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The mental health crisis across college campuses is accelerating, with anxiety listed as the top mental health issue for undergraduate college students (Center for Collegiate Health, 2021). The COVID-19 pandemic sent universities into disarray, with students experiencing an increase in perceived stress and anxiety (Hoyt et al., 2021; Lee et al., 2021; Nguyen et al., 2021). College counseling centers, often under resourced (Lipson et al., 2019), must adapt to serve their community ripe with mental health concerns, with Mindfulness Based Interventions (MBIs) a tool at their disposal. Although evidence supports the benefits of group MBIs to reduce stress and anxiety for college students (Hazlett-Stevens & Oren, 2017; Levin et al., 2017; Lothes II et al., 2021), group counseling services were impacted by the COVID-19 pandemic, with students asked to leave campus and refrain from social gatherings, with one exception, outdoors in nature. Exposure to nature contributes to positive mental health outcomes (Howell et al., 2011; Howell & Passmore, 2013; Lackey et al., 2021), specifically for college students (Foellmer et al., 2021; McFarland et al., 2008). With both exposure to nature and mindfulness practices effective in reducing symptoms of anxiety, nature-based mindfulness may enhance mindfulness practice and improve well-being (Albrecht & Albrecht, 2019; Van Gordon et al., 2018).

Brief nature-based mindfulness interventions appear beneficial to college student mental health and mood (Ibes & Forestell, 2022; Ibes et al., 2018; Nisbet et al., 2019; Owens & Bunce, 2022a). However, a major flaw in the nature-based mindfulness literature is the lack of articulating the integration of nature and mindfulness in the intervention design which is vital given the reciprocal relationship between mindfulness and natural environments (Van Gordon et al., 2018). The author integrated the core components of Mindfulness (i.e., *Attention, Intention,*

and Attitude; Shapiro et al., 2006) and Attention Restoration Theory (ART; i.e., *Being Away, Extent, Soft Fascination, and Compatibility*; Kaplan & Kaplan, 1989) into the Nature-Based Mindfulness Training intervention aimed to improve mindfulness and reduce anxiety.

The author explored the impact of a newly created 90-minute psychoeducational group intervention, NBMT, for college students experiencing anxiety. Using a quantitative, two-group quasi-experimental switching replication with treatment removal design, the author explored the impact of the intervention on college student anxiety and mindfulness scores when compared to a control/delayed intervention group. Secondary research questions explored the relationship between level of engagement and anxiety change scores. While the study results indicated nonsignificant results in reducing anxiety for participants in the intervention group ($n = 20$) when compared to a control group ($n = 19$), the effect size was between small and moderate. NBMT appears to impact total mindfulness scores and *Observing* subscale scores as the results were statistically significant. Although a small positive correlation was found between engagement and anxiety scores, the results should be interpreted with caution as they were not statistically significant. The results from this study are just a first step to providing accessible nature-based interventions to college students and others seeking relief from stress, anxiety, depression, and a host of mental health concerns rampant in our society. The small decrease in anxiety and increases in mindfulness provide hope that NBMT can help improve mental health and pave the path for researchers to development nature-based mindfulness interventions to improve population health.

NATURALLY MINDFUL: PILOTING NATURE-BASED MINDFULNESS TRAINING
FOR COLLEGE STUDENTS WITH ANXIETY

by

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DEDICATION

“Be yourself. Especially do not feign affection. Neither be cynical about love; for in the face of all aridity and disenchantment, it is as perennial as the grass.

Take kindly the counsel of the years, gracefully surrendering the things of youth.

Nurture strength of spirit to shield you in sudden misfortune. But do not distress yourself with dark imaginings. Many fears are born of fatigue and loneliness.

Beyond a wholesome discipline, be gentle with yourself. You are a child of the universe no less than the trees and the stars; you have a right to be here.

And whether or not it is clear to you, no doubt the universe is unfolding as it should. Therefore be at peace with God, whatever you conceive Him to be. And whatever your labors and aspirations, in the noisy confusion of life, keep peace in your soul. With all its sham, drudgery and broken dreams, it is still a beautiful world. Be cheerful. Strive to be happy.”

