not remember their code name.

The use of a two-week intervention in the design of this project may also have contributed to participant attrition; a shorter intervention might have maintained participant interest, though shorter project timeframes also pose problems for replicability and reliability of results. The time period of a fourteen-day intervention period was chosen based on the PHQ-9 and GAD-7 questions both beginning with “over the last two weeks.”

A different questionnaire could have been considered in place of the PHQ-9 and GAD-7, such as the widely used POMS, which would have lent itself to a shorter project duration and the potential for greater generalizability as many studies on green therapies utilize this questionnaire. The Principal Investigator chose the PHQ-9 and GAD-7 as both are widely used in American clinical practice. This was done in an effort to make the results more relevant to American medical providers.

The project's design also included several exclusion criteria that severely limited project participation. Participants were excluded if they were not actively working as a nurse in the US, did not have access to a green space, used nicotine, or consumed more the CDC-recommended number of alcohol drinks per day (one per day in females and two per day in males). The exclusion criteria were chosen to mirror the methodology in other studies on green therapies, but in the US, these criteria were not as relevant due to differences in lifestyle and culture. The Principal Investigator received several messages and Facebook posts from nurses who drank more than the CDC-recommended amount, smoked, or were military spouses who were nurses stationed with their spouses overseas and not currently working. Each expressed a desire to participate, but could not under the current exclusion criteria.

The convenience sampling method used in this project was another limitation. Due to the nature of the sampling method, respondents self-selected to participate. This could be a potential source of sampling bias since nurses are known to want to "help" and participation could have been driven in part by wanting to help out another nurse with research. A non-representative sample was also a limitation of this project, with Caucasian females being overly represented, although, in the US, male nurses account for less than 10% of all nurses (Statistic Stats, 2019) and White (Non-Hispanic) nurses account for 68.4% of all registered nurses (DataUSA, n.d.).

The method by which some project participants were recruited could also have influenced the results of the project by creating experimental demand characteristics. Specifically, the Facebook posting mentioned the project's objectives and the goal of enhancing the body of evidence on nature and green therapies in relation to nurses (Bhandari, 2020; Gravetter & Forzano, 2018). Participants who were aware of the Principal Investigator's expectations regarding outcomes may have been influenced to provide those outcomes.

COVID-19 was also a project limitation. The pandemic directly impacted the day-to-day lives of nurses. It is hypothesized that nurses' physical and emotional availability was hindered due to the pervasive impact of the lingering pandemic, thus limiting participants and complicating project completion. Beyond the normal stressors of taking care of ill patients, COVID-19 has taken a deep emotional toll on healthcare providers, the full effects of which are not known. In survivors of trauma, symptoms of PTSD often evolve later, after the event or trauma has faded. It is not yet known if nurses will develop these symptoms and/or if the Green RX will continue to be a tangible solution for them.

Finally, a limitation was seen in the form of several uncontrolled confounding variables: the number of existing plants in participants' homes (since adding two more plants to a home with a dozen or more existing plants would hardly matter), the outdoor walk constituting as exercise depending on exertion (since depression is found to be negatively correlated with exercise), and, whether or not the participant walked with a friend/family member/pet or alone (when social interaction is positively correlated with good mental health). Lastly, participants all conducted study interventions between November and February, the coldest and darkest portion of the year, with darkness correlated to increased depression symptoms. All four of these variables could have influenced the results, but were not accounted for in the current project. These limitations were in line with many existing studies on SY and green therapies.

Despite multiple limitations, the overall findings indicate positive benefits associated with the Green RX and are consistent with previous research involving green therapies. Many of the project's limitations, such as small sample size and short project timeframe, were also shared in previous research.

Implications for Future Research

Implications for future research are extensive. Green therapies have been used for centuries as medical cures and recently the scientific method has confirmed their worth. Future research should address the current limitations of the project, namely the small sample size. New studies could target diverse nursing populations across a wider section of the United States, thus increasing reproducibility, generalizability, and validity. Research using fewer exclusion criteria could also increase sample size.

The Principal Investigator would improve on the design of the project by doing three things differently: (a) using different instruments that do not force a 2-week intervention period, (b) partnering with a hospital system (such as a local Veteran's Affairs hospital) to allow for stratified sampling, and (c) evaluating the intervention using a more complex crossover experimental design to measure the efficacy of the Green RX in comparison with other green interventions and/or a control condition, thus enabling the analysis of causal conclusions regarding the Green RX.

