

GREENING THERAPY: THE IMPACT OF GREEN ELEMENTS ON THE EFFICACY OF ANXIETY-REDUCING INTERVENTIONS

By

Angelica Ford

July 2021

Director of Thesis: Damon Rapplelea, Ph.D.

Major Department: Human Development and Family Sciences

ABSTRACT

The purpose of the present study is to better understand the relationship between plants and anxiety. The researcher primarily seeks to investigate the capacity for plants to reduce anxiety and increase the efficacy of anxiety-reducing interventions as well as the potential for one's connection to nature to further impact the ability for plants to reduce anxiety. The present study is situated within Bowen Family Systems Theory and is primarily interested in the concept of chronic anxiety. Previous research has demonstrated a connection between green interventions and positive mental health outcomes, but there is a gap in the literature for experimental, quantitative research as well as studies that include indoor exposure to green elements (Bang et al., 2017; Gubbels et al., 2016; Lee et al., 2011; Wendelboe-Nelson et al., 2019). The researcher sought to fill these gaps with an experimental study that collected data on participants' (N=36) state anxiety in a green or non-green environment alongside the completion of a diaphragmatic breathing exercise.

GREENING THERAPY: THE IMPACT OF GREEN ELEMENTS ON THE EFFICACY OF
ANXIETY-REDUCING INTERVENTIONS

A Thesis

Presented to the Faculty of the Department of Human Development and Family Science

East Carolina University

In Partial Fulfillment of the Requirements for the Degree

Master of Science in Marriage and Family Therapy

By

Angelica Ford

July 2021

© Angelica Ford, 2021

GREENING THERAPY: THE IMPACT OF GREEN ELEMENTS ON THE EFFICACY OF ANXIETY-REDUCING INTERVENTIONS

By

Angelica Ford

APPROVED BY:

DIRECTOR OF THESIS: _____

Damon Rappleyea, Ph.D.

COMMITTEE MEMBER: _____

Katharine Didericksen, Ph.D.

COMMITTEE MEMBER: _____

Jacquelyn Mallette, Ph.D.

CHAIR OR THE DEPARTMENT OF HUMAN DEVELOPMENT AND FAMILY SCIENCE:

Sharon Ballard, Ph.D.

DEAN OF THE GRADUATE SCHOOL:

Paul J. Gemperline, Ph.D.

ACKNOWLEDGMENTS

As a marriage and family therapist, I am well aware of the value of systems and this project has been continual proof of this message. I am so grateful to have been a part of the system that collaborated to make this paper a reality. Through unexpected challenges, this system provided unconditional support that is rare to find. To Dr. Mallette, thank you for your contribution of invaluable statistical knowledge and a love of research that is contagious. Thank you for your hope and optimism to find interesting results from the data. To Dr. Didericksen, thank you for the countless hours of support and your trust. Thank you for meeting me where I was and for your flexibility in the kind of support that was needed, whether this was to discuss timelines, the specifics of a discussion section, or the emotions that come along with a master's thesis. To Dr. Rappleyea, thank you for your continual support and faith in this project. I had so much fun discussing with you both the logistics of this study as well as the philosophical components as we chase concepts that we may not know just quite how to measure yet.

Beyond the thesis committee, I am so thankful for the system of my cohort that knew me and loved me. To Chris, Claire, Daija, Judith, Molly, Olivia, and Rachel, thank you for all of the things you did to help support me in this process, and more than this, thank you for all the things that you are. To Kelsi, my sister in arms, if I was to properly thank you, it would be longer than this entire thesis. Thank you for the hours we got to share. I will not forget them.

Finally, to my family: you have passed me the message to "enjoy the ride." While this project has been challenging and heart-breaking at times, there was always an element of joy in the struggle. I'd like to think I enjoyed the ride. Thank you for this message; I hope I can continue to live it.

TABLE OF CONTENTS

TITLE PAGE	i
COPYRIGHT	ii
SIGNATURE PAGE	iii
ACKNOWLEDGEMENTS	iv
LIST OF TABLES	ix
LIST OF FIGURES	x
CHAPTER 1: INTRODUCTION	1
Importance of Study	2
Purpose of Study	3
CHAPTER 2: LITERATURE REVIEW	5
Bowen Family Systems Theory	6
Differentiation	6
Chronic Anxiety	7
“Green Space”	8
Green Space Interventions	9
Accessibility to Green Space	11
Anxiety	12
Clinical Anxiety	12
Bowen’s Concept of Chronic Anxiety	13
Anxiety in Therapy	14
Treatments for Anxiety	15
Cognitive Behavioral Therapy	15

Mindfulness	16
Diaphragmatic Breathing	17
Summary	19
CHAPTER 3: METHODS	20
Purpose of Study	20
Research Questions and Hypotheses	20
Study Design	21
Participants	21
Procedures	22
Informed Consent	22
Confidentiality	22
Procedural Overview	23
Measures	24
State-Trait Anxiety Inventory	24
Nature-Relatedness Scale-6	25
Data Analysis	26
Variables	26
Analysis Plan	27
Ethical Considerations	28
CHAPTER 4: PUBLICATION MANUSCRIPT	30
Study Justification	31
The Purpose of the Study	32

Literature Review.....	32
Bowen Family Systems Theory	32
Green Interventions for Anxiety	33
Anxiety	35
Treatments for Anxiety	37
Methodology.....	38
Procedures	38
Participants.....	40
Research Questions and Hypotheses	41
Data Analysis	42
Results.....	43
ANOVAs.....	44
Regressions	45
Discussion.....	47
Limitations	50
Future Directions	51
Implications.....	53
Research Implications.....	53
Clinical Implications.....	54
Conclusion	56
REFERENCES	57
APPENDIX A: IRB APPROVAL	64
APPENDIX B: DEMOGRAPHICS SURVEY	66

APPENDIX C: SHORTENED STATE ANXIETY SCALE	67
APPENDIX D: NATURE-RELATEDNESS SCALE-6 (NR-6)	68
APPENDIX E: INFORMED CONSENT	69

LIST OF TABLES

1. Participant Demographics	40
2. Correlations for Study Variables	44
3. One-way ANOVA Results	44
4. Regression Results for Time 1 and Time 2 on Time 3 in Green Condition	46
5. Regression Results for Time 1 and Time 2 on Time 3 in Non-Green Condition	47

LIST OF FIGURES

1. “Completed” Tangram Puzzle	39
-------------------------------------	----

CHAPTER 1: INTRODUCTION

The use of nature in therapy and therapeutic interventions is not a new concept and there is an existing body of literature on this topic. In the literature, therapy that utilizes green space has been defined several different ways and it is important to define how this study will utilize nature and what this will be called. In the present study, the researcher will use the term “green space” to refer to a space utilizing nature and plants (Wendelboe-Nelson et al., 2019). The term “green space” has been operationalized in many different ways, as forest therapy, community green space, urban green space, community gardening, horticulture therapy, biodiversity, virtual or indoor green space, etc. However, despite the differing descriptors, they all have in common a positive association between the green space and mental health and wellbeing outcomes (Wendelboe-Nelson et al., 2019).

Green space has been used to address the symptoms of anxiety and stress, which are two common presenting problems in therapy with deleterious consequences. Those in the United States experience high rates of stress and clinical anxiety in comparison to the world average (APA, 2013; Gallup, 2019). In the United States, the 12-month prevalence for Generalized Anxiety Disorder (GAD) is 2.9 percent while other countries report prevalence rates ranging from 0.4 to 3.6 percent (APA, 2013). In addition, 55 percent of U.S. citizens report feeling stress during the day. The world average is 35 percent (Gallup, 2019). In 2014, U.S. citizens rated their stress level at a 4.9 on a scale of one to 10. (APA, 2015). Without the implementation of proper coping strategies, high levels of stress and anxiety can lead to unhealthy coping strategies, such as substance use and isolation as well as engaging in unhealthy exercise habits, disordered eating, or risky sexual behavior (Anxiety and Depression Association of America, 2010-2020).

The researcher will position this study within the theoretical framework of Bowen Family Systems Theory, a modern therapy approach that is particularly interested in increasing the emotional differentiation of clients and their ability to manage reactivity to chronic anxiety. To increase one's differentiation is to increase one's ability to distinguish themselves from others and their emotions from their thoughts (Bowen, 1985). In increasing differentiation, clients are then also better able to manage their response to "chronic anxiety." Bowen defines "chronic anxiety" as a response with high levels of emotional arousal (Bowen, 1985). This closely resembles Ekman and Gottman's concept of emotional flooding (Ekman, 1984; Gottman, 1999).

There are several methods clinicians use to decrease client anxiety responses in and out of the therapy room. Bowen Family Systems Theory presents a few interventions, such as de-triangulation, which references the client separating oneself from conflicts in which they are not primarily involved (Bowen, 1985). Other interventions include Cognitive Behavioral Therapy, mindfulness, and diaphragmatic breathing (Arch & Craske, 2008; Chen et al., 2017; Creswell, 2017; Hazlett-Stevens & Craske, 2009; Kim et al., 2015). High anxiety is a prevalent clinical problem that therapists seek to address and what may work for one client may not work for the next. Therefore, exploring potential new modes of treating this problem is valuable.

Importance of Study

Through this study, the researcher will seek to fill a few important gaps in the literature of the burgeoning field interested in the mental health benefits of the natural world. In Wendelboe-Nelson et al.'s literature review of the research in this field, they found that the vast majority of the studies were qualitative and subjective research (2019). Moreover, they discovered that 8.4 percent of publications were reviews of the literature; while this is valuable, so too is experimental research (Wendelboe-Nelson et al., 2019). This proposed study seeks to

provide quantitative research through the implementation of an experiment, filling the gap for quantitative and experimental research. Additionally, Wendelboe-Nelson et al. identified that only 24 of the 263 reviewed articles were interested in virtual or indoor green space; the proposed study is interested in the use of indoor green space, seeking to fill this gap as well (2019).

High anxiety and stress levels have a host of negative impacts, both physically and mentally (APA, 2018; Gallup, 2019). The researcher proposes that a green environment could aid in decreasing anxiety and stress as well as increase the efficacy of anxiety-reducing therapy interventions. Perhaps the small and low-cost additions of plants in the therapy room can lead clients to experience lower levels of anxiety in the room, leading to a faster, more effective, or more robust course of therapy.

Purpose of Study

The researcher will primarily seek to investigate the capacity for plants to reduce anxiety and increase the efficacy of anxiety-reducing interventions, such as diaphragmatic breathing. Considering that diaphragmatic breathing reduces anxiety and green space reduces anxiety, it may follow that diaphragmatic breathing in a green space has a compounded effect to reduce anxiety even further (Bang et al., 2017; Hopper et al., 2019; Lee et al., 2011). Additionally, the researcher will be interested in what role one's connection to nature may have on the ability of plants to reduce anxiety and increase the efficacy of anxiety-reducing interventions. It may be the case that, as is true of many interventions, client buy-in is very important (Gubbels et al., 2016). Perhaps those clients that feel closer to nature will see higher rates of anxiety reduction in an environment with natural elements such as plants.

Having established the importance and purpose of the proposed study, the researcher will next present a brief review of the relevant literature, situating the current study within the existing body of knowledge on Bowen Family Systems Theory, green space interventions, anxiety, and treatments for anxiety. Then, the researcher will describe the methodology of the proposed study, describing the participants, procedures, measures, plan for analysis, and notable ethical considerations. Finally, the researcher will present the results of the study as well as key points of discussion, including the research and clinical implications of the results, the limitations of the study, and the researcher's suggestions for future directions.

Chapter 2: LITERATURE REVIEW

High levels of anxiety and stress interrupt typical functioning and can affect normal development and growth, leaving the individual vulnerable to autoimmune and endocrine diseases (Stratakis & Chrousos, 1995). Those with Generalized Anxiety Disorder experience physical symptoms, such as muscle aches and soreness, somatic symptoms such as diarrhea, nausea, and sweating, and autonomic hyperarousal symptoms, such as increased heart rate, shortness of breath, and dizziness (American Psychiatric Association, 2013). Beyond the physical repercussions, there are psychological implications of high stress and anxiety, including vulnerability to psychiatric disorders, negative affectivity, excess worrying, and feeling a lack of control (APA, 2013; Stratakis & Chrousos, 1995). It takes time and energy to worry (APA, 2013). Stress can disturb sleep, negatively impact personal relationships, and affect one's ability to work, leading to occupational problems and job loss (Korn Ferry, 2018). Considering the damaging consequences and the high prevalence rates of these two potential presenting problems in the United States, it is important to study methods of managing stress and anxiety (APA, 2013; Gallup, 2019).

In the following chapter, the author will review existing and relevant literature in the field. It is important to position the work of the present study within the existing field that explores the mental health benefits of green space. First, the researcher will situate the literature within the Bowen Family Systems Theory framework, which is a systemic therapeutic theoretical orientation that is particularly interested in anxiety management (Bowen, 1985; Bowen & Kerr, 1988). Next, the researcher will present recent literature on green space interventions and their mental health benefits. Lastly, the researcher will present research on

anxiety and describe some of the treatment options for anxiety, namely diaphragmatic breathing as a particularly successful intervention (Kim et al., 2015).