Max Ehrmann

To all those who struggle, may you find peace.

APPROVAL PAGE

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CHAPTER I: INTRODUCTION

The mental health crisis across college campuses is accelerating, with anxiety listed as the top mental health issue for undergraduate college students (Center for Collegiate Health [CCHC], 2021). The COVID-19 pandemic sent universities into disarray, in turn negatively impacting students experiencing an increase in perceived stress and anxiety (Hoyt et al., 2021; Lee et al., 2021; Nguyen et al., 2021). With the return of campus life, college counseling centers, often under resourced (Lipson et al., 2019), must adapt to serve their community ripe with mental health concerns. Mindfulness Based Interventions (MBIs) demonstrate promising results to combat anxiety in undergraduate college students (Bamber & Morpeth, 2019; Substance Abuse and Mental Health Services Administration [SAMHSA], 2021).

Research focused on MBIs as a clinical intervention for college students has increased exponentially, with evidence to support the benefits of MBIs to reduce suicidal ideation and depression (Pistorello et al., 2012), stress and anxiety (Hazlett-Stevens & Oren, 2017), social anxiety (Levin et al., 2017), test anxiety (Lothes II et al., 2021), and improve satisfaction with life, mindfulness, and self-compassion (Taylor et al., 2014). However, group counseling services were impacted by the COVID-19 pandemic, with students asked to leave campus and refrain from social gatherings, with one exception, outdoors in nature.

Researchers have identified the positive impact of nature exposure on mental health and well-being (Howell et al., 2011; Howell & Passmore, 2013; Lackey et al., 2021) specifically for children and adolescents (Mygind et al., 2019; Overbey et al., 2021; Tillmann et al., 2018). Additionally, college students experience mental health benefits from exposure to nature (Foellmer et al., 2021; McFarland et al., 2008) with an abundance of nature on college campuses (Rakow & Eells, 2019). With both exposure to nature and mindfulness practices effective in

reducing symptoms of anxiety, researchers suggest human connection with nature may enhance mindfulness practice and well-being (Albrecht & Albrecht, 2019; Van Gordon et al., 2018).

Nature-based mindfulness connects nature with mindfulness techniques to deepen meditation practices (Van Gordon et al., 2018), encourage social activism, assist individuals to cope with climate change (Wamsler et al., 2018), and to improve well-being (Kirwin et al., 2019; Sadowski et al., 2020). Researchers conducting a meta-analysis indicated meditation in nature improves psychological outcomes when compared with indoor meditation (Djernis et al., 2019). Additionally, nature-based mindfulness interventions reduce subjective distress for young males with substance use disorders (Russell et al., 2016) and decrease depressive symptoms for adults (Schuling et al., 2018). Despite the research evidence of the benefits of both mindfulness practice and exposure to natural environments, few scholars have explored the impacts of a nature-based mindfulness intervention for college students (Djernis et al., 2021; Nisbet et al., 2019).

In this chapter, a statement of the problem to include an overview of anxiety among undergraduate college students and under resourced college counseling centers is discussed. The benefits of mindfulness practice and exposure to nature are described. Nature-based mindfulness is discussed, with the author introducing Nature-Based Mindfulness Training © (NBMT) as a potentially powerful intervention for college students struggling with anxiety. The need for the study, purpose of the study, significance of the study, and research questions are described. The chapter concludes with the definition of key terms.

Statement of the Problem: College Student Anxiety

Anxiety is the top mental health concern for undergraduate college students (CCMH, 2021) with students experiencing moderate to severe anxiety increasing 92% between 2013 and 2018 (Duffy et al., 2019). The COVID-19 pandemic accelerated the mental health crisis on

college campuses with upwards of 44% of college students experiencing anxiety (Lee et al., 2021; Nguyen et al., 2021), a risk factor leading to academic distress (Mofatteh, 2021), isolation (Hefner & Eisenberg, 2009), and suicidal ideation (Moskow et al., 2022).