In addition, longitudinal research aimed at tracking and understanding the longevity of Green RX benefits across a more diverse participant pool would also be wise. Assessing the impacts of green therapies within a short window of time may produce positive results, but does not prove the effectiveness of said results over time. Research should incorporate checkpoints at one month, six months, and a year or more to fully assess the strength of the Green RX.

Future research could also expand to include other medical professionals such as certified nursing assistants, medical assistants, physician assistants, physicians, and respiratory therapists with the goal of building a more diverse population sample and analyzing more variables (i.e., race, sex, years of experience in nursing, and geographic location) in relation to anxiety and

depression scores of healthcare professionals. It would be interesting to explore whether or not nurses have different manifestations and magnitudes of anxiety and depression symptoms when compared to the rest of the healthcare population (or population at large).

The Principal Investigator would also consider collaborating with a biologist or dendrologist to co-investigate if certain flora produce different degrees of results based on geographic location and time of year. Practical application of measuring phytoncides would provide the most accurate correlation calculations when compared to lower depression and anxiety scores. This approach would also address the question of how the effects of green interventions are mediated.

Last, the Principal Investigator would immerse the participants in a more controlled green environment and plan on taking hemodynamic measurements (i.e., heart rate, blood pressure, and oxygen saturation measurements) before and after. Holistic care combines care of the mind and body; measurements of both dynamics would create the most tangible data.

Implications for Practice, Health Policy, and Education

As indicated by the project's integrated theoretical framework, connection to nature is a human right and a critical part of lifestyle medicine. It is supported by the theories of Rogers, Nightingale, and the Adventist Nursing Model of Care. Within the broader context of nursing practice, the promising results of the project can be viewed as an invitation to prescribe nature-based therapies in the treatment of psychosocial care for anxiety and depression. Furthermore, nature-based therapies, including the Green RX (i.e., walking in nature and plants in the home) should be taught to nurses as a form of self-care.

The need for self-care is increasingly important as nurses are indeed a vulnerable population—a fact exacerbated by the SARS-CoV-2 this past year. In addition to higher rates of

depression and anxiety, burnout, moral injury, horizontal and occupational violence, and suicide, nurses face the mounting and persistent demands of providing care during a global pandemic. Evolving research shows even higher rates of nurse anxiety and depression.

Though mental health care is becoming more accepted nationwide, medical professionals, including nurses, fear the stigma of diagnosis and treatment. Over half of state nursing boards ask questions regarding mental health diagnoses during licensure (Halter, Rolin, Adamaszek, Ladenheim, & Hutchens, 2019). The clinical significance of the project's findings provides a two-fold call to action for medical providers. Prescribing green therapies benefits nurses and serves as an answer to the perceived stigma of mental health treatment. With nurse anxiety and depression rates growing, lifestyle modifications (such as the Green RX) will become more important. For these reasons, future research should carefully explore the impacts of green therapies on healthcare professionals.

Additionally, though not peer-reviewed at this time, a study found that anti-psychotics and certain anti-depressants could correlate with more severe SARS-CoV-2 infection (Laporte & Healy, 2020). This finding does not yield cause and effect significance, but patients, especially nurses, might fear treatment options for mental illness given these proposed findings. Thus, the plethora of new and yet unfounded information available might limit treatment options due to patient hesitance. This strengthens the argument for using a Green RX in the treatment of nurse anxiety and depression as there are no negative correlations with human health.

Because green therapies present a non-invasive, cost-effective opportunity to improve overall health, implications for practice extend beyond prescribing and into professional development and teaching. Becoming certified to lead green-based interventions and seeking to protect green spaces are key ways to broaden the positive impacts of green therapy. The Forest

Therapy Institute and The Association of Nature and Forest Therapy Guides and Programs are examples of organizations that provide continuing education coursework, as well as a framework for healthcare providers to help share the power benefits of nature therapy.

Regarding the Biophilia Hypothesis, medical professionals who take care of patients must be both protectors and champions of green laws and environmental protections as access to these wild and natural places not only heals man/woman, but is also their right. Green therapy training is easily attainable and mutually beneficial for nurses and the patients they serve.