Bowen Family Systems Theory

Bowen Family Systems Theory was developed by Murray Bowen and has its roots in psychoanalytic and systems theory (Bowen, 1985). In his theory, Bowen describes a progression of transmission processes in which patterns of behavior are passed down between generations within expanding systems of development (Bowen, 1985). The family projection process describes transmission within the nuclear family, most often from parent to child. The multigenerational transmission process creates a larger picture in which the nuclear transmission process occurs repeatedly throughout generations of parent and child relationships. Lastly, the concept of societal regression creates an even larger picture in which all families across time and space experience transmission processes, impacting society holistically (Bowen, 1985). In these processes, individuals, families, and societies transmit differentiation level (Bowen, 1985).

Differentiation

Differentiation can be a difficult concept to define. Briefly, it references one's ability to balance togetherness and autonomy: one can understand themselves as a unique individual both within and outside of their relationships (Bowen & Kerr, 1988). Their sense of self remains intact regardless of their contextual environment. This sense of self is called the "solid self." In comparison to this solid self exists a "pseudo self" that is flexible and changes based on contextual factors (Bowen, 1985). Those on the higher end of the differentiation of self-scale have a larger solid self in comparison to their pseudo self. Additionally, differentiation references one's ability to distinguish their emotions from their thoughts. Bowen surmises that

most people have very low levels of differentiation; therefore, increasing individual differentiation is a primary goal for all clients (Bowen, 1985).

Chronic Anxiety

Differentiation exists within the context of anxiety and stress: it takes a stressful or anxious situation to see one's most accurate differentiation level (Bowen, 1985). One can appear to be highly differentiated, demonstrating an understanding of themselves from others and of their thoughts from their emotions. However, when placed in an anxious situation, these same individuals may begin to reflect their more accurate differentiation level. In the anxiety, they may become overly involved in relationships and emotional systems that do not pertain to them and experience difficulty understanding their thoughts from their emotions (Bowen, 1985).

Chronic anxiety is an outcome of what Bowen described as the undifferentiated ego mass, the emotional oneness and stuck together-ness of particularly undifferentiated systems (Bowen, 1985). In families, this may look like a sister who cries every time her brother cries. This intense form of connection prevents individuals from recognizing and maintaining their basic sense of self in relationships and causes distress (Bowen, 1985).

Because we do not exist in a vacuum, and instead exist in a particularly stressful and anxiety-provoking world, another primary goal within Bowen's theory is to decrease reactivity to chronic anxiety. Increasing differentiation and decreasing reactivity to anxiety often occur in tandem, as increasing differentiation inherently lowers one's emotional reactivity to chronic anxiety and vice versa (Bowen, 1985). Often in chronic anxiety, individuals have an automatic and wholly emotional reaction, similar to Ekman's (1984) concept of flooding (Friedman, 1991). One task of the Bowenian therapist is to manage client reactivity to chronic anxiety in the therapy room to allow for the therapeutic process to continue; clients who are flooding will

struggle more with communication and have more difficulty thinking logically and making connections (Bowen, 1985; Gottman, 1999). Therefore, the therapist seeks out methods to manage that reactivity, be it their non-anxious presence in the room or interventions they implement (Bowen, 1985). The researcher is interested in the potential for green space to further manage that anxiety.

“Green Space”

The concept that green space, gardening, and exposure to the outdoor environment contribute positive physical and psychological benefits is not new. In a literature review seeking to connect elements of green space to mental health and wellbeing, Wendelboe-Nelson et al. (2019) found 263 different studies in the currently burgeoning field. Of interest, 70 percent of these studies (N=~184 studies) found evidence to support a positive association between green space and improved mental health and wellbeing. The researchers in this field have conceptualized green space in many different ways: forest therapy, community green space, indoor green space, urban green space, community gardening and horticulture therapy, and biodiversity (Wendelboe-Nelson et al., 2019).

The researcher of the present study is particularly interested in indoor green space, as this would be the conceptualization that is most representative of utilizing plants in the therapy room. There were 24 studies identified in the literature review that cover indoor green space. Among these studies, half implemented only questionnaires and had no exposure to green space in their methods. Of the half that did include exposure to green space, 37.5 percent used images and 4.2 percent used video to serve as the tool for exposure to the green space. Only two studies had indoor exposure (Wendelboe-Nelson et al., 2019). Moreover, Among the 263 studies in the entire literature review, only 32 studies were interested in clinical mental health, and anxiety was

the clinical problem of focus in only a fraction of these. This presents a gap in the literature throughout this field: there is a lot of discussion about the potential benefits of green space, but there is much less action taken to find quantitative data on these benefits, especially clinical mental health benefits (Wendelboe-Nelson et al., 2019). By quantitatively investigating the link between indoor green space and the clinical benefit of reduced anxiety, the present study will seek to narrow this gap. In the next section, the researcher will present some of the existing literature on green space as a mental health intervention.

Green Space Interventions

Lee et al. (2011) investigated the psychological and physiological effects of forest bathing, which is defined as “taking in the forest atmosphere” (p. 94). While it is not impossible, it is improbable that therapists would be able to provide therapy within a forest and gain the benefits found in this study. However, Lee et al.’s results help build an argument for adding natural elements found in a forest to the therapy room to glean their health benefits (2011). In this study, participants (n=12) spent time in both an urban and forest setting. The researchers measured cortisol levels, parasympathetic nervous system activity, pulse, blood pressure, and subjective psychological feelings (Lee et al., 2011).

In the forest environment, participants reported significantly higher activity of the parasympathetic nervous system, significantly decreased levels of cortisol, a significantly lower pulse, and more self-reported feelings of comfort and refreshment, all indicating increased relaxation and decreased anxiety (Lee et al., 2011). There was no significant difference in blood pressure between the two settings. Not only did participants psychologically feel relaxed, physiologically, their bodies relaxed (Lee et al., 2011). Perhaps adding plants and other natural

elements to the therapy room can garner these same results and lower the anxiety and reactivity clients experience while receiving therapy.

In the same vein of exploring forest-based mental health interventions, Bang et al. (2017) explored the impacts of a forest walking intervention paired with a stress management class. The stress management class was one hour a week for a total of six weeks (Bang et al., 2017). Participants engaged in forest walking in a group with around 15 members and walked for a total of 40 minutes, stopping at some point to take a 10-minute break and eat a light meal. Participants were encouraged to walk on their own once a week in addition to the group forest walks (Bang et al., 2017). It is particularly relevant to this study that the walking intervention took place only once a week, as this is the typical indicated schedule for therapy sessions. These participants included 47 men and 52 women that were all undergraduate or graduate students aged 19 to 29 (Bang et al., 2017).

These researchers utilized the Health-Promoting Lifestyle Profile II that includes 6 subscales: responsibility for health, physical activity, healthy nutrition, social relations, stress management, and spiritual growth (Bang et al., 2017). Participants that took part in this intervention scored higher on health-promoting behavior, particularly on the subscales of physical activity, healthy nutrition, stress management, and spiritual growth scores. Regarding psychological health, and in agreement with other literature in the field, forest exposure led to higher activation of the parasympathetic nervous system, indicating a more relaxed state, and a decrease in depressive symptoms (Bang et al., 2017). It is important to note that, while walking is productive and has its own physical and psychological benefits, walking in the forest environment led to increased mental health benefits, potentially due to the lower levels of environmental stress that are unique to a greener environment (Richardson et al., 2008).

Accessibility to Green Space

There is an element of privilege in having ready and safe access to a green environment (Taylor, 2018; Wesely & Gaarder, 2004). Fortunately, the mental health benefits associated with a green environment can also be found in botanical gardens, which can exist in rural and urban spaces. Botanical gardens have the potential to be restorative environments with physical and psychological benefits as well as improvements to perceived subjective well-being (Carrus et al., 2017). Utilizing a convenience sample of 127 people in four different cities in Italy, Carrus et al. (2017) found support for the claim that the perceived restorativeness of the botanical garden was significantly positively correlated with physical and psychological benefits. Further, these benefits mediate the relationship between the perceived restorativeness of an environment and perceived well-being. These results suggest that time in a natural setting has meaningful benefits, especially when we perceive that setting to be restorative (Carrus et al., 2017).

Should botanical gardens be limited, Gubbels et al. (2016) propose a solution by “greening” neighborhoods. After implementing greening interventions in urban neighborhoods in the Netherlands and subsequently providing questionnaires that assess for mental health outcomes, Gubbels et al. (2016) identified a significant negative relationship between the number of trees and changes in depressive symptoms in adult participants (n=727). This relationship indicates that, as the number of trees increased, the number of depressive symptoms decreased (Gubbels et al., 2016). This relationship is mediated by the perceived improved quality of the space and perceived mental restfulness of green spaces (Gubbels et al., 2016). Like with all interventions in therapy, it may be important to have the client’s “buy-in” with green space to gain the benefits.

Anxiety

Thus far, anxiety has been referenced in several different contexts. The purpose of this section is to clarify the different concepts that all hold the general title of anxiety, though they represent different definitions. The researcher will first describe clinical anxiety, then Bowen's notion of chronic anxiety. Finally, the therapist will describe the experience of anxiety in the therapy room, as therapy can be an anxiety-inducing experience for many people. Social stigmas associated with therapy can make it difficult for people to even come to a first session, and once therapy begins, it can often be anxiety-inducing to discuss difficult emotions, thoughts, and experiences as is often the content of therapy sessions (Patterson et al., 2018; Watsford & Rickwood, 2014).

Clinical Anxiety

Clinical anxiety should be differentiated from the chronic anxiety that Bowen discusses and that is of interest for the present study. In the fifth edition of the Diagnostic and Statistical Manual (DSM-5), one section focuses on anxiety disorders (APA, 2013). These disorders are characterized by fear—the response to a real or perceived threat—and anxiety—the anticipation of that threat. In addition, these disorders are inherently distressing. Though anxiety can be adaptive, the anxiety in these disorders is not adaptive and is, by definition, excessive and developmentally inappropriate (APA, 2013). The DSM-5 contains 11 anxiety disorders differentiated based on the context or stimuli that invoke the anxiety as well as the thoughts that result from the anxiety. Among these diagnoses are Panic Disorder, Social Anxiety Disorder, and Specific Phobia. One anxiety disorder of note that is worth further description for the sake of the present study is Generalized Anxiety Disorder (APA, 2013).

Generalized Anxiety Disorder is the typical diagnosis for those who report that they have felt nervous or anxious their entire life (APA, 2013). It is characterized by excessive anxiety and worry that is difficult to control and is experienced more days than not for at least 6 months. This anxiety is not directed at anything specific and instead is felt towards a variety of events and/or activities (APA, 2013). Individuals with this disorder may experience restlessness, difficulty concentrating, irritability, muscle tension, disturbance in sleep, or fatigue. Beyond these symptoms, these individuals also experience significant distress as a result (APA, 2013). Anxiety has become a word that is used relatively colloquially by people who may not necessarily meet the diagnostic criteria required to obtain this diagnosis (Stiehl, 2017). To understand chronic anxiety that is experienced by all, it was important to describe the clinical anxiety that is experienced by a much smaller portion of the population, roughly 2.9 percent of the U.S. adult population and 0.9 percent of the U.S. adolescent population (APA, 2013).

Bowen's Concept of Chronic Anxiety

Bowen's chronic anxiety references a universal response to a threat, real or imagined (Bowen, 1985). Unlike clinical anxiety, this form of anxiety exists in all living things and a primary aim of therapy is to teach clients how to manage this anxiety rather than try to reduce the symptoms as would be the aim when treating clinical anxiety (Gehart, 2017). There is not a diagnosis tied to chronic anxiety. Distress results from the impact of this form of anxiety: individuals may cut themselves off from their family and friends or experience a fusion with these individuals, losing their sense of self (Bowen, 1985). As anxiety rises in the individual, their perception of their choices begins to decrease, and they may find themselves relying on previous experience rather than thought and consideration to determine how to move forward.

Emotionality takes the lead (Bowen, 1985). This concept is closely tied to Ekman's concept of flooding, which could be considered a physiological response to unmanaged chronic anxiety.

Flooding

John Gottman (1999) studied couples' experience with flooding, utilizing heart rate to physiologically measure flooding. Flooding can be defined as an experience where "one emotion or a set of emotions becomes so aversive and so prominent that it takes over the emotional world of the person" (Gottman, 1999, p. 73). Gottman recommended that once couples in conflict reach a heart rate of 95 beats per minute, they should take a break from the conversation, as they are beginning to flood and their ability to communicate is diminished. Moreover, Gottman (1999) reported that, at heart rates of 100 beats per minute, the body starts to secrete epinephrine, which can activate the sympathetic nervous system and flight or fight response. Anxiety can be adaptive, and the fight or flight response is very useful when there is imminent danger (Morris, 2019). However, in a therapy room, it is no longer adaptive for clients to experience this physiological response. To manage flooding, one must learn to self-soothe (Gottman, 1999). Several mechanisms can be used to soothe anxiety that will be discussed in a later section of this literature review.

Anxiety in Therapy

Therapy is no easy task. It asks clients to dive deeply into who they are as a person and what change they hope to see in themselves. Moreover, to even enter a therapy room for a first session, a client must have already conquered shame and stigma associated with mental health issues and, consequently, therapy (Watsford & Rickwood, 2014). Internally, clients may be managing these systemic fears as well as their personal fears. Many clients only come to therapy

after they have reached the point where they feel tired or hopeless about being able to find solutions to their problems (Patterson et al., 2018). On top of these concerns many clients are not sure exactly what the process of therapy will look like or what they will be asked to do, which can serve to increase anxiety, fear, and stress (Gelb, 2015). It can be quite easy for clients to begin to flood while they are in the process of therapy, discussing some of the most challenging emotions or experiences of their lives. Therefore, it is important for therapists to have interventions and strategies at their disposal to manage flooding as it occurs in the therapy room to relieve distress and to continue with the therapeutic process (Gottman, 1999).