Factors contributing to the rise in anxiety symptoms among college students include academic distress (Beiter et al., 2015), financial stress (Archuleta et al., 2013), and limited social supports (i.e., peer support and family support; Hefner & Eisenberg, 2009), which have predicted anxiety in a national sample (Jones et al., 2018). In 2019, 6,263 first year college students completed the Your First College Year survey, with 50.3% of students experiencing occasional anxiety and 38.8% of students experiencing frequent anxiety; however, 68.8% of students experiencing anxiety did not utilize campus mental health resources (Romo & Jacobo, 2020). While the number of students pursuing campus mental health resources has increased over the years (Duffy et al. 2019, Oswald et al., 2020), college students may underutilize mental health services due to lack of information of campus resources and the stigma associated with disclosing mental health issues (Cage et al., 2020).

The COVID-19 pandemic imposed further barriers for college students to access campus mental health resources due to geographic restrictions, inadequate insurance coverage, and financial concerns (Lee et al., 2021). With the return to campus life amidst increased mental health concerns for students, college counseling centers must utilize their resources efficiently, with level of engagement with interventions indicative of greater reduction of anxiety symptoms (Glenn et al., 2013) and group MBIs able to serve more students than individual services and effective in reducing anxiety in college students (Bamber & Morpeth, 2019).

Mindfulness

Jon Kabat-Zinn pioneered the translation of eastern mindfulness practice as a clinical intervention in his Mindfulness-Based Stress Reduction (MBSR) program in 1979 at the University of Massachusetts Medical Center (2003a, 2003b). In the past several decades, an abundance of research evidence suggests MBIs such as MBSR (Kabat-Zinn, 1982, 2003a, 2003b), Mindfulness-Based Cognitive Behavioral Therapy (MBCT; Segal et al., 2013; Teasdale et al., 2000), Dialectical Behavior Therapy (DBT; Linehan, 1993, 2014), and Acceptance and Commitment Therapy (ACT; Hayes et al., 1999; Hayes et al., 2006) lead to clinically significant improvements in emotion regulation (Hill & Updegraff, 2012; Heppner et al., 2015), relationship satisfaction (Barnes et al., 2007), and decreased reactivity (Davis & Hayes, 2011), stress (Grossman et al., 2004; Sharma & Rush, 2014), and anxiety (Hofmann & Gomez, 2017; Hofmann et al., 2010). While there is robust evidence in support of MBIs to improve mental health, different definitions of mindfulness (Bishop et al., 2004; Brown & Ryan, 2003; Carmody, 2009; Carmody & Baer, 2008; Kabat-Zinn, 1994) have led researchers to examine the complex multi-faceted construct of mindfulness (Baer et al., 2006).

In exploring the facet structure of mindfulness, researchers developed and validated the Five Facet Mindfulness Questionnaire (FFMQ) consisting of 39 items with five constructs of mindfulness, Observing, Describing, Acting with Awareness, Nonjudging of inner experience, and Nonreactivity to inner experience (Baer et al., 2006). The FFMQ is a commonly used mindfulness assessment, however, researchers have indicated nonsignificant relationships between the Observing construct and psychological adjustment in a sample of nonmeditators (Baer et al., 2008). Researchers tested a 15-item short form of the FFMQ demonstrating convergent validity with the original 39-item version in a sample of adults with depression

before and after MBCT, while also finding nonsignificant relationships between Observing and other facets of mindfulness, suggesting a four-factor structure is more appropriate for those with little or no meditation experience (Gu et al., 2016). The nonsignificant relationship between the Observing construct and other facets of mindfulness is reflected in previous literature (Baer et al., 2006; Baer et al., 2008; Curtiss & Klemanski, 2014; Williams et al., 2014), with researchers suggesting those with little to no meditation experience may observe in a way that is maladaptive and not consistent with common mindfulness practice (i.e., nonjudging, acting with awareness; Gu et al., 2016). Nonetheless, the FFMQ appears to be in line with a common definition of mindfulness (Kabat-Zinn, 1994) and a proposed model of mindfulness (Shapiro et al., 2006).