The Principal Investigator found no study that reported negative health interactions with green therapies as a study intervention during literature review, and, although the current project did not screen for negative health consequences at project completion, contact information was given to all participants and no negative interactions were reported. Green therapies, including spending time outdoors, SY, and utilization of houseplants in the home are both cost effective and yield positive results in relation to mental health outcomes. Improvement of mental health outcomes has been demonstrated across different cultures, occupations including nurses, races, genders, and amongst different interventions. Nature and green based therapies are indeed correlated with improved mental health scores and outcomes and need to be prescribed as a tangible treatment.

The following changes to APRN practice, education, and health policy are proposed:

- a required training module on the human mental and physical health benefits of nature-based therapies, and
- the creation of a continuing education module that would be presented to the AANP for continuing education accreditation on the topic of prescribing nature-based therapies (including past and present research findings).

Nursing professionals should also write their state and national representatives and urge them to sponsor bills which would allow nurses and other healthcare workers to enter state and national parks for free (to allow for healing).

Conclusion

The purpose of this project was to assess whether green interventions in the form of a Green RX, reduced the severity of anxiety and depression symptoms in nurses and APRNs. Project outcomes supported the hypothesis that scores on both the PHQ-9 and GAD-7 would decrease from pretest to posttest after intervention. These findings were not significant due to small sample size. Ancillary analysis revealed the modulating factors of age, nursing tenure, and education did not contribute to participants' completion of the posttest; however, it was noted that those who did complete both the pre- and posttest had higher GAD-7 scores, making anxiety a possible motivating factor.

These findings, in conjunction with current studies demonstrating rising nurse anxiety and depression levels due to SARS-CoV-2 and the global pandemic, are a call to medical providers to prescribe nature-based therapies and conduct research on green therapies including those in the Green RX. Healthcare professionals should also become certified in nature-based modalities and advocate for both environmental protection and the adoption of legislation that would allow nurses and other medical professionals free admission to state and federal natural lands. Green therapy offers an easy and efficient way to be a good steward of environmental resources while prioritizing overall health. Symptoms of depression and anxiety are undeniable among the nursing population and green and nature-based therapies offer a promising prescription in the treatment of mental health diseases in nurses.

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Appendix A: Patient Health Questionnaire (PHQ-9)

PATIENT HEALTH QUESTIONNAIRE (PHQ-9)

ID #: _____ **DATE:** _____

Over the last *2 weeks*, how often have you been bothered by any of the following problems?
(use "✓" to indicate your answer)

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite — being so figety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead, or of hurting yourself	0	1	2	3

(Healthcare professional: For interpretation of TOTAL, please refer to accompanying scoring card). TOTAL: _____

10. If you checked off *any problems*, how *difficult* have these problems made it for you to do your work, take care of things at home, or get along with other people?

- Not difficult at all _____
- Somewhat difficult _____
- Very difficult _____
- Extremely difficult _____

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PHQ-9 Patient Depression Questionnaire

For initial diagnosis:

1. Patient completes PHQ-9 Quick Depression Assessment.
2. If there are at least 4 ✓s in the shaded section (including Questions #1 and #2), consider a depressive disorder. Add score to determine severity.

Consider Major Depressive Disorder

- if there are at least 5 ✓s in the shaded section (one of which corresponds to Question #1 or #2)

Consider Other Depressive Disorder

- if there are 2-4 ✓s in the shaded section (one of which corresponds to Question #1 or #2)

Note: Since the questionnaire relies on patient self-report, all responses should be verified by the clinician, and a definitive diagnosis is made on clinical grounds taking into account how well the patient understood the questionnaire, as well as other relevant information from the patient.
Diagnoses of Major Depressive Disorder or Other Depressive Disorder also require impairment of social, occupational, or other important areas of functioning (Question #10) and ruling out normal bereavement, a history of a Manic Episode (Bipolar Disorder), and a physical disorder, medication, or other drug as the biological cause of the depressive symptoms.

To monitor severity over time for newly diagnosed patients or patients in current treatment for depression:

1. Patients may complete questionnaires at baseline and at regular intervals (eg, every 2 weeks) at home and bring them in at their next appointment for scoring or they may complete the questionnaire during each scheduled appointment.
2. Add up ✓s by column. For every ✓: Several days = 1 More than half the days = 2 Nearly every day = 3
3. Add together column scores to get a TOTAL score.
4. Refer to the accompanying **PHQ-9 Scoring Box** to interpret the TOTAL score.
5. Results may be included in patient files to assist you in setting up a treatment goal, determining degree of response, as well as guiding treatment intervention.