Treatments for Anxiety

The high prevalence of anxiety and stress as presenting problems in therapy has led to the development of several evidence-based courses of treatment to help clients manage these experiences and symptoms (APA, 2013; Gallup, 2019). As the researcher considers green space as a potential tool to manage anxiety, it is useful to also consider other established interventions that have demonstrated success in treating high anxiety and stress. Cognitive Behavioral Therapy, mindfulness, and diaphragmatic breathing are three notable existing strategies (Arch & Craske, 2008; Chen et al., 2017; Creswell, 2017; Hazlett-Stevens & Craske, 2009; Kim et al., 2015). The researcher is particularly interested in the potential for diaphragmatic breathing to be applied in a green therapy space to increase anxiety reduction.

Cognitive Behavioral Therapy

Cognitive Behavioral Therapy (CBT) is a widely used and empirically validated therapeutic technique that is successful in treating a variety of presenting problems, including anxiety (Gehart, 2017; Arch & Craske, 2008). CBT has demonstrated long-term effectiveness in

reducing anxiety symptoms (DiMauro et al., 2013). In a study investigating the effectiveness of a CBT treatment in an outpatient sample experiencing a variety of clinical anxiety disorders, 62 percent of participants were responsive to treatment, indicating an improvement in symptoms. Moreover, after one year, 77 percent of those who were responsive to treatment maintained their improvement (DiMauro et al., 2013).

CBT is interested in the thoughts, behaviors, and emotions of the client, intervening in the negative cognitions that are causing distress to change the negative behaviors (Gehart, 2017). In addition, CBT seeks to increase control and a sense of predictability with the anxious thoughts to reduce the symptoms causing dysfunction and distress (Arch & Craske, 2008). To reduce anxiety, CBT may suggest providing psychoeducation on fear and anxiety, encouraging self-monitoring of symptoms, and challenging and restructuring negative cognitions, among other techniques (Arch & Craske, 2008).

Mindfulness

While CBT is an incredibly successful evidence-based treatment for clinical anxiety disorders, mindfulness provides an approach that is particularly successful in managing situational or state anxiety representative of a flooding anxiety response (Zeidan et al., 2014). Mindfulness can be defined as the process of being present in the current moment and increasing awareness of one's surroundings and themselves (Creswell, 2017). It is intended as a break from the automaticity that is so often found in the human experience. Beyond noticing oneself in context, mindfulness involves a level of acceptance of that context. Every person is capable of being mindful, but that does not mean it is easy and it can take practice for it to be effective (Creswell, 2017).

There are physical health benefits associated with practicing mindfulness, including a reduction in chronic pain and an improved immune system (Creswell, 2017). Specific to the interests of this paper, mindfulness interventions have been shown to reduce anxiety symptoms (Strauss et al., 2014; Zeidan et al., 2014). In a study investigating the impact of mindfulness meditation on state anxiety, state anxiety was significantly decreased in every session of meditation (Zeidan et al., 2014). The researchers identified that this reduction was associated with activation of the anterior cingulate cortex, ventromedial prefrontal cortex, and anterior insula, indicating that there are neurological impacts of meditation (Zeidan et al., 2014).

Diaphragmatic Breathing

Diaphragmatic breathing is considered one of the most useful techniques to decrease stress, and it is also particularly accessible (Kim et al., 2015). In a literature review studying diaphragmatic breathing interventions, the researchers found that all three articles reviewed found evidence to support the claim that diaphragmatic breathing interventions led to reduced physiological and psychological stress (Hopper et al., 2019). Despite breathing often being considered an automatic process, many people breathe incorrectly; diaphragmatic breathing is a mindful way of correcting that breathing so that one appropriately utilizes the diaphragm to slow their breathing rate, decrease their body's demand for oxygen, and decrease the amount of effort and energy needed to breathe (Diaphragmatic Breathing Exercises & Techniques, 2018).

There are a few steps to this exercise that a clinician may need to walk a client through the first time they are completing it. To feel one's diaphragm, the individual places one hand on their chest and one hand below their ribcage (Diaphragmatic Breathing Exercises & Techniques, 2018). At the same time, the individual breathes in slowly through the nose and pushes their stomach outwards. Next, as the individual breathes out through pursed lips, they will tighten

their stomach muscles (Diaphragmatic Breathing Exercises & Techniques, 2018). Diaphragmatic breathing does not require any special equipment, space, or cost to implement (Kim et al., 2015). It is considered easy for clients to learn and practice in a variety of settings and it is a non-pharmacological approach (Hopper et al., 2019; Kim et al., 2015).

Chen et al. (2017) studied the physiological and psychological effects of diaphragmatic breathing on anxiety. The researchers measured anxiety using the Beck Anxiety Inventory and four physiological anxiety measures, including skin conductivity, peripheral blood flow (temperature), heart rate, and breathing rate (Chen et al., 2017). After implementation of the diaphragmatic breathing intervention, those in the experimental group had significantly lower scores on the Beck Anxiety Inventory in comparison to the pre-intervention measures and in comparison to the control group. Measured peripheral blood flow, heart rate, and breathing rate scores in the experimental group were significantly lower, indicating lower anxiety responses (Chen et al., 2017). Additionally, those in the experimental group had lower scores on the skin conductivity test, where lower scores indicate lower anxiety levels, though this was not statistically significant (Chen et al., 2017). The results indicate support for the use of diaphragmatic breathing to calm an anxious, flooded response.

Diaphragmatic breathing exercises have been indicated for use with both clinical anxiety and stress-related health conditions (Hazlett-Stevens & Craske, 2009). With clinical anxiety, diaphragmatic breathing is used to counteract hyperventilating that may occur while clients are experiencing panic symptoms and to promote an overall sense of relaxation. It is provided as an effective coping strategy to manage anxiety or worry (Chen et al., 2017; Hazlett-Stevens & Craske, 2009). Those that could be contraindicated for this kind of intervention include people with respiratory conditions such as asthma or chronic obstructive pulmonary disease (COPD).

However, this treatment is not contraindicated for all people with these conditions, and indication should be determined on a case-by-case basis (Hazlett-Stevens & Craske, 2009).

Summary

In this chapter, the researcher provided a brief review of the existing literature on Bowen Family Systems Theory, green space interventions, clinical anxiety and chronic anxiety, and existing treatments to reduce anxiety. Considering the prevalence and risks associated with high anxiety, it is important for therapists and researchers to investigate and identify methods to reduce that anxiety (APA, 2013; Gallup, 2019; Korn Ferry, 2018; Stratakis & Chrousos, 1995). The present study will seek to better understand how green space can be leveraged in therapy to reduce anxiety and boost anxiety-reducing interventions. To do so, the researcher will implement diaphragmatic breathing in a green space to reduce anxiety after an anxiety-provoking situation. The proposed methodology of this study will be described in the following chapter.

CHAPTER 3: METHODS

After reviewing the literature, it next becomes the task to describe the aims and proposed methodology of the proposed study. This section will describe the purpose of the study, the methodology, including the participants, procedures, and measures, the ethical considerations involved in this research, and the analyses completed. Throughout the section, justifications will be made for the study's design, particularly those elements that are more controversial.

Purpose of the Study

The primary aim of this study is to investigate the way that plants can be used to reduce anxiety in the therapy room for both clients and therapists and enhance the efficacy of anxiety-reducing interventions. More specifically, this study seeks to answer several research questions regarding this topic.

Research Questions and Hypotheses

RQ1) Is there a significant correlation between the presence of plants and the experience of psychological anxiety responses, as measured by the State Anxiety Scale?

H1) In conditions with plants, participants will report significantly lower scores on the State Anxiety Scale.

RQ2) Can plants increase the reduction of psychological anxiety seen after completing a diaphragmatic breathing exercise?

H2) In conditions with plants, after the diaphragmatic breathing exercise, participants will report psychological anxiety responses that reflect significantly lower anxiety than those seen in the non-plants condition after the breathing exercise.

RQ3) How does nature-relatedness impact the effect plants can have on anxiety response reduction?

H3) Due to limited research, we do not have an a priori hypothesis for how nature-relatedness will impact the relationship between plants and anxiety reduction.

Study Design

The researcher will complete a quantitative study investigating the role plants and green features can play in decreasing anxiety and increasing the efficacy of interventions aimed at decreasing anxiety. Quantitative measures of psychological anxiety will be taken utilizing the State Anxiety Scale (Julian, 2011). Quantitative measures interested in participant's connection to nature will be taken utilizing the Nature-Relatedness Scale-6 (Nisbet & Zelenski, 2013). Participants will also complete a demographics survey with questions about age, gender, race, religion, and the climate region in which they have spent the most time living. This study will employ a between-subjects design in which participants only engage in one condition, either the experimental or the control. This study will utilize deception, and therefore it is necessary to use a between-subjects design where participants are present in only one condition. In this section, the researcher will detail the procedures of the proposed study.

Participants

The participants in this study will be recruited from a major university in the southeast of the United States. The researcher will only recruit participants aged 18 or older from undergraduate and graduate departments at the university. Participants will ideally be sampled from a diverse spectrum of social locations on the dimensions of age, race, ability, sexual

orientation, and SES. Beyond the age requirement to legally consent to participate in the study, there will be no additional exclusion criteria. Participants will not be compensated for their time.

Procedures

The following section will describe the procedures for the study. First, the researcher will describe the informed consent process for participants as well as how confidentiality was protected and maintained for participants. Then, the researcher will provide the procedural overview, which details the progression of events participants will take part in during the study.

Informed Consent

Informed consent will be obtained from each participant when they first arrive to the study and before any measures are taken. Each participant will be made aware that participation is voluntary and they are free to withdraw at any point. This study involves a level of deception as to the purpose of some of the events of the study, so participants will be told that the goal of the study is to learn more about the anxiety responses individuals experience when completing different tasks. The participants will be told that they will be fully debriefed following the study's completion. The researcher will share the potential benefits and costs of the study. Lastly, the confidentiality of the study and the data collected will be explained to participants. Participants will sign a form granting consent and have an opportunity to ask questions and share concerns before engaging in any part of the study.

Confidentiality

Within the informed consent, the participants will be made aware of the limits to confidentiality as well as the details of how the researcher will protect the confidentiality of any data collected during the study. To protect the confidentiality of the participants, the data collected will remain anonymous by the use of numerical codes rather than participant names.

Every piece of data collected will be de-identified and password protected by the researcher. The data will be stored through the completion of the study and for 3 years after the published results, as per best practice. After 3 years, the data will be destroyed.

Procedural Overview

The researcher will first obtain IRB approval to begin collecting data and schedule subjects for participation in this study (see Appendix A). This study will take place at a therapy clinic in the community. When participants arrive, the researcher will describe the study using deception. Participants will be told that the purpose of the study is to measure the psychological anxiety response after an easy task and a difficult task. The role of plants will not be disclosed and participants will not be told about the diaphragmatic breathing exercise at this time. After completing the informed consent, the researcher will ask participants to switch to a paper mask provided by the researcher in order to standardize the masks worn by participants. Next, participants will complete the Demographics Survey (see Appendix B) and the first time of the State Anxiety Scale (see Appendix C).

After the first time of the State Anxiety Scale, participants will complete a task that will be described to them as relatively easy, though it will be an unsolvable tangram puzzle. Participants will be told that it typically takes people about five minutes to complete the puzzle. After five minutes pass, the researcher will provide an additional two minutes to complete the task. When they are not able to complete the task, the researcher will tell the participants to complete the second time of the State Anxiety Scale anyway.

Participants will next be told that, because they were not able to complete the first task, they cannot continue to the second, more difficult task, but there is an alternative task they can complete instead. They will be brought into a different room, which will be set up as either the

green condition or the non-green condition. In this room, participants will complete the diaphragmatic breathing exercise and the final time of the State Anxiety Scale. Next, the participants will complete the Nature-Relatedness Scale-6 (see Appendix D).

Finally, the participants will be debriefed on the experience and the deception will be identified. The researcher will clearly explain the impossibility of the puzzle, the study's purpose to investigate the ability of plants to decrease anxiety and increase the effectiveness of anxiety-reducing interventions, and the purpose of completing the Nature Relatedness Scale to understand if one's connection to nature impacts the effect it has on reducing anxiety. After the debrief, participants will be offered additional time in the green room with facilitation of diaphragmatic breathing by the researcher if needed to further de-escalate anxiety, as well as low-cost therapy services through the clinic where the study will take place.

Measures

The researcher was interested in collecting data on a psychological anxiety response. The researcher utilized the State Anxiety Scale to do so. To measure nature-relatedness, the researcher implemented the NR-6, a short-form version of the Nature-Relatedness Scale. Due to this maintained reliability and validity of the shortened versions of these scales as well as the quantity of measures participants will complete during the study, the shortened versions will be used to lessen the burden on the participant during the study.