A Model and Theory of Mindfulness

Researchers propose a model of mindfulness including three bidirectional axioms, *Intention* “on purpose”, *Attention* “paying attention”, and *Attitude* “in a particular way” (Shapiro et al., p. 375, 2006). *Intention*, one’s purpose or goal, is integral for mindfulness practice. Setting one’s intention, the “why”, lays the groundwork for the possible benefits of mindfulness. Intentions often change and evolve, ranging from self-regulation to self-liberation (Shapiro et al., 2006). At the core of mindfulness practice is *Attention*, the “what”, paying attention moment to moment of both internal and external experiences. Paying attention is critical to mindfulness practice, fostering a sense of internal and external awareness. *Attitude*, “how” we attend to the present moment is essential to mindfulness practice. Attention to the moment with a poor attitude may lead one to be judgmental and self-critical, while an open mind can lead to kindness and acceptance. When combined, these three axioms facilitate a shift in perspective coined *Reperceiving*, the meta-mechanism of mindfulness (i.e., theory of change; Shapiro et al., 2006) by increasing the ability to be objective to internal and external experiences. Mindfulness

practice can lead to desirable changes and outcomes such as self-regulation of emotions, clarification of values, and cognitive, behavioral, and emotional flexibility (Shapiro et al., 2006).

MBIs demonstrate effectiveness among college students to improve emotion-regulation (Muhomba et al., 2017) and reduce anxiety and stress (Bamber & Morpeth, 2019; Bamber & Schneider, 2016; Hazlett-Stevens & Oren, 2017; Taylor et al., 2014), social anxiety (Levin et al., 2017), and test anxiety (Lothes II & Mochrie, 2017; Lothes II et al., 2021). When offered in a group setting, MBIs reach a larger number of students in need of counseling services. Not only do universities have group MBIs to support college students with anxiety, but also campuses have another resource to improve mental health, access to nature (Rakow & Eells, 2019).

Nature

The belief in the benefits of exposure to nature in human health spans thousands of years, from Aristotle (Lennox, 2002) to more recent transcendentalists such as Ralph Waldo Emerson (1836) and Henry David Thoreau (1917), and naturalists like John Muir (1901). Exposure to nature is linked to positive mental health benefits (Howell et al., 2011; Howell & Passmore, 2013) such as reducing anxiety (Bratman et al., 2015a; Coventry et al., 2021; Lackey et al., 2021) and enhancing well-being (Keniger et al., 2013). Researchers have demonstrated the positive benefits of green exercise (Barton & Pretty, 2010; Song et al., 2014) and sitting in nature (Lee et al., 2011; Park et al., 2010) in reducing college student anxiety, with as little as 5 to 10 minutes of nature exposure needed to reap the benefits of nature (Barton & Pretty, 2010; Meredith et al., 2019). Although the research evidence supports the mental health benefits from exposure to nature, the push towards urbanization and the increase in access to technology leads human beings to spend more time indoors, decreasing regular contact with nature and may explain the increase in mental illness (Bratman et al., 2015b; Bratman et al., 2019).

With rapid urbanization, scholars suggest conservation efforts of botanical gardens (Wassenberg et al., 2015) and local parks (Keniger et al., 2013; Wood et al., 2017) as they are integral to promoting human health. Nature has been defined in a variety of ways with terms such as wilderness inferring humans are distinctly separate from nature (Public Law 88-577, 1964). Other researchers suggest any living organism is a part of nature (Maller et al., 2006) while others propose nature as a process, comprised of the quality of interactions between human beings and the non-human scenery or living organisms (Cookson, 2011).