Scoring: add up all checked boxes on PHQ-9

For every ✓ Not at all = 0; Several days = 1;
More than half the days = 2; Nearly every day = 3

Interpretation of Total Score

Total Score	Depression Severity
1-4	Minimal depression
5-9	Mild depression
10-14	Moderate depression
15-19	Moderately severe depression
20-27	Severe depression

Appendix B: Generalized Anxiety Disorder Scale (GAD-7)

GAD-7 Anxiety

Over the last two weeks, how often have you been bothered by the following problems?	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious, or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid, as if something awful might happen	0	1	2	3

Column totals _____ + _____ + _____ + _____ =

Total score _____

If you checked any problems, how difficult have they made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all	Somewhat difficult	Very difficult	Extremely difficult
☐	☐	☐	☐

Source: Primary Care Evaluation of Mental Disorders Patient Health Questionnaire (PRIME-MD-PHQ). The PHQ was developed by Drs. Robert L. Spitzer, Janet B.W. Williams, Kurt Kroenke, and colleagues. For research information, contact Dr. Spitzer at ris8@columbia.edu. PRIME-MD® is a trademark of Pfizer Inc. Copyright© 1999 Pfizer Inc. All rights reserved. Reproduced with permission

Scoring GAD-7 Anxiety Severity

This is calculated by assigning scores of 0, 1, 2, and 3 to the response categories, respectively, of "not at all," "several days," "more than half the days," and "nearly every day."
GAD-7 total score for the seven items ranges from 0 to 21.

0–4: minimal anxiety

5–9: mild anxiety

10–14: moderate anxiety

15–21: severe anxiety

Appendix C: Green Prescription Pre-Survey

Green Prescription Pre-Survey

Informed Consent

Introduction:

My name is Melissa Dawley. I am a doctoral student at Southern Adventist University. I am conducting a research study on how green interventions (spending time outdoors and plants) affect human health. I am completing this research as part of my doctoral degree. Your participation is completely voluntary. I am seeking your consent to involve you and your information in this study. Reasons you might not want to participate in the study include the cost of purchasing two houseplants and a 90 minute time commitment a week for two weeks to walk outdoors. Reasons you might want to participate in the study include strengthening the body of research in the U.S. on nature and green-based therapies. An alternative to this study is simply not participating. I am here to address your questions or concerns during the informed consent process.

PRIVATE INFORMATION

Certain private information may be collected about you in this study. I will make the following effort to protect your private information, including not collecting identifying information such as your name, date of birth or contact information. Even with this effort, there is a chance that your private information may be accidentally released. The chance is small but does exist. You should consider this when deciding whether to participate.

Activities:

If you participate in this research, you will be asked to:

1. Thirty minute walk three times weekly (during daylight hours) in an outdoor green space (see definition in introduction video). Days will not be set or standardized; you can walk any three days of the week.

2. You will purchase two houseplants and place them in the room where you spend the most time in your home or where you live and these will remain in place during the two weeks of the study (hopefully longer).

Eligibility:

You are eligible to participate in this research if you:

1. Are a nurse (LPN, RN, APRN)

2. Must be employed in the United States

3. Have access to an outdoor green space

You are not eligible to participate in this research if you:

1. **Use nicotine**

2. **Consume more than one alcoholic drink per day in females and more than two in one day for males**

3. **You are not currently employed or employed outside the U.S**

4. **You are not a nurse (LPN, RN, APRN)**

5. **You do not have access to a green outdoor space (as defined in the introduction video)**

I hope to include 99 people in this research.

Risks:

There are minimal risks in this study. Some possible risks include: Risk of poisoning to children or pets related to indoor plants and during time outside, slipping, tripping, falling, sunburn, dehydration, insect sting and being hit by a vehicle.

To decrease the impact of these risks you wil be asked to look up safety information regarding your plants of choice you bring into your home. You will also be asked to bring a water source during your walks, wear sunscreen, look both ways when crossing streets and follow any local COVID-19 guidance related to masking and spending time outdoors.

Click NEXT to proceed to the next page.

Green Prescription Pre-Survey

Benefits:

If you decide to participate you will receive direct benefit health benefits through interaction with trees and plants via sense stimulation, air purification and release of chemicals called phytoncides.