State-Trait Anxiety Inventory

The State-Trait Anxiety Inventory is a tool used to measure the self-reported presence and severity of current symptoms of anxiety as well as the tendency to be anxious (Julian, 2011). Within this measure, there are two subscales, the Trait Anxiety Scale (T-Anxiety) that measures

the more stable tendency of individuals to be anxious, and the State Anxiety Scale (S-Anxiety) which measures the individual's current state of anxiety (Julian, 2011). This study will utilize the State Anxiety Scale.

State Anxiety Scale (S-Anxiety)

The S-Anxiety scale contains 20 items that assess for the severity of current feelings of anxiety on a scale of one to four, one indicating not at all, two indicating somewhat, three indicating moderately, and four indicating very much so (Julian, 2011). A shortened version of this scale has been developed that contains only six items and maintains favorable internal consistency reliability and validity from the full 20-item scale (Tluczek, Henriques, & Brown, 2009). This short form for both the State Anxiety Scale and Trait Anxiety Scale have Cronbach alphas that range from 0.743 to 0.824. In the present study, the State Anxiety Scale would demonstrate acceptable reliability at time points 2 and 3 ($\alpha=0.793$; $\alpha=0.786$). The measure would not demonstrate acceptable reliability at time 1 ($\alpha=0.596$). The six items on this shortened version of the scale include items one, three, six, 15, 16, and 17 from the original scale, which reference statements such as "I feel calm," "I am relaxed," and "I am worried" (Tluczek, Henriques, & Brown, 2009). Please see Appendix C for the complete shortened version of the S-Anxiety scale that will be administered to participants during the prospective study.

Nature-Relatedness Scale-6

As the researcher of this study is interested in how one's connection to nature may impact the relationship between green space and anxiety reduction, it is important for the researcher to also collect data on participants' feelings toward and relationship with nature. To accomplish this, a short-form version of the Nature-Relatedness Scale, which assesses subjective

connectedness to nature, will be administered (Nisbet & Zelenski, 2013). This short-form version is called the NR-6 and has a Cronbach alpha of 0.88. In the present study, the NR-6 would also demonstrate acceptable reliability ($\alpha = 0.777$). It consists of six statements that assess the individual's relation to nature by asking them to scale how strongly they agree with each statement on a scale of one to five, one indicating strong disagreement and five indicating strong agreement. The statements on the scale include "I always think about how my actions affect the environment" and "I feel very connected to all living things and the earth" (Nisbet & Zelenski, 2013). Please see Appendix D for the complete scale. This version of the scale has demonstrated good internal consistency and temporal stability and maintained the reliability and validity of the full version (Nisbet & Zelenski, 2013).

Data Analysis

The following section describes the data analyses that will be run for the present study. The researcher will first describe the variables of this study considering the measures being taken and the study's design. Then, the researcher will describe the analyses to be run after data collection is complete.

Variables

The study will compare self-report psychological anxiety responses in a "green" and "non-green" environment. The independent variable will be the presence or absence of green elements, which will be coded as a nominal variable. The dependent variable will be the psychological anxiety response as measured by the State Anxiety Scale; this will be coded as an interval variable. Another variable of interest is the effect of nature-relatedness on responses in the "green" environment. This will be coded as an interval variable.

Analysis Plan

To analyze the data collected during the study, the researcher will utilize the statistical software SPSS, version 25.0. The researcher will perform several different tests to identify potential correlations and effects among the data collected. The researcher will run the frequencies of the demographic variables collected from the demographics survey to gain a better understanding of the social locations of participants and the ability for results to be generalized across populations.

From the data collected from the State Anxiety Scale at three time points and the Nature-Relatedness Scale-6 (NR-6), the researcher will complete the following descriptive statistics: means, standard deviations, variance, and skewness. The mean scale scores of the State Anxiety Scale at each time point will also be calculated in order to compare the means of participant scores at each time point and between the green and non-green conditions. The researcher will identify the Cronbach's alpha for the State Anxiety Scale and the NR-6 to identify the internal consistency of the measures in the study (Salkind & Frey, 2020).

The researcher will complete a series of correlations, identifying if the three time points of the mean scale scores of the State Anxiety Scale are correlated to each other, correlated to the scores on the NR-6, and correlated to the condition of the participant. The researcher will also complete a one-way-ANOVA and a repeated measures ANOVA in an attempt to identify differences between groups (Salkind & Frey, 2020). Lastly, the researcher will complete a series of linear regressions to identify if time points 1 and 2 of the State Anxiety Scale can predict scores at time point 3 with the condition of the participant as the selection variable.

Ethical Considerations

In this proposed study, there are several ethical considerations worth noting. This study will require approval by the International Review Board (IRB), as this research is interested in obtaining data from human subjects. Upon acceptance of this proposal by the researcher's thesis committee, the researcher will begin the process of obtaining IRB approval by completing the IRB research project application, preparing informed consent documentation, and making any necessary adjustments as per the IRB's request.

The researcher of this study will employ the use of deception and this complicates the informed consent process. The deception is minimal and is put in place to ensure adequate flooding of participants as they complete an "easy" (impossible) task. Participants will be fully debriefed following the closure of the experiment and the researcher will fully describe the purpose of the study, the impossible nature of the first task, the non-existence of a second, more difficult task, and the inevitability of reaching the diaphragmatic breathing exercise. Additionally, participants will be informed of the use of nature in this study. The experiment's design allows room for participants to soothe after the flooding experience through diaphragmatic breathing, which is an established intervention to decrease the anxiety response (Chen, Huang, Chien, & Cheng, 2017; Hopper, Murray, Ferrara, and Singleton, 2019; Kim, Roth, & Wolburg, 2015). Moreover, the researcher will offer additional time and space to de-escalate after the experiment and the option to pursue low-cost or free therapy as indicated. The flooding is intended to not have long-term consequences.

A final ethical consideration of this study regards the safety of research participants during COVID-19. Additional procedures will be put in place to ensure health safety for all participants. Participants will engage in the study individually and both researcher and

participant will wear a face mask for the duration of the study. Before starting the study, participants will have their temperature taken and complete a brief screener assessing for COVID-19 symptoms, recent travel, and potential exposure. The researcher and participant will maintain six feet distance. Before and after each participant, the researcher will wipe down all equipment used during the study's duration.

CHAPTER 4: MANUSCRIPT

“Green space,” a space that includes the addition of nature and plants, has demonstrated a capacity to improve mental health outcomes and decrease symptoms that are often seen in the therapy room (Wendelboe-Nelson et al., 2019). More specifically, green space has been used with the intention of decreasing anxiety and stress, two presenting problems that are particularly prevalent and have deleterious consequences (APA, 2013; Gallup, 2019). Moreover, those in the United States experience higher rates of clinical anxiety and stress levels; 55 percent of U.S. citizens report feeling stress during the day in comparison to the world average of thirty-five percent (Gallup, 2019). To manage this anxiety and stress, some individuals may engage in unhealthy coping strategies, such as increased use of substances, unhealthy exercise and eating habits, risky sexual behavior, and self-isolation (Anxiety and Depression Association of America, 2010-2020). Therefore, it is particularly important to investigate other potential coping strategies and tools that can be used to manage this anxiety in a more adaptive way.

This study was positioned within the theoretical framework of Bowen Family Systems Theory, which is particularly interested in the management of reactivity to chronic anxiety (Bowen, 1985). Chronic anxiety was the type of anxiety that is of interest in this study. While only a portion of the population experiences clinical anxiety, all people experience chronic anxiety (APA, 2013; Bowen, 1985). One’s response to chronic anxiety is often highly emotional and is similar to what Gottman defined as emotional “flooding” (Bowen, 1985; Ekman, 1984; Gottman, 1999). In managing this reactivity, one also increases their differentiation, which refers to one’s ability to externally differentiate themselves from others and internally differentiate emotions from thoughts. Managing reactivity to chronic anxiety through the implementation of coping strategies improves mental health and decreases distress (Bowen, 1985).

Study Justification

High anxiety and stress can lead to a host of negative consequences to physical and mental health, including restlessness, difficulty concentrating, irritability, muscle aches and soreness, nausea, sweating, excessive worrying, feeling out of control, shortness of breath, and negative affectivity (APA, 2013; Gallup, 2019; Stratakis & Chrousos, 1995). Anxiety can also interrupt sleep, negatively impact personal relationships, and impair occupational functioning (Korn Ferry, 2018). Given these consequences, it is important to investigate methods of managing anxiety and stress. Considering existing literature on the topic, we, the researchers, proposed that a green environment can help decrease our reactivity to chronic anxiety and increasing our management of symptoms.

We sought to fill a few important gaps in the existing literature connecting the natural world to mental health benefits. In Wendelboe-Nelson et al.'s literature review of 263 articles on this topic, only 24 of the reviewed articles were interested in virtual or indoor green space (2019). This study was particularly interested in the use of indoor green space, contributing to this gap in the literature. Moreover, of the 24 articles interested in virtual and indoor green space, only two studies had a research design of indoor exposure to green space (Wendelboe-Nelson et al., 2019). The present study was designed to have indoor exposure, contributing to this especially limited body of literature. Additionally, Wendelboe-Nelson et al.'s literature review found that the vast majority of the studies included qualitative research and 22 of the 263 articles were literature reviews (2019). We collected quantitative data on the impact of green space on perceived state anxiety, helping to close the gap in the literature for quantitative data.

The Purpose of the Study

We primarily sought to investigate the capacity for plants to reduce anxiety and increase the efficacy of anxiety-reducing interventions, such as diaphragmatic breathing. Considering that diaphragmatic breathing reduces anxiety and green space reduces anxiety, it may follow that diaphragmatic breathing in a green space has a compounded effect to reduce anxiety even further (Bang et al., 2017; Hopper et al., 2019; Lee et al., 2011). Additionally, we were interested in what role one's connection to nature may have in the ability of plants to reduce anxiety and increase the efficacy of anxiety-reducing interventions. It may be the case that, as is true of many interventions, client buy-in is very important (Gubbels et al., 2016). Perhaps those clients that feel closer to nature will see higher rates of anxiety reduction in an environment with natural elements such as plants. As therapists, we were interested in the potential for the low-cost addition of plants in the therapy room to lead to lower levels of anxiety and therefore to a more effective, faster, or more robust course of therapy.

Literature Review

Bowen Family Systems Theory

The theoretical framework of this study was Bowen Family Systems Theory, which was developed by Murray Bowen and has its roots in psychoanalytic and systems theory (Bowen, 1985). Bowen has two key concepts in his theory: differentiation and chronic anxiety. Briefly, differentiation refers to one's ability to exist in a balance of togetherness and autonomy: one can understand themselves as a unique individual existing in and valuing relationships (Bowen & Kerr, 1988). Higher differentiation is reflected by an ability to maintain one's sense of self and continue to manage one's emotions and thoughts in periods of high anxiety. Differentiation

exists within the context of anxiety and stress: it takes a stressful or anxious situation to see one's most accurate differentiation level (Bowen, 1985). One can appear to be highly differentiated, knowing themselves firmly from others and fluently distinguishing their thoughts from their emotions. However, when placed in an anxious situation, these same individuals may begin to reflect their more accurate differentiation level, becoming overly involved in relationships and emotional systems that do not pertain to them and experiencing difficulty understanding their thoughts from their emotions (Bowen, 1985).

Increasing differentiation and decreasing reactivity to chronic anxiety often exist conjointly, as increasing differentiation inherently lowers one's emotional reactivity to chronic anxiety and vice versa (Bowen, 1985). In reacting to chronic anxiety, individuals have an automatic and wholly emotional reaction devoid of the logic that would typically be influencing the reaction (Friedman, 1991). This reaction has a physiological effect as well and part of this reaction includes what Ekman (1984) would define as flooding. One task of the Bowenian therapist is to manage client reactivity to chronic anxiety in the room in order for the therapeutic process to continue; clients who are flooding will struggle more with communication and have more difficulty thinking logically and making connections (Bowen, 1985; Gottman, 1999). We were interested in the ability for green space to further manage the client's reactivity to felt chronic anxiety in the therapy room.

Green Interventions for Anxiety

The present study contributes to an already existing body of literature that seeks to connect green space and mental health and wellbeing outcomes. In Wendelboe-Nelson et al.'s literature review, 70 percent of the 263 studies reviewed contributed evidence to support a positive association between green space and improved mental health and wellbeing (2019).

Moreover, Wendelboe-Nelson et al. suggested that the benefits of green space can be experienced by different population subgroups (2019).

Lee et al. investigated the physiological and psychological effects of a forest green space on physiological and psychological anxiety experiences (2011). In the forest environment, participants (n=12) reported significantly higher activity of the parasympathetic nervous system, significantly lower pulse, and significantly lower levels of cortisol, indicating lower levels of anxiety and stress. Additionally, while in the forest environment, participants reported more feelings of comfort and refreshment, indicating perceived lower levels of anxiety (Lee et al., 2011). Not many therapists have access to a forest environment to complete therapy, but perhaps adding plants and natural elements to the therapy room can garner similar results and lower anxiety and reactivity.

Similarly, participants that engaged in a forest walking group alongside stress management courses scored higher on health-promoting behaviors, one of these being stress management (Bang et al., 2017). Regarding psychological health, and in agreement with other literature in the field, forest exposure led to higher activation of the parasympathetic nervous system, indicating a more relaxed state, and a decrease in depressive symptoms (Bang et al., 2017). It is important to note that, while walking is productive and has its own physical and psychological benefits, walking in the forest environment yields more benefits on mental health, potentially due to the lower levels of environmental stress that are unique to a greener environment (Richardson et al., 2008).