The different perspectives on nature led to several theoretical models explaining the impact of influence of nature in the human nature connection (Kaplan & Kaplan, 1989; Roszak, 1992; Ulrich, 1983; Wilson, 1984), with two dominant theories proposing different pathways in how nature benefits human beings in outdoor therapies (Harper et al., 2021). Stress Reduction Theory (SRT) suggests nature elicits unconscious emotional responses in human beings which leads to a positive influence on physiological responses to reduce stress (Ulrich, 1983), while Attention Restoration Theory (ART) suggests natural environments are the antidote to recover from mental fatigue by restoring attentional capacity (Kaplan, 1995; Kaplan & Kaplan, 1989).

Attention Restoration Theory

Derived from the work of William James (1892), the founders of ART posit mental fatigue arises with prolonged use of *directed attention*, forced attention that requires a great deal of effort on something that is not particularly interesting, while *involuntary attention* requires no effort at all and has the capacity to restore mental fatigue (Kaplan & Kaplan, 1989). The authors propose four components found in natural environments provide the opportunity to rest directed attention, thus restoring cognitive capacity and reducing mental fatigue. *Being Away* entails a physical distancing, or escape, of oneself from their current day to day environment. Kaplan and

Kaplan (1989) identify three patterns from escape: distraction, putting aside ordinary work, and an internal escape (i.e., escape from mental efforts, taking a rest from pursuing current purposes). They suggest the strongest effect is through a combination of these patterns. *Extent* includes scope and sense of relatedness one experiences in natural environments. Scope suggests there is more beyond what is immediately perceived, while relatedness refers to the perceptions that the elements of a setting are part of a larger whole, with extent prompting a sense of fascination in the natural world. *Soft Fascination* occurs when one is engaged in involuntary attention induced by the natural aesthetics of the environment (e.g., trees, clouds, sunsets, rivers) which captures attention, but does not require directed attention, restoring focus, concentration, and mental capacity, thus reducing fatigue (Kaplan, 1995; Kaplan & Kaplan, 1989). *Compatibility* suggests natural environments are well suited to one's preference or purpose within that setting (Kaplan, 1995). Although researchers have developed assessments demonstrating the restorative effects of natural environments (Hartig et al., 1997; Herzog et al., 2003), the components of ART are vague, with inconsistency in the operationalization and definition of constructs (Dillman-Haso, 2020; Joye & Dewitte, 2018).

The causal pathways of nature's influence in outdoor therapies are unclear, with researchers conducting an umbrella review unable to identify a clear theory of change related to the role nature in outdoor therapies (Harper et al., 2021). Nonetheless, research evidence supports mental health benefits of exposure to nature for college students (Rakow & Eells, 2019) and for reducing anxiety (Bratman et al., 2015a; Coventry et al., 2021; Lackey et al., 2021). With exposure to nature and mindfulness practice suggested to restore attention (Kaplan, 2001), ART may be suitable to integrate with mindfulness in a nature-based mindfulness intervention.

Nature-Based Mindfulness

Scholars suggest nature-based mindfulness, connecting mindfulness with nature, enhances mindfulness practice and well-being (Albrecht & Albrecht, 2019; Van Gordon et al., 2018), with a meta-analysis indicating meditation in nature improves psychological outcomes when compared with indoor meditation (Djermis et al., 2019). Mindfulness is an integral component of shinrin-yoku (i.e., forest bathing; Owens & Bunce, 2022b), with researchers conducting a systemic review and meta-analysis of the effects of shinrin-yoku found benefits for mental health, particularly in reducing anxiety (Kotera et al., 2022). Recently, the impacts of nature-based mindfulness have been explored by researchers for professionals with high levels of work-related stress, and with pilot studies in outdoor education and adventure therapy programs.

Several researchers have demonstrated the benefits of nature-based mindfulness interventions. In a pilot study exploring the impacts of a nature-based mindfulness training for individuals from high-stress jobs, participants met for two evenings per week, one half day training per month over a period of four weeks. Researchers found an improvement in participant overall mindfulness scores using the Freiburg Mindfulness Inventory (FMI), self-efficacy scores, and a reduction in psychological and psychiatric symptoms (Lucke et al., 2019). The FMI measures aspects of attention, acceptance, and mental openness, with researchers previously indicating the awareness component of mindfulness rather than acceptance is more strongly correlated with nature connectedness (Howell et al., 2011). In a study investigating the benefits of an adapted MBSR intervention, participants were randomly assigned to one of three different environments (i.e., natural outdoors, built outdoors, and indoors) meeting one-hour per week over six weeks researchers found greater mental health benefits for participants in the natural outdoor environment compared to the indoor or built environments (Choe et al., 2020).