There are potential benefits to others. This study will increase the body of research on green and nature-based therapies in the United States, allowing medical providers to make informed and holistic decisions regarding healthcare for their patients. This will also add to the body of research regarding nurse and APRN depression and anxiety and interventions which may be helpful in treatment.

Confidentiality:

The information you provide will be kept confidential to the extent allowable by law. Some steps I will take to keep your identity confidential are: not collecting identifiable information and both physically and electronically safeguarding survey results via encryption and password protection.

The people who will have access to your information are myself, Melissa Dawley (the researcher), my faculty advisor and my contracted statistician. The Institutional Review Board may also review my research and view your information.

I will keep your data for no more than 7 years. Then, I will delete electronic data and destroy paper data.

Contact Information:

If you have questions for me, you can contact me at: mdawley@southern.edu.

My dissertation chair's name is Dr. Frances Johnson. She works at Southern Adventist University and is supervising me on the research. You can contact her at: francesj@southern.edu.

If you contact us you will be giving us information like your phone number or email address. This information will not be linked to your responses if the study is anonymous.

If you have questions about your rights in the research, or if a problem has occurred, or if you are injured during your participation, please contact the Institutional Review Board at: irb@southern.edu or 423-236-2285.

Voluntary Participation:

Your participation is voluntary. If you decide not to participate, or if you stop participation after you start, there will be no penalty to you. You will not lose any benefit to which you are otherwise entitled.

Future Research:

Any information collected from you during this research may not be used for other research in the future, even if identifying information is removed.

Do you agree to the above and to participate in this research study?

- ○ Yes
- ○ No

Green Prescription Pre-Survey

Study Eligibility

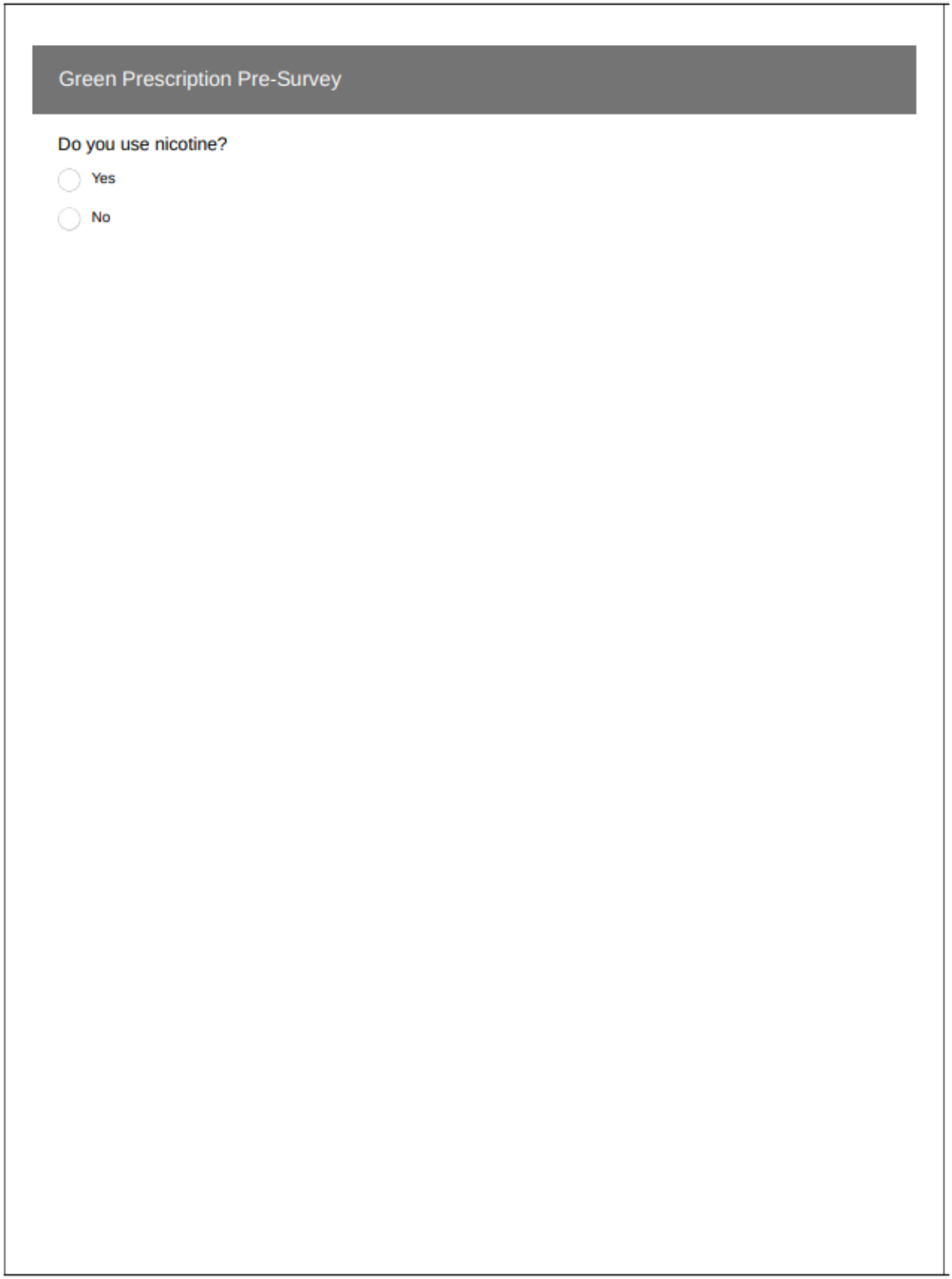
Are you currently working in the United States as an LPN, RN, or APRN?