Away from the forest environment, Carrus et al. indicated that botanical gardens can provide psychological and physiological benefits as well as improvements to perceived subjective well-being (2017). Data collected from participants (n=127) indicated that the

perceived restorativeness of botanical gardens was significantly positively correlated with mental health benefits (Carrus et al., 2017). When a botanical garden is not available, environments can be “greened,” as was the case in the present study. In “greening” neighborhoods, there was a significant negative relationship between the number of trees and changes in depressive symptoms in adult participants (n=727), indicating that as trees increased, the number of depressive symptoms decreased (Gubbels et al., 2016). Of note, this relationship was mediated by the perceived improved quality of the space and perceived mental restfulness of green spaces (Gubbels et al., 2016). It may be important to have the client’s “buy-in” with green space to gain the benefits.

Anxiety

Thus far, anxiety has been referenced in different contexts: clinical anxiety and chronic anxiety. In the fifth edition of the Diagnostic and Statistical Manual (DSM-5), there is one section that focuses on clinical anxiety disorders (APA, 2013). These disorders are characterized by fear—the response to a real or perceived threat—and anxiety—the anticipation of that threat. In addition, these disorders cause distress. Though anxiety can be adaptive, the anxiety in these disorders is not adaptive and is by definition excessive and developmentally inappropriate (APA, 2013). Anxiety has become a word that is used relatively colloquially by those who may not necessarily meet the diagnostic criteria required for these diagnoses (Stiehl, 2017). In order to understand chronic anxiety that is experienced by all, it was important to describe the clinical anxiety that is experienced by a much smaller portion of the population, roughly 2.9 percent of the U.S. adult population and 0.9 percent of the U.S. adolescent population (APA, 2013).

Bowen’s chronic anxiety references a universal response to a threat, real or imagined (Bowen, 1985). Unlike clinical anxiety, this form of anxiety exists in all living things and, in

Bowen's view, a primary aim of therapy is to teach clients how to manage this anxiety rather than try to reduce the symptoms as would be the aim when treating clinical anxiety (Gehart, 2017). There is not a diagnosis tied to chronic anxiety and distress results from the impact of this form of anxiety (Bowen, 1985). As anxiety rises in the individual, their perception of their choices begins to decrease, and they may find themselves relying on previous experience rather than thought and consideration for how to move forward (Bowen, 1985).

This emotional response is similar to Ekman's concept of flooding that Gottman researched (Ekman, 1984; Gottman, 1999). Flooding can be defined as an experience where "one emotion or a set of emotions becomes so aversive and so prominent that it takes over the emotional world of the person" (Gottman, 1999, p. 73). This impacts ability to communicate effectively. Gottman used heart rate to physiologically measure flooding and indicated that 100 beats per minute, one's body starts to secrete epinephrine, which can activate the sympathetic nervous system and flight or fight response. Anxiety can be adaptive, and the fight or flight response is very useful when there is imminent danger (Morris, 2019). However, in a therapy room, it is no longer adaptive for clients to experience this physiological response. To manage flooding, one must learn to self-soothe (Gottman, 1999).

Therapy can be anxiety-inducing. To even enter a therapy room for a first session, a client has to have already conquered shame and stigma associated with mental health issues and, consequently, therapy (Watsford & Rickwood, 2014). Many clients only come to therapy after they have reached a point where they feel tired or hopeless about being able to find solutions to their problems (Patterson et al., 2018). The process of therapy can also feel covert and not very transparent, which can serve to increase anxiety, fear, and stress (Gelb, 2015). Clients may begin to flood in the therapy room as they discuss some of the most challenging emotions or

experiences of their lives. Therefore, it is incredibly important for therapists to have interventions and strategies at their disposal to manage flooding as it occurs to relieve distress and to continue with the therapeutic process (Gottman, 1999).

Treatments for Anxiety

There are several evidence-based methods for treating anxiety and stress responses, including Cognitive Behavioral Therapy (CBT), mindfulness, and diaphragmatic breathing as three notable existing strategies (Arch & Craske, 2008; Chen et al., 2017; Creswell, 2017; Hazlett-Stevens & Craske, 2009; Kim et al., 2015). CBT is a widely used and empirically validated therapeutic technique that has demonstrated long-term effectiveness in reducing anxiety symptoms by intervening in the negative cognitions that cause distress (Arch & Craske, 2008; DiMauro et al., 2013; Gehart, 2017). Green interventions and CBT interventions have successfully been combined in the past to reduce anxiety. A major intervention in CBT is psychoeducation, which was also a key intervention in Bang et al.'s study that provided stress management alongside forest walking (2017).

Mindfulness provides an approach that is particularly successful in managing situational anxiety by asking the person to increase awareness of their surroundings and themselves (Creswell, 2017; Zeidan et al., 2014). Similar to CBT, mindfulness and green interventions have often been used in combination (Lee et al., 2011). Forest bathing is inherently mindful, as it is defined as “taking in the forest atmosphere” (Lee et al., 2001, p. 94). It requires the participant to be present in the current moment and increase their awareness of their surroundings, which is the definition of mindfulness (Creswell, 2017).

Diaphragmatic breathing, which was of particular interest to this study, is particularly accessible and effective in reducing physiological and psychological stress (Chen et al., 2017; Hazlett-Stevens & Craske, 2009; Hopper et al., 2019; Kim et al., 2015). We were interested in the use of these anxiety-reducing interventions, namely diaphragmatic breathing, in a green space to increase their efficacy and capitalize on the benefits they provide. As demonstrated with mindfulness and CBT, anxiety-reducing interventions have been implemented alongside green interventions in the past; it is worth discovering more about this connection and how it can be used in a therapeutic context (Bang et al., 2017; Lee et al., 2011).

Methodology

To test the connection between green interventions and anxiety reduction, the present study utilized an experimental between-subjects design. In this section, we will identify the procedures of the study, the demographics of the participants who engaged in the study, the research questions, and the analyses run on the collected data.

Procedures

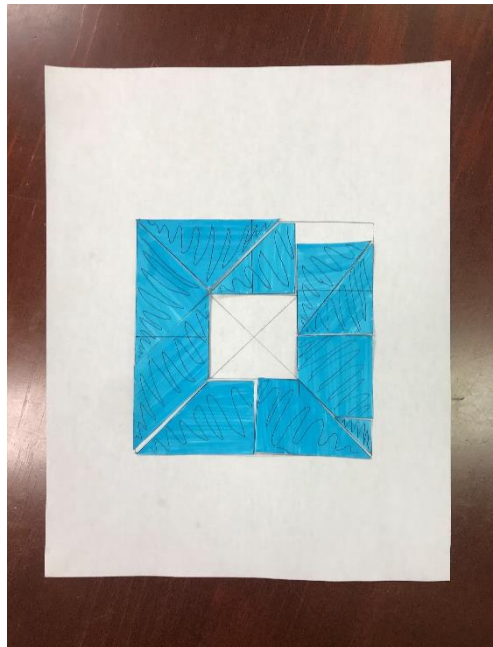
Participants arrived to the site of the study and were screened for COVID-19 symptoms, provided informed consent, and were asked to wear a paper mask in order to standardize the type of mask worn by participants. Participants completed a Demographics Survey (see Appendix B) and the first time of the shortened State Anxiety Scale (see Appendix C), which includes six items that assess for the severity of current feelings of anxiety on a scale of one to four, one indicating not at all and four indicating very much so (Julian, 2011). In previous literature, the State Anxiety Scale has demonstrated acceptable reliability, ranging from 0.743 to 0.824 (Tluczek, Henriques, & Brown, 2009). In the present study, the State Anxiety Scale taken at this

time did not demonstrate acceptable reliability ($\alpha=0.596$), which will be addressed in more detail later in this paper.

Next, participants completed a first task that was described to them as relatively easy, though it was in reality an unsolvable tangram puzzle (see Figure 1). When participants were unable to complete the task, they were prompted to complete the shortened State Anxiety Scale a second time. At the second time point, the State Anxiety Scale demonstrated acceptable reliability ($\alpha=0.793$).

Figure 1

“Completed” Tangram Puzzle



At this point in the study, participants were asked to step into a different room that contained one of two conditions. Nineteen participants completed the remainder of the study in the green condition, which included the presence of 11 non-flowering plants of varying types, while 17 participants completed the remainder of the study in the non-green condition, which did not include the presence of plants. In this room, participants completed a two-minute

diaphragmatic breathing exercise and the shortened State Anxiety Scale a third time. At this time point, the State Anxiety Scale demonstrated acceptable reliability ($\alpha=0.786$). Participants then completed the Nature-Relatedness Scale-6 (NR-6), which is a short-form version of the Nature-Relatedness Scale that assesses for subjective connectedness to nature and can be found in its entirety in Appendix D (Nisbet & Zelenski, 2013). In previous literature, the NR-6 has demonstrated acceptable reliability ($\alpha=0.88$; Nisbet & Zelenski, 2013). In the present study, it also demonstrated acceptable reliability ($\alpha= 0.777$). Participants were then fully debriefed on the experience and the deception.

Participants

This study’s sample included 36 participants. Participants were primarily recruited through undergraduate courses at a major university in the southeast of the United States. The sample included participants from a variety of social locations; participant demographics can be found below in Table 1. Data on gender, race, and age were collected to better understand the social locations of participants and identify potential generalizability of findings. Data on participant religion and climate region was collected to determine if there was a connection between one’s nature-relatedness and their spirituality or the climate region in which they had spent the most time in their life.

Table 1:
Participant Demographics

	Frequency	Percent
Gender		
<i>Female</i>	30	83.3
<i>Male</i>	6	16.7
Race		
<i>Black or African American</i>	11	30.6
<i>White</i>	20	55.6

Continued on page 41

	<i>More Than One Race</i>	5	13.9
Age			
	<i>18-24 years old</i>	33	91.7
	<i>25-34 years old</i>	2	5.6
	<i>35-44 years old</i>	1	2.8
Religion			
	<i>No Religion</i>	2	5.6
	<i>Christian</i>	28	77.8
	<i>Jewish</i>	1	2.8
	<i>Other</i>	3	8.3
	<i>Prefer Not to Specify</i>	2	5.6
Climate Region			
	<i>Tropical Regions</i>	1	2.8
	<i>Temperate Regions</i>	26	72.2
	<i>Dry Regions</i>	4	11.1
	<i>Cold Regions</i>	1	2.8
	<i>Prefer Not to Specify</i>	4	11.1

Research Questions and Hypotheses

RQ1) Is there a significant correlation between the presence of plants and the experience of psychological anxiety responses, as measured by the State Anxiety Scale?

H1) In conditions with plants, participants will report significantly lower scores on the State Anxiety Scale.

RQ2) Can plants increase the reduction of psychological anxiety seen after completing a diaphragmatic breathing exercise?

H2) In conditions with plants, after the diaphragmatic breathing exercise, participants will report psychological anxiety responses that reflect significantly lower anxiety than those seen in the non-plants condition after the breathing exercise.

RQ3) How does nature-relatedness impact the effect plants can have on anxiety response reduction?

H3) Due to limited research, we do not have an a priori hypothesis for how nature-relatedness will impact the relationship between plants and anxiety reduction.

Data Analysis

To analyze the data collected during the study, the researcher utilized the statistical software SPSS, version 25.0. The researcher performed several different tests in order to identify potential correlations and effects among the data collected. The researcher ran the frequencies of the demographic variables collected from the demographics survey to gain a better understanding of the social locations of participants and the ability for results to be generalized across populations.

From the data collected through the State Anxiety Scale at three time points and the Nature-Relatedness Scale-6 (NR-6), the researcher completed the following descriptive statistics: means, standard deviations, variance, and skewness. The mean scale scores of the State Anxiety Scale at each time point were also calculated in order to compare the means of participant scores at each time point and between the green and non-green conditions. The researcher identified Cronbach's alpha for the State Anxiety Scale and the NR-6 to identify the internal consistency of the measures in the study (Salkind & Frey, 2020).

The researcher completed a series of correlations, identifying if the three time points of the mean scale scores of the State Anxiety Scale were correlated to each other, correlated to the scores on the NR-6, and correlated to the condition of the participant. The researcher also completed a one-way-ANOVA and a repeated measures ANOVA in attempts to identify differences between groups (Salkind & Frey, 2020). Lastly, the researcher completed a series of

linear regressions to identify if time points 1 and 2 of the State Anxiety Scale could predict scores at time point 3 with the condition of the participant as the selection variable.

Results

We identified the mean scale score of the scales in the study, including the Shortened State Anxiety Scale at the three time points and the Nature-Relatedness Scale-6 (NR-6). On the State Anxiety Scale, higher scores indicated higher levels of relaxation and lower levels of anxiety. On average, participants entered the study at time point 1 reporting high feelings of relaxation ($M=3.49$; $SD=0.388$). When measured at time point 2 after the impossible task, feelings of relaxation were lower on average ($M=2.713$; $SD=0.659$) and rose again when measured at time point 3 after the diaphragmatic breathing exercise ($M=3.388$; $SD=0.500$). The mean scale score of the NR-6 was 3.537 ($SD=0.763$).