- Yes
- No

Green Prescription Pre-Survey

Do you have access to a "Green Space," defined as land that is partly or completely covered with grass, trees, shrubs, or other vegetation, including parks, community gardens, cemeteries, and schoolyards?"

- ○ Yes
- ○ No


Green Prescription Pre-Survey
Do you use nicotine?
Yes
No

Green Prescription Pre-Survey

Do you consume more than one alcoholic drink per day (for women) or more than two alcoholic drinks per day (for men).

- Yes
- No

Green Prescription Pre-Survey

It will be important that your responses to this survey be paired with your responses to a second survey. Here you will select a code name or number that will identify your responses without identifying you personally.

To enable computer pairing of your two surveys, it is important that you be able to remember your code name or number when you are asked for it again on the second survey. It is also important that you type your code name or number in exactly the same way both time--using the same upper and lower case letters, same spacing, etc.

Please enter your code name or number here and write it down so that you will have it for the next survey.

Green Prescription Pre-Survey

Tell me a little bit about yourself.

What is your age?

18 100

How do you identify racially?

- White or Caucasian
- Black or African American
- Hispanic or Latino
- Asian or Asian American
- American Indian or Alaska Native
- Native Hawaiian or other Pacific Islander
- Another race
- Multi-Racial

What is your sex?

- Female
- Male

How long have you worked as a nurse?

0 50

What is your educational level?

- Associates Degree
- Bachelors Degree
- Masters Degree
- Doctorate of Nursing Practice

What is your geographical location?

- Alaska Region
- Eastern Region
- Inter-mountain Region
- Northern Region
- Pacific Northwest Region
- Pacific Southwest Region
- Rocky Mountain Region
- Southern Region
- Southwestern Region

Green Prescription Pre-Survey

PHQ-9

Please indicate how often you have been bothered by each of the following problems.

Please indicate how often you have been bothered by each of the following problems over the last two weeks.

	Not at all	Several days	More than half the days	Nearly every day
Little interest or pleasure in doing things	○	○	○	○
Feeling down, depressed, or hopeless	○	○	○	○
Trouble falling asleep, staying asleep, or sleeping too much	○	○	○	○
Feeling tired or having little energy	○	○	○	○
Poor appetite or overeating	○	○	○	○

Please indicate how often you have been bothered by each of the following problems over the past two weeks.

	Not at all	Several days	More than half the days	Nearly every day
Feeling bad about yourself	○	○	○	○
Trouble concentrating on things, such as reading a newspaper or watching television	○	○	○	○
Moving or speaking so slowly that other people could have noticed. Or the opposite, being so fidgety or restless that you have been moving around a lot more than usual	○	○	○	○
Thoughts that you would be better off dead or of hurting yourself in some way	○	○	○	○

Green Prescription Pre-Survey

GAD-7

Over the past two weeks, how often have you been bothered by each of the following problems?

	Not at all	Several days	More than half the days	Nearly every day
Feeling nervous, anxious, or on edge	○	○	○	○
Not being able to stop or control worrying	○	○	○	○
Worrying too much about different things	○	○	○	○
Trouble relaxing	○	○	○	○
Being so restless that it is hard to sit still	○	○	○	○
Becoming easily annoyed or irritable	○	○	○	○
Feeling afraid, as if something awful might happen	○	○	○	○

Green Prescription Pre-Survey

Now that you've completed the pre-survey portion of this study, please do these THREE THINGS:

First, please write down the code name or number you chose today.

Second, please set a reminder on your calendar or phone to complete the post-survey portion of this study **16 days from today.**

Third, please complete this portion of the study by viewing this brief (8 min, 20 sec) video, "A Green Prescription"

Appendix D: IRB Approval Form

SOUTHERN ADVENTIST UNIVERSITY
Power for Mind & Soul

IRB
Institutional Review Board

October 5, 2020

Principal Investigator: Melissa Dawley
Research Project: The Green RX: An Intervention in Nurse Anxiety and Depression
IRB Tracking Number: 2020-2021-016

Dear Melissa,

It is a delight to inform you that your research protocol titled "The Green RX: An Intervention in Nurse Anxiety and Depression "has been approved by the Southern Adventist University Institutional Research Board according to the proposal. You are now authorized to proceed with the project as outlined. This approval expires May 31, 2021.
As a principal researcher, you have the ultimate responsibility for the conduct of the study, adherence to ethical standards, and protection of the rights and welfare of human participants. As you proceed with your research, you are expected to:

1) Conduct the study according to the approved protocol.
2) Make no changes to the approved study. If changes are necessary, proceed with one of the following:
   a) For minor changes to this protocol, please notify IRB by submitting an IRB Form B and proceed after its approval.
   b) For substantial changes, submit a new IRB Form A and proceed after its approval.
3) Use the approved procedure and forms for obtaining informed consent and data.
4) Promptly report any significant adverse events to the IRB within five working days of occurrence using an Adverse Report Form.

All forms must be submitted to irb@southern.edu.

We wish you many blessings as you move forward with this study and look forward to reading your findings when they are ready. If there is anything else we can do to assist you with this research study, please contact us.

Always in His service,

Cynthia M. Gettys, PhD

Director, Center for Teaching Excellence and Biblical Foundations of Faith and Learning
Chair, Institutional Review Board
Southern Adventist University
office. 423.236.2285
cell. 423.227.2352
address. PO Box 370, Collegedale, TN 37315

SOUTHERN ADVENTIST UNIVERSITY
Power for Mind & Soul

"I will instruct you and teach you in the way you should go; I will counsel and watch over you." Psalm 32:8

Responsibility – Input – Strategic – Learner – Achiever

"I applied my mind to **study** and to explore by wisdom all that is done under the heavens…" - Ecclesiastes 2:13
"Research is to see what everyone else has seen and to think what nobody else has thought." - Albert Szent-Gyorgyi

Appendix E: Green RX Training Video Link

The Green RX Training Video is accessible via Zoom. Click the link to view.

https://us02web.zoom.us/rec/share/Nk0pEpzMwMnwBBLe3nQ-oVnNfDEBUhCkAmI-lt2WytkZBkWicFu5SKoASrBF35o.CGTcgCiAagveNPH2

Passcode: +Ehv8KdX

Appendix F: EOP-SLO Synthesis

I. Cultural Competence

"*Mentor Christian responsiveness and caring to a global culture through sensitivity and competence for patient traditions and values.*"

The clinical problem identified was nurses facing higher rates of depression, anxiety, burnout, moral injury, horizontal and workplace violence and suicide due to workplace stressors and lack of resources, coupled with a global pandemic amplifying the above occupational hazards. The solution was the project intervention, the Green RX. Competency of this SLO was demonstrated by not restricting the project to a certain subset of nurses (e.g., males, heterosexuals, Christians). Great care was taken to try and recruit participants from varied nursing groups, which contained a diverse mix of members. Further, nursing culture was examined to identify the unique needs of nurses and the intervention was tailored to fit multiple schedules and beliefs.

II. Evidence Based Practice

"Translate quality research findings and outcomes to solve problems for quality personalized outcomes."