Table 2 contains a series of Pearson correlations that were run for the study variables. Pearson correlations indicated a positive relationship between the Mean State Anxiety Scale at time point 1 and time point 2 ($r=0.377$, $p<.05$) suggesting that time point 1 and time point 2 were correlated. Additionally, time point 1 was positively correlated to time point 3 ($r=0.333$, $p<.05$), and time point 2 is positively correlated to time point 3 ($r=0.793$, $p<.01$). All three time points of the State Anxiety Scale were correlated, suggesting that participants that were more anxious tended to stay more anxious. The Mean State Anxiety Scale at all three time points were not correlated to the Mean Nature Relatedness ($r=-0.320$, $p>.05$; $r=-0.095$, $p>.05$; $r=-0.003$, $p>.05$). The Mean State Anxiety Scale at all three time points was also not correlated to condition ($r=0.071$, $p>.05$; $r=0.033$, $p>.05$; $r=0.025$, $p>.05$) nor was Mean Nature-Relatedness ($r=-.133$, $p>.05$).

Table 2:
Correlations for Study Variables (n=36)

Variables	1	2	3	4	5
1. Mean State Anxiety Scale 1	--				
2. Mean State Anxiety Scale 2	.377*	--			
3. Mean State Anxiety Scale 3	.333*	.793**	--		
4. Mean Nature-Relatedness	-.320	-.095	-.003	--	
5. Condition	.071	.033	.025	-.133	--

Note. ** $p < .01$; * $p < .05$

ANOVAs

A one-way ANVOA was completed to identify differences between the State Anxiety Scale at its three time points with the condition as the factor. Table 3 below contains the results of the ANOVA. There were no significant differences between groups, $F(1, 35) = .174$, $p = .679$; $F(1, 35) = .036$, $p = .851$; $F(1, 35) = .006$, $p = .885$.

Table 3:
One-way ANOVA Results

Predictor	df	F	η	p
1. Mean State Anxiety Scale 1	1	.174	.027	.679
2. Mean State Anxiety Scale 2	1	.036	.016	.851
3. Mean State Anxiety Scale 3	1	.021	.006	.885

We ran a repeated measures ANOVA to better understand the differences between the State Anxiety scores at different points in the study between conditions. The repeated measures ANOVA determined that mean State Anxiety scores differed significantly between time points

($F(2, 70) = 46.744, p < 0.001$) and that there was a significant quadratic effect ($F(1, 35) = 91.013, p < .001$). Post hoc tests using the Bonferroni correction revealed that scores decreased significantly from time 1 to time 2 ($p < .001$), indicating that anxiety significantly increased after the first impossible task. Scores then increased significantly from time 2 to time 3 ($p < .001$), indicating that anxiety significantly decreased after the diaphragmatic breathing exercise. However, there was not a significant difference in the results between the green condition and non-green condition, indicating that all participants regardless of their condition experienced similar changes in scores.

Regressions

The mean scale scores of the Shortened State Anxiety Scale were also calculated according to the condition of participants. In the green condition ($n=19$), at time 1, the mean scale score was 3.464 ($SD=0.387$); at time 2, the mean scale score was 2.693 ($SD=0.616$); and at time 3, the mean scale score was 3.377 ($SD=0.470$). In the non-green condition ($n=17$), the mean scale score at time 1 was 3.519 ($SD=0.399$); at time 2, the mean scale score was 2.735 ($SD=0.721$); and at time 3, the mean scale score was 3.402 ($SD=0.546$).

A series of linear regressions were run to better understand the relationship between State Anxiety Scales at time point 1 and time point 2 on time point three, also considering the condition of the participant as the selection variable (see Table 4 & 5). The first two linear regressions looked at the relationship between the State Anxiety Scale at different time points in the green condition (see Table 4). The first linear regression looking at the relationship between the State Anxiety Scale at time point 1 and time point 3 in the green condition indicated a significant relationship ($F(1, 18) = 4.937, p < .05, R^2 = 0.225$). Scores at time point 1 predicted scores at time point 3. A second linear regression looking at the relationship between the State

Anxiety Scale at time point 2 and time point 3 in the green condition indicated a significant relationship ($F(1, 18)=32.141, p < .001, R^2 = 0.654$). Scores at time point 2 predicted scores at time point 3.

Table 4:
Regression Results for Time 1 and Time 2 on Time 3 in Green Condition

Variable	Time 1			Time 2		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
Constant	2.436	.200		1.714	.300	
State Anxiety Scale	.274	.346	.200*	.617	.109	0.809**
R^2	.225			.654		
<i>F</i> for change in R^2	.474*			.809**		

$p < .05^* p < .001^{**}$

The last two linear regressions looked at the relationship between the State Anxiety Scale at different time points in the non-green condition (See Table 5). The third linear regression looking at the relationship between the State Anxiety Scale at time point 1 and time point 3 in the non-green condition indicated a non-significant relationship ($F(1, 16) = 0.627, p = .441, R^2 = 0.040$). Scores at time point 1 did not predict scores at time point 3. A fourth and final linear regression looking at the relationship between the State Anxiety Scale at time point 2 and time point 3 indicated a significant relationship ($F(1, 16) = 23.198, p < .001, R^2 = 0.607$). Scores at time point 2 predicted scores at time point 3.

Table 5:
Regression Results for Time 1 and Time 2 on Time 3 in Non-Green Condition

Variable	Time 1			Time 2		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
Constant	2.436	1.227		1.788	.346	
State Anxiety Scale	.274	.346	.200	.590	.123	.779**
R^2	.040			.607		
<i>F</i> for change in R^2	.200			.779**		

$p < .05$ * $p < .001$ **

Discussion

The purpose of the current study was to investigate the capacity for plants to reduce anxiety and potentially increase the efficacy of anxiety-reducing interventions in the therapy room. More specifically, we wanted to answer the following research questions: 1) Is there a significant correlation between the presence of plants and the experience of psychological anxiety responses, as measured by the State Anxiety Scale? 2) Can plants increase the reduction of psychological anxiety seen after completing a diaphragmatic breathing exercise? and 3) How does nature-relatedness impact the effect plants can have on anxiety response reduction?

Previous literature in this field has identified that green interventions that include the presence of plants have been used in conjunction with other anxiety-reducing interventions and as stand-alone interventions that successfully reduce both psychological and physiological anxiety (Bang et al., 2017; Lee et al., 2011; Wendelboe-Nelson et al., 2019). There was a gap in the literature for experimental design, quantitative results, and studies that involve indoor

exposure to green space (Wendelboe-Nelson et al., 2019). This study includes all of these elements, seeking to fill those gaps. The results of this study contributed to a relatively novel and burgeoning field of literature, providing a greater understanding of how the natural world impacts us and our mental health and how therapists may be able to leverage these elements to improve client's management of anxiety and decrease their distress.

Based on the previous literature put forth by Lee et al. (2011) and Carrus et al. (2017) that demonstrated lower anxiety responses and higher rates of relaxation in green spaces, we hypothesized that participants in a green condition would report significantly lower anxiety scores on the State Anxiety Scale. All participants began the study in the same room, which did not include any plants. The exposure to natural elements occurred alongside the diaphragmatic breathing exercise, meaning that time 3 of the State Anxiety Scale was the time point where some participants had exposure to plants while others did not. On average, participants in the green condition tended to report less relaxation and more anxiety than those in the non-green condition at the beginning of the study, after the impossible task, and after the diaphragmatic breathing exercise, so it is possible that the participants in the green condition may have been more anxious overall in comparison to participants in the non-green condition. However, the scores on the State Anxiety Scales were not correlated to the condition, indicating that there is no relationship between anxiety scores and condition. Further, an ANOVA identified that there were no significant differences between groups by condition. We did not find evidence to support our first hypothesis that in conditions with plants, participants will report significantly lower scores on the State Anxiety Scale.

We also hypothesized that after the diaphragmatic breathing exercise, participants in the green condition would report significantly lower anxiety responses than those in the non-green

condition. This was based on the thought that an anxiety-reducing intervention's effectiveness could be increased in a green environment, as Bang et al (2017) demonstrated in their study in which a forest walking intervention was implemented alongside stress management psychoeducation. A repeated measures ANOVA identified that participants on average experienced a significant increase in anxiety after the impossible task and a significant decrease in anxiety after the diaphragmatic breathing. However, there was no significant difference between groups, indicating that there was not a significant difference in the decrease seen in the green condition in comparison to the non-green condition. This provides support for the efficacy of diaphragmatic breathing to reduce anxiety but does not provide support for our hypothesis that diaphragmatic breathing is significantly more effective when completed in a green environment.

A regression indicated that State Anxiety Scale scores at time 1 and time 2 were predictive of scores at time 3 in the green condition. In contrast, in the non-green condition, State Anxiety Scale scores at time 1 were not predictive of scores at time 3, while scores at time 2 were predictive of scores at time 3. The effect sizes were relatively large in the green condition, indicating that there may be some element to the green condition impacting scores, though it may not be what we were measuring using the State Anxiety Scale and does not contribute evidence to support our hypothesis.

We were curious about how one's relatedness to nature may impact the relationship between plants and anxiety reduction. Previous literature has identified that the perceived restorativeness of green elements mediates the relationship between the green elements and mental health outcomes (Carrus et al., 2017; Gubbels et al., 2016). Our findings suggested that mean scores on the State Anxiety Scale were not correlated to the mean score of the Nature-Relatedness. Additionally, nature-relatedness was not correlated to condition. This suggests that

there is not a significant relationship between one's connection to nature and reported anxiety. There was a negative relationship between the mean State Anxiety Scale at all three time points and the mean Nature-Relatedness score, indicating that, as nature-relatedness increased, reported feelings of relaxation decreased, though this is non-significant, indicating that in this sample, those with higher scores of nature-relatedness did not have lower anxiety.

Limitations

No study is without its limitations and ours is not an exception. It is important to reflect on the limitations of this study, as these limitations also provide future directions for this field of research and elements that could be adjusted in the search for a greater understanding of how the natural world impacts mental health. A first limitation to be mindful of is the low reliability demonstrated for the State Anxiety Scale at time 1 ($\alpha=0.596$). This may have impacted the results and the ability to make assumptions about the relationship between the scores on the State Anxiety Scale at each time point, the Nature-Relatedness Scale-6, or the condition of participants. On the topic of measures, within the scope of this study, we were able to collect self-report, subjective scores for anxiety through the State Anxiety Scale. It is possible that this method of data collection limited our ability to adequately answer our research questions. Future research should seek to learn more about the potential physiological anxiety responses seen in a green and non-green environment.

The sample of this study was diverse racially, with 55.6 percent of the sample identifying as White, 30.6 percent identifying as Black or African American, and 13.9 percent identifying as More Than One Race. This is a strength of this study and suggests generalizability. However, this sample was not particularly diverse on the social locations of gender, age, religion, and climate region. The majority of this sample identified as female, aged 18 to 24, Christian, and

reported that they spent most of their time in Temperate Regions. On these locations, the results are not generalizable. Future research should be interested in continuing to foster a diverse sample and better understand the impact plants can have on anxiety across social location.

The body of literature on green interventions is limited, and the research on indoor green interventions is even more limited, so this study still contributed to fill that gap (Wendelboe-Nelson et al., 2019). However, another limitation to consider is the limited exposure participants had to plants in this study. In the present study, participants were only in the green space for two minutes while completing the diaphragmatic breathing exercise before taking the State Anxiety Scale at time point 3. It is possible that this was not enough time to make an impact on participant anxiety and this could contribute to the finding that there were no differences between groups by condition. Additionally, the design of this study provides cross-sectional data, meaning that data was collected only at one point in time which can impact the data collected and should be interpreted cautiously. A last limitation to be aware of is the potential impact of observer/experimenter expectancy, as it was our belief a priori that green elements can decrease anxiety. Our expectancy to see this change could skew the data, as we may have subconsciously influenced participants to behave or interact in different ways based on our assumptions. This limitation impacts our ability to interpret the data.

Future Directions

Given the limitations of this study and the current novelty of the field on green therapy and interventions, there are many future directions for research to take to learn more about how the natural world impacts our mental health. As the field moves forward, we have some recommendations for future research. In contrast to the quantitative design of the present study, future research may be interested in mixed methods data collection, acquiring quantitative data

on the anxiety response experienced by participants as well as qualitative data by asking participants to self-report a few words they would associate with how they felt in the green or non-green condition or how they perceived the green or non-green condition. Additionally, we would recommend collecting quantitative physiological data as well as psychological data on the anxiety response to better understand the ability of green space to reduce anxiety. In Lee et al.'s study (2011), they identified that exposure to a green environment was connected to a decreased cortisol level and future research may attempt to replicate this finding, using cortisol, heart-rate variability, or pulse as measures of physiological anxiety.

In addition, future research may be interested in longer exposure to green space, both across time and at each time point of exposure. In the present study, participants were only exposed to the green space for two minutes, and this was also during a time where they were completing a diaphragmatic breathing exercise. It would be interesting to see what may change should participants have 15 minutes of exposure to green space rather than two minutes or if participants had weekly exposure to green space over the span of several months. Previous literature that saw changes in anxiety levels had longer exposure times (Bang et al., 2017; Lee et al., 2011). We are interested in finding the potential threshold of time needed to make an impact, as our research suggests that two minutes at a single time point is too little.