Forest Bathing, also known as Shinrin-Yoku (SY), is a peer-reviewed nature-based treatment option that has numerous positive effects on the human body physiologically and psychologically. Beyond SY, multiple green and nature-based therapies have been shown to benefit human health. The Principal Investigator spent her time at Southern Adventist University focused on this topic and used her extensive knowledge of the subject to translate previous research findings into a solution to her clinical problem. To the author's knowledge, nature-based treatments in the form of a Green RX had never been used as a treatment option for nurses

but had previously been investigated as a treatment option for students, Veterans and nursing home residents, who share similar stressors to nurses. The Principal Investigator synthesized previous research findings to tailor an intervention for nurses.

III. Health Promotion

"Propose evidence-based methods that prevent disease and promote human flourishing through the utilization of a holistic framework to educate and empower healthy lifestyle choices."

The application of nature-based therapies and interventions, including those from the Green RX, are part of a holistic lifestyle medicine intervention. The importance of the human environment is one of the eight principles of CREATION Health and is recognized in numerous nursing theories including Florence Nightingale, Martha Rogers and the Adventist Nursing Theory. Nature based treatments are used in the treatment of anxiety and depression but its application has also been shown to decrease sympathetic nervous system activity and induce relaxation through stimulation of the five senses, further it has been shown to lower heart rate and blood pressure. Due to the influence on multiple body systems, clinical treatment, health promotion and disease prevention can be achieved with the application of nature-based therapies.

IV. Patient-Centered Care

"Facilitate inter/intra professional healthcare to achieve personalized, compassionate, and coordinated whole person care."

Competency was demonstrated in relation to this EOP-SLO, as my intervention is a holistic treatment that focuses on Cura Personalis. As previously noted, green and nature-based interventions are linked to decreased sympathetic nervous system activity, improved vital signs, improved sleep and decreased anxiety and depression. Mental health and physical health share a

symbiotic relationship and although the Green RX was tailored to anxiety and depression symptoms, previous research has demonstrated physical health symptom reduction as well. By improving the nurses' mental health, it is also hypothesized their physical health improved (although not measured).

V. Quality & Safety

"Evaluate current evidence and outcomes of practice in health care systems to ensure a just culture that minimizes the risk of harm and promotes safety and quality of care."

When nurses suffer from depression, anxiety, burnout, moral injury and violence, patient care suffers. Further, nurses and other caregivers often neglect their own personal care leading to injury and mental health problems. This project addressed safety on two fronts, the first being ensuring nurses practiced self-care leading to better patient care outcomes and decreasing mental health symptoms and the second was ensuring participant safety during the intervention period. A safety video was made that highlighted hazards related to the two interventions.

VI. Informatics & Innovation

"Analyze healthcare outcomes using knowledge of nursing, computer and information sciences to ethically and innovatively manage data, information, and technology."

Competency was achieved by way of a sound design. The Principal Investigator collaborated with a statistician to ensure correct synthesis and evaluation of data as well as data security. Two technology systems were used to complete the project, SPSS for statistical analysis and SurveyMonkey for data collection. Data was managed ethically as no identifying information was obtained from the participants as they chose their own username/number.

VII. Teamwork & Collaboration

"Organize effective inter/intra professional teams to promote quality health outcomes and reduce risk."

Although the Principal Investigator was the sole researcher, collaboration took place with a team of professionals: a faculty advisor, statistician, editor. Each provided expert advice and guidance regarding the project design and write-up. The Principal Investigator also worked with the IRB at Southern Adventist University to ensure patient safety and privacy was maintained. These collaborations decreased risk to project participants and allowed for promotion of health through project participation.

VIII. Professionalism

"Advocate for Christ-centered excellence in nursing roles and professional behaviors throughout the inter/intra professional team."

The Principal Investigator was able to show competency in this EOP-SLO in the completion of the DNP project. In medicine, advocacy can be achieved in many ways including the introduction of new evidence that can be applied in new and existing patient populations. Moreover, the Principal Investigator plans on writing to elected officials asking for the introduction of legislature to create bills that would allow nurses and other frontline healthcare workers free access to both state and national parks. A continuing education opportunity related to this topic is also under development as a way to educate other medical professionals on the benefits of green therapies. Finally, the Principal Investigator plans on becoming a certified forest therapy guide in order to offer this therapy to patients and nursing professionals. Although the Green RX project has concluded, it continues to offer opportunities for professional training, expansion of care options, and the potential for improved health outcomes for future patients.

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