Future research should continue to be interested in collecting data from a diverse sample. Further, future research may be interested in how elements of social location may impact the ability of natural elements to decrease anxiety or provide mental health benefits. The concern of safety in natural spaces is particularly relevant. Marginalized genders and races are at risk of violence in some natural spaces, specifically women and Black people (Taylor, 2018; Wesely & Gaarder, 2004). This could potentially impact the perceived restorativeness of these spaces,

limiting one's ability to garner mental health benefits (Carrus et al., 2017; Gubbels et al., 2016). Future research should investigate potential differential anxiety experiences in a natural context by race, gender, and other identity categories. Moreover, future research should aim to foster more inclusive and safer outdoor spaces, increasing access to the natural world for all those who are interested.

Implications

In systems theory, the first axiom of communication is that one cannot not communicate (Watzlawick, Bavelas, & Jackson, 1967). It is our belief that all research that is conducted has something to communicate, regardless of significance or supported hypotheses. It is important to consider the implications the findings may have both for research and for application. First, we will consider the research implications and how the present study fits within current research and what it may suggest for future research. Then, we will discuss the clinical implications and the impact this study may have on the therapeutic process.

Research Implications

The research on the impact plants may have on our mental health is limited, but growing (Wendelboe-Nelson et al., 2019). We sought answers for the specific impact of plants on anxiety. While the findings of this study did not indicate a significant difference in anxiety or in the efficacy of anxiety-reducing interventions in a green space, that does not inherently mean that plants do not have an impact on anxiety or mental health or that the answer to our research questions is no. There was a greater reduction in feelings of anxiety in the green condition than in the non-green condition, though non-significant. It is important to note that this small change was evident after only two minutes of exposure, highlighting the importance of future research to

look at longer-term exposure and learn if this reduction could reach significance should participants have had exposure for a longer time period at one point or long-term exposure over time. The present study urges for further study and continued exploration.

It is particularly important to continue to study how the natural world impacts our mental health, especially considering the high scores participants in this sample reported on the Nature-Relatedness Scale-6. The mean scores were moderately high, indicating that, on average, participants enjoy nature and are interested in having proximity to nature. This was also seen in the study, as several participants expressed their belief that plants make them feel more relaxed after they were debriefed. Further, two participants in the non-green condition requested to see the green condition after being debriefed. Future research should further question not only how plants may have an impact, but what it is they are impacting. Though this study looked at anxiety, we wonder if perhaps plants impact some other influencing factor of our mental health, such as hope or optimism. Though the research questions were not supported, we still believe that plants are doing something—and we are interested in learning what that something could be.

Clinical Implications

The present study is situated within a body of literature that supports a connection between plants and mental health and well-being (Bang et al., 2017; Lee et al., 2011; Gubbels et al., 2016; Wendelboe-Nelson et al., 2019). Considering the moderately high mean scale scores on the Nature-Relatedness Scale-6, our study contributes that there may be client buy-in to green therapy interventions. Fostering a green environment in one's therapy room is relatively inexpensive with limited risk for consequences. The least it may be able to contribute is additional decoration to the therapy space that people feel drawn to. Several participants in the study commented that they enjoyed the appearance of the therapy room.

Should one be interested in developing their own green therapy room, there are several guidelines we would suggest based on the previous literature that impacted the set-up of the present study's green room. In the present study, there were a total of 11 non-flowering plants of varying sizes and types. We would suggest that green therapy rooms include a minimum of six plants, have a variety of types of plants, and include some flowering and some non-flowering plants. Previous literature has shown that the presence of six plants was related to lower anxiety (Chang & Chen, 2005). Previous literature has also suggested that diversity in the types of plants related to perceived lower stress and perceived attractiveness of the room (Carrus et al., 2017; Dijkstra et al., 2008). Additionally, some literature suggested that flowering plants promoted stress recovery (Kim & Mattson, 2002). This study did not include flowering plants and we are curious of how this may have impacted the study findings.

This study was interested in indoor green space, as therapy traditionally takes place indoors in the confidentiality of an office space. Therefore, that was the design of this study. However, much of the previous literature approached green space as a much more immersive experience, with participants engaging in a therapeutic or mindful activity in a forest space rather than in an indoor space with plants (Bang et al., 2017; Lee et al., 2011). If accessible, therapists should wonder how they may be able to engage in therapy in these more immersive green spaces. Perhaps rather than bringing natural elements inside, we should be going to those natural spaces to access the benefits they may be able to provide. We wonder about potential partnerships between therapists and gardeners, farmers, and biologists and the possibility of therapy offices in greenhouses. Issues of confidentiality and accessibility challenge this and we will need to be creative to identify potential solutions.

Conclusion

The present study was interested in Bowen's concept of chronic anxiety, which is a force in our world that is experienced by all (Bowen, 1985). The task at hand when considering chronic anxiety is not about eliminating our experience of anxiety, but rather increasing our ability to manage our reactivity to anxiety (Bowen, 1985). The present study sought to investigate the capacity of the natural world to aid in our management of this anxiety. While our findings do not provide evidence to support our hypotheses that plants can reduce anxiety or increase the efficacy of anxiety-reducing interventions, this paper contributes to a body of knowledge seeking to find more creative, authentic, and effective methods to manage anxiety and decrease distress. Future research should continue the search, coming closer to an understanding of what plants and the natural environment may have to offer our health and sense of well-being.

REFERENCES

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th edition). Washington, DC: American Psychiatric Publishing.
- American Psychiatric Association. (2015). *Stress in america: Paying with our health*.
<https://www.apa.org/news/press/releases/stress/2014/stress-report.pdf>.
- American Psychiatric Association. (2018, November). *Stress effects on the body*.
<https://www.apa.org/helpcenter/stress>.
- Anxiety and Depression Association of America. (2010-2020). *Highlights: Workplace stress & anxiety disorders survey*. Anxiety and depression association of america.
<https://adaa.org/workplace-stress-anxiety-disorders-survey>.
- Arch, J. J. & Craske, M. G. (2008). Acceptance and commitment therapy and cognitive behavioral therapy for anxiety disorder; Different treatments, similar mechanisms? *Clinical Psychology: Science and Practice*, 15(4), 263-279. doi: 10.1111/j.1468-2850.2008.00137.x.
- Bang, K., Lee, I., Kim, S., Lim, C. S., Joh, H., Park, B., & Song, M. K. (2017). The effects of a campus forest-walking program on undergraduate and graduate students' physical and psychological health. *International Journal of Environmental Research and Public Health*, 14(7), 728. doi:10.3390/ijerph14070728.
- Bowen, M. (1985). *Family therapy in clinical practice*. New York: Jason Aronson.
- Bowen, M., & Kerr, M. E. (1988). *Family evaluation*. WW Norton & Company.

- Carrus, G., Scopelliti, M., Panno, A., Laforteza, R., Colangelo, G., Pirchio, S., ... Sanesi, G. (2017). A Different Way to Stay in Touch with “Urban Nature”: The Perceived Restorative Qualities of Botanical Gardens. *Frontiers in Psychology*, 8. doi:10.3389/fpsyg.2017.00914.
- Chang, C.-Y., & Chen, P.-K. (2005). Human responses to window views and indoor plants in the workplace. *HortScience*, 40, 1354–1359.
- Chen, Y., Huang, X., Chien, C., & Cheng, J. (2017). The effectiveness of a diaphragmatic breathing relaxation training for reducing anxiety. *Perspectives in Psychiatric Care*, 53(4), 329-336. doi: 10.1111/ppc.12184.
- Creswell, J. D. (2017). Mindfulness Interventions. *Annual Review of Psychology*, 68, 491-516. doi: 10.1146/annurev-psych-042716-051139.
- Diaphragmatic Breathing Exercises & Techniques. (2018). Retrieved 2020, from <https://my.clevelandclinic.org/health/articles/9445-diaphragmatic-breathing>.
- Dijkstra, K., Pieterse, M. E., & Pruyn, A. (2008). Stress-reducing effects of indoor plants in the built healthcare environment: the mediating role of perceived attractiveness. *Preventive Medicine*.
- DiMauro, J., Domingues, J., Fernandez, G., & Tolin, D. F. (2013). Long-term effectiveness of cbt for anxiety disorders in an adult outpatient clinic sample: A follow-up study. *Behaviour Research and Therapy*, 51(2), 82-86. doi: 10.1016/j.brat.2012.10.003.

- Ekman, P. (1984). Expression and the nature of emotion. In K. R. Scherer & P. Ekman (Eds.), *Approaches to emotion* (pp. 319-344). Hillsdale, NJ: Lawrence Erlbaum Associates Press.
- Friedman, E. H. (1991). Bowen theory and therapy. In A. S. Gurman & D. P. Kniskern (Eds.), *Handbook of family therapy* (vol. 2, pp. 134-170). Philadelphia, PA: Brunner/Mazel.
- Gallup. (2019). *Gallup 2019 global emotions report*.
<https://www.gallup.com/analytics/248906/gallup-global-emotions-report-2019.aspx>.
- Gehart, D. (2017). *Mastering competencies in family therapy: A practical approach to theories and clinical case documentation*. (3rd ed.). Belmont, CA: Brooks/Cole.
- Gelb, S. (2015, December 5). *What really happens in a therapy session*. Psychology Today.
<https://www.psychologytoday.com/us/blog/all-grown/201512/what-really-happens-in-therapy-session>.
- Gottman, J. M. (1999). *The marriage clinic: A scientifically based marital therapy*. New York: Norton.
- Gubbels, J. S., Kremers, S. P. J., Droomers, M., Hoefnagels, C., Stronks, K., Hosman, C., & de Vries, S. (2016). *The impact of greenery on physical activity and mental health of adolescent and adult residents of deprived neighborhoods: A longitudinal study*. *Health & Place, 40*, 153–160. doi:10.1016/j.healthplace.2016.06.002.
- Hazlett-Stevens, H., & Craske, M. G. (2009). Breathing retraining and diaphragmatic breathing techniques. In O’Donohue, W. T. & Fisher, J.E. (Eds.), *General principles and*

empirically supported techniques of cognitive behavior therapy (pp. 166-173). John Wiley & Sons, Inc.

Hopper, S. I., Murray, S. L., Ferrara, L. R., & Singleton, J. K. (2019). Effectiveness of diaphragmatic breathing for reducing physiological and psychological stress in adults: A quantitative systemic review. *JBIS Database of Systemic Reviews and Implementation Reports*, 17(9), 1855-1876. doi: 10.11124/JBISRIR-2017-003848.

Jensen, J. F., Fish, M. T., Blocker, D., Collins, M., Brown, B., & Kose, O. (2018). Psychophysiological arousal while discussing romantic challenges with partner and friends. *The American Journal of Family Therapy*, 46(3), 213-226. doi: 10.1080/01926187.2018.1493957.

Julian, L. J. (2011). Measures of anxiety: State-trait anxiety inventory (STAI), beck anxiety inventory (BAI), and hospital anxiety and depression scale-anxiety (HADS-A). *Arthritis Care & Research* (2010), 63(S11), S467-S472. doi:10.1002/acr.20561.

Kim, E., & Mattson, R. H. (2002). Stress recovery effects of viewing red-flowering geraniums. *Journal of Therapeutic Horticulture*, 13, 4–12.

Kim, S., Roth, W. T., & Wollburg, E. (2015). Effects of therapeutic relationship, expectancy, and credibility in breathing therapies for anxiety. *Bulletin of Menninger Clinic*, 79(2), 116–130. doi:10.1521/bumc.2015.79.2.116.

Korn Ferry. (2018, November). *Workplace stress continues to mount*. Retrieved October 20, 2020, from <https://www.kornferry.com/insights/articles/workplace-stress-motivation>.

- Lee, J., Park, B. J., Tsunetsugu, Y., Ohira, T., Kagawa, T., & Miyazaki, Y. (2011). Effect of forest bathing on physiological and psychological responses in young Japanese male subjects. *Public Health, 125*(2), 93-100. doi: <https://doi.org/10.1016/j.puhe.2010.09.005>.
- Morris, D. W. (2019). Adaptive affect: The nature of anxiety and depression. *Neuropsychiatric Disease and Treatment, 15*, 3323-3326. doi: [10.2147/NDT.S230491](https://doi.org/10.2147/NDT.S230491).
- Nisbet, E. K., & Zelenski, J. M. (2013). The nr-6: A new brief measure of nature relatedness. *Frontiers in Psychology, 4*, 813. doi: [10.3389/fpsyg.2013.00813](https://doi.org/10.3389/fpsyg.2013.00813).
- Patterson, J., Williams, L., Edwards, T. M., Chamow, L., & Grauf-Grounds, C. (2018). *Essential skills in family therapy: From the first interview to termination* (3rd). New York: The Guilford Press.
- Pittig, A., Arch, J. J., Lam, C. W. R., Craske, M. G. (2013). Heart rate and heart rate variability in panic, social anxiety, obsessive-compulsive, and generalized anxiety disorders at baseline and in response to relaxation and hyperventilation. *International Journal of Psychophysiology, 87*(1), 19-27. doi: [10.1016/j.ijpsycho.2012.10.012](https://doi.org/10.1016/j.ijpsycho.2012.10.012).
- Richardson C.R., Newton T.L., Abraham J.J., Sen A., Jimbo M., Swartz A.M. (2008). A meta-analysis of pedometer-based walking interventions and weight loss. *Annals of Family Medicine, 6*(1), 69-77.
- Salkind, N. J. & Frey, B. B. (2020). *Statistics for people who (think they) hate statistics* (7th edition). SAGE Publications. ISBN: 1544381859.
- Stiehl, C. (2017, November 8). *Stop confusing your nerves with having anxiety*. VICE. <https://www.vice.com/en/article/bjgeg4/stop-confusing-your-nerves-with-having-anxiety>.

- Stratakis, C. A. & Chrousos, G. P. (1995). Neuroendocrinology and pathophysiology of the stress system. *Annals of the New York Academic of Sciences*, 771, 1-18. doi: 10.1111/j.1749-6632.1995.tb44666.x.
- Strauss, C., Cavanagh, K., Oliver, A., & Pettman, D. (2014). Mindfulness-based interventions for people diagnosed with a current episode of an anxiety or depressive disorder: A meta-analysis of randomised controlled trials, *PLOS ONE*, 9(4), e96110.
- Taylor, D. E. (2018). Racial and ethnic differences in connectedness to nature and landscape preferences among college students. *Environmental Justice*, 11 (3), 118-136. doi: <https://doi.org/10.1089/env.2017.0040>.
- Gluczek, A., Henriques, J. B., Brown, R. L. (2009). Support for the reliability and validity of a six-item state anxiety scale derived from the state-trait anxiety inventory. *Journal of Nursing Measurement*, 17(1), 19-28. doi: 10.1891/1061-3749.17.1.19.
- Watsford, C. & Rickwood, D. (2014). Young people's expectations, preferences, and experiences of therapy: Effects on clinical outcome, service use, and help-seeking intentions. *Clinical Psychologist*, 18(1). doi: <https://doi.org/10.1111/cp.12034>.
- Watzlawick, P., Bavelas, J. B., Jackson, D. D. (1967) Some tentative axioms of communication. In P. Watzlawick, J.B. Bavelas, & D.D. Jackson, *Pragmatics of Human Connection* (pp. 48-71) New York and London: WW Norton & Co.
- Wendelboe-Nelson, C., Kelly, S., Kennedy, M., & Cherrie, J. (2019). A scoping review mapping research on green space and associated mental health benefits. *International Journal of Environmental Research and Public Health*, 16(12), 2081. doi:10.3390/ijerph16122081.

Wesely, J. K. & Gaarder, E. (2004). The gendered “nature” of the urban outdoors: Women negotiating fear of violence. *Gender and Society, 18*(5), 645-663.

Zeidan, F. Martucci, K. T., Kraft, R. A., McHaffie, J. G., & Coghill, R. C. (2014). Neural correlates of mindfulness meditation-related anxiety relief. *Social Cognitive and Affective Neuroscience, 9*(6), 751-759. doi: 10.1093/scan/nst041.

APPENDIX A: IRB APPROVAL



EAST CAROLINA UNIVERSITY

University & Medical Center Institutional Review Board

4N-64 Brody Medical Sciences Building · Mail Stop 682

600 Moye Boulevard · Greenville, NC 27834

Office 252-744-2914 · Fax 252-744-2284 · rede.ecu.edu/umcirb/

Notification of Initial Approval: Expedited

From: Social/Behavioral IRB

To: [Angelica Ford](#)

CC: [Damon Rappleyea](#)

Date: 1/28/2021

Re: [UMCIRB 20-002737](#)

Greening Therapy

I am pleased to inform you that your Expedited Application was approved. Approval of the study and any consent form(s) occurred on 1/28/2021. The research study is eligible for review under expedited category # 4,7. The Chairperson (or designee) deemed this study no more than minimal risk.

As the Principal Investigator you are explicitly responsible for the conduct of all aspects of this study and must adhere to all reporting requirements for the study. Your responsibilities include but are not limited to:

1. Ensuring changes to the approved research (including the UMCIRB approved consent document) are initiated only after UMCIRB review and approval except when necessary to eliminate an apparent immediate hazard to the participant. All changes (e.g. a change in procedure, number of participants, personnel, study locations, new recruitment materials, study instruments, etc.) must be prospectively reviewed and approved by the UMCIRB before they are implemented;
2. Where informed consent has not been waived by the UMCIRB, ensuring that only valid versions of the UMCIRB approved, date-stamped informed consent document(s) are used for obtaining informed consent (consent documents with the IRB approval date stamp are found under the Documents tab in the ePIRATE study workspace);
3. Promptly reporting to the UMCIRB all unanticipated problems involving risks to participants and others;

4. Submission of a final report application to the UMICRB prior to the expected end date provided in the IRB application in order to document human research activity has ended and to provide a timepoint in which to base document retention; and

5. Submission of an amendment to extend the expected end date if the study is not expected to be completed by that date. The amendment should be submitted 30 days prior to the UMCIRB approved expected end date or as soon as the Investigator is aware that the study will not be completed by that date.

The approval includes the following items:

Name	Description
Debriefing Statement v.2	Debriefing Statement
Demographic Survey	Surveys and Questionnaires
Informed Consent Form v.2	Consent Forms
Nature-Relatedness Scale-6 (NR-6)	Surveys and Questionnaires
Recruitment Email	Recruitment Documents/Scripts
Research Project Proposal	Study Protocol or Grant Application
Shortened State Anxiety Scale	Surveys and Questionnaires

For research studies where a waiver or alteration of HIPAA Authorization has been approved, the IRB states that each of the waiver criteria in 45 CFR 164.512(i)(1)(i)(A) and (2)(i) through (v) have been met. Additionally, the elements of PHI to be collected as described in items 1 and 2 of the Application for Waiver of Authorization have been determined to be the minimal necessary for the specified research.

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

APPENDIX B: DEMOGRAPHICS SURVEY

1. Age: What is your age
 - a. 18-24
 - b. 25-34
 - c. 35-44
 - d. 45-54
 - e. 55-64
 - f. 65 and older
 - g. Prefer Not to Specify
2. Gender: What is your gender?
 - a. Female
 - b. Male
 - c. Non-Binary
 - d. Other: _____
 - e. Prefer Not to Specify
3. Race: What do you consider your race to be? Please choose all that apply:
 - a. American Indian/Alaskan Native
 - b. Asian
 - c. Black or African American
 - d. Native Hawaiian/Other Pacific Islander
 - e. White
 - f. More Than One Race
 - g. Unknown
 - h. Other: _____
 - i. Prefer Not to Specify
4. Religion: What is your religious identity?
 - a. No religion
 - b. Buddhist
 - c. Christian
 - d. Hindu
 - e. Jewish
 - f. Muslim
 - g. Other: _____
 - h. Prefer Not to Specify
5. How would you describe the climate region in which you have spent the most time living?
 - a. Tropical Regions
 - b. Temperate Regions
 - c. Polar Regions
 - d. Dry Regions
 - e. Cold Regions
 - f. Prefer Not to Specify

APPENDIX C: SHORTENED STATE ANXIETY SCALE

Instructions: Read each statement and select the appropriate response to indicate how you feel right now, that is, at this very moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

1. I feel calm.
2. I feel tense.
3. I feel upset.
4. I am relaxed.
5. I feel content.
6. I am worried.

APPENDIX D: NATURE-RELATEDNESS SCALE-6 (NR-6)

Instructions: For each of the following, please rate the extent to which you agree with each statement, using the scale from 1 to 5 as shown below. Please respond as you really feel, rather than how you think “most people” feel.

1. My ideal vacation spot would be a remote, wilderness area.
2. I always think about how my actions affect the environment.
3. My connection to nature and the environment is a part of my spirituality.
4. I take notice of wildlife wherever I am.
5. My relationship to nature is an important part of who I am.
6. I feel very connected to all living things and the earth.

APPENDIX E: INFORMED CONSENT



Informed Consent to Participate in Research Information to consider before taking part in research that has no more than minimal risk.

Title of Research Study: Greening Therapy: The Impact of Green Elements on Efficacy of Anxiety-Reducing Interventions

Principal Investigator: Angelica Ford (Person in Charge of this Study)
Institution, Department or Division: Department of Human Development and Family Science
Address: 1000 E 5th St, Greenville, NC 27858 (Rivers 108)
Telephone #: 252-737-2416
Study Coordinator: Not applicable
Telephone #: Not applicable

Researchers at East Carolina University (ECU) study issues related to society, health problems, environmental problems, behavior problems and the human condition. To do this, we need the help of volunteers who are willing to take part in research.

Why am I being invited to take part in this research?

The purpose of this research is to learn more about how anxiety affects us physically and mentally when we are completing tasks of different difficulty levels. You are being invited to take part in this research because you are a healthy adult (over age 18) volunteer. The decision to take part in this research is yours to make. By doing this research, we hope to learn if there are differences in your anxiety level while completing different tasks.

If you volunteer to take part in this research, you will be one of about 40 people to do so.

Are there reasons I should not take part in this research?

I understand I should not volunteer for this study if I am under 18 years of age, I am not able to give my consent, or I am not able to climb one flight of stairs. I understand that I should not volunteer for this study if I am experiencing symptoms of COVID-19 during the time of my participation, I have travelled by plane or to a high-risk area in the 5 days leading up to my participation, or if I know I have been exposed to someone who is suspected or who has COVID-19 before my participation.

What other choices do I have if I do not take part in this research?

You can choose not to participate. If you are a student at ECU in Dr. Damon Rappleyea's course, there are other options you can take part in to receive the same amount of extra credit as this option.

Where is the research going to take place and how long will it last?

The research will be conducted at the ECU Marriage and Family Therapy Clinic. You will need to come to the entrance at the back of the building and ring the doorbell one time during the study. The total amount of time you will be asked to volunteer for this study is 30 minutes over the next 3 months.

What will I be asked to do?

You will be asked to do the following: Throughout the course of this study, you will be asked to complete two tasks of different difficulty levels and complete a few surveys. At the start of the study, you will be asked to complete a demographics survey and another short survey called the State Anxiety Scale that measures your current feelings of anxiety. After taking these first measures, you will be asked to complete the first task. I will then ask you to complete the Shortened State Anxiety Scale again. You will then move to the second task. After this task, I will ask you to complete the Shortened State Anxiety Scale one last time. I will also ask you to complete one more brief survey that asks for information about your interests. You do not need to complete anything prior to your participation in the study.

What might I experience if I take part in the research?

We don't know of any risks (the chance of harm) associated with this research. Any risks that may occur with this research are no more than what you would experience in everyday life. We don't know if you will benefit from taking part in this study. There may not be any personal benefit to you, but the information gained by doing this research may help others in the future.

Will I be paid for taking part in this research?

We will not be able to pay you for the time you volunteer while being in this study.

Will it cost me to take part in this research?

It will not cost you any money to be part of the research.

Who will know that I took part in this research and learn personal information about me?

ECU and the people and organizations listed below may know that you took part in this research and may see information about you that is normally kept private. With your permission, these people may use your private information to do this research:

- Any agency of the federal, state, or local government that regulates human research. This includes the Department of Health and Human Services (DHHS), the North Carolina Department of Health, and the Office for Human Research Protections.
- The University & Medical Center Institutional Review Board (UMCIRB) and its staff have responsibility for overseeing your welfare during this research and may need to see research records that identify you.

How will you keep the information you collect about me secure? How long will you keep it?

Any information collected from you during this study will be de-identified, meaning that your name or other identifying factors will not be connected to the information. I will assign a number to your information instead. The de-identified information that I will collect will be kept in a secure file that is specifically for protecting research data. This will be kept for 3 years and then destroyed (in 2024). Any de-identified electronic data will be stored on a password-protected laptop. This will be removed from the password-protected laptop after the completion of the study (by August 2021).

What if I decide I don't want to continue in this research?

You can stop at any time after it has already started. There will be no consequences if you stop and you will not be criticized. You will not lose any benefits that you normally receive. If you are a student in Dr. Damon Rappleyea's course, you will receive 10 extra credit points for your participation.

Who should I contact if I have questions?

The people conducting this study will be able to answer any questions concerning this research, now or in the future. You may contact the Principal Investigator at 252-737-2416 (weekdays, between 9 AM to 5 PM).

If you have questions about your rights as someone taking part in research, you may call the University & Medical Center Institutional Review Board (UMCIRB) at phone number 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, you may call the Director for Human Research Protections, at 252-744-2914.

Is there anything else I should know?

Any additional information you provide about yourself will be confidential, meaning that it will not be shared with anyone else besides me. However, there are a few limits to this confidentiality that you should know about. I will have an ethical obligation to break confidentiality and make a report to the necessary entity if you share with me any situations of abuse or neglect to a child, an elderly person, or a person with a disability. Additionally, I will need to break confidentiality if you share with me that you are at risk for harming yourself or another.

If you are interested in learning the results of this research study, you can provide your email address and consent to receiving an email from me that will include these results. This is completely voluntary and there is no consequence for not providing your email or for not providing your consent to receive this email with the results of the study.

I have decided I want to take part in this research. What should I do now?

The person obtaining informed consent will ask you to read the following and if you agree, you should sign this form:

- I have read (or had read to me) all of the above information.
- I have had an opportunity to ask questions about things in this research I did not understand and have received satisfactory answers.
- I know that I can stop taking part in this study at any time.
- By signing this informed consent form, I am not giving up any of my rights.
- I have been given a copy of this consent document, and it is mine to keep.

Participant's Name (PRINT)

Signature

Date

Person Obtaining Informed Consent: I have conducted the initial informed consent process. I have orally reviewed the contents of the consent document with the person who has signed above, and answered all of the person’s questions about the research.

Person Obtaining Consent (PRINT)

Signature

Date