Researchers exploring the impact of a nature-based 8-day Outward Bound Mindfulness Program (OBMP) on positive affect and mindfulness conducted a pilot study with 14 adults, with approximately 5 hours a day dedicated to mindfulness practice. When compared to the control group, the participants in the OBMP intervention group demonstrated significant increase in mindfulness scores and positive affect post-intervention, with the results being maintained at a 3-month follow-up (Kirwin et al., 2019). Researchers examining mindfulness-based experiences for young males with substance use disorders in a 90-day adventure therapy program found improvements in the nonjudging and nonreactivity constructs from the FFMQ correlated with a decrease in overall subjective distress (Russell et al., 2016). With promising evidence of the benefits of nature-based mindfulness, there is limited research on its impact for college students.

Few researchers have explored nature-based mindfulness among college students. Researchers investigating the relationships between nature relatedness, subjective well-being, and mindfulness in a sample of Canadian university students determined only the nonreactivity and observing constructs of mindfulness from the FFMQ partially mediated the positive relationship between positive affect and nature related (Sadowski et al., 2020). Interestingly, researchers found only the nonreactivity construct fully mediated the negative relationship between nature relatedness and negative affect. Researchers exploring the impact of a 20-minute walk on mood randomly assigned 100 Canadian university students to one of three conditions: a guided walk outdoors, outdoors with mindfulness, or indoors. The participants walking outdoors with mindfulness were found to have a greater reduction in negative affect compared to the other two conditions (Nisbet et al., 2019). In a more intensive intervention, researchers investigating the impacts of a 5-day residential program on reducing stress and improving mental health outcomes for Danish university students experiencing moderate to high levels of stress randomly

assigned participants to one of three conditions: indoors, natural outdoor setting, and a control group (Djernis et al., 2021). Although researchers found a moderate effect size post-treatment for perceived levels of stress, the results were non-significant. Contrary to previous research (Djernis et al., 2019), the authors did not find an improvement in mindfulness scores for participants in the indoor and natural outdoor settings. There is mixed evidence on the benefits of nature-based mindfulness interventions for college students (Djernis et al., 2021; Nisbet et al., 2019) and which constructs of mindfulness are correlated with mental health benefits (Howell et al., 2011; Russell et al., 2016; Sadowski et al., 2020).

Although the results from the nature-based mindfulness studies described are promising, there is limited information regarding the details of the nature-based mindfulness interventions such as whether interventions were explicitly designed to integrate to constructs of nature and mindfulness or if the group interventions are process oriented or psychoeducational in nature. Additionally, the nature-based mindfulness interventions reviewed may be inaccessible given the duration and time required for the interventions (e.g., 8 days to 3 months). Given these considerations, the author has integrated the constructs of mindfulness and ART into brief psychoeducation group intervention aimed to reduce anxiety.

Nature-Based Mindfulness Training Intervention

NBMT is designed as a group psychoeducational intervention aimed to reduce anxiety. To be expanded upon in later chapters, the author intentionally integrates constructs from Mindfulness and ART into the NBMT intervention components. NBMT is designed to be delivered outdoors in nature, consisting of eight to twelve group members and is 90-minutes in length. The number of participants for NBMT is appropriate for psychoeducational groups with 1.5 to 2 hours recommended for psychoeducational groups (Corey et al., 2018; Gladding, 1994)

including group MBIs (e.g., DBT; Linehan, 2014). The impact of the NBMT intervention on reducing symptoms of anxiety has yet to be explored. Given the prevalence of anxiety among college students, they may be an ideal population to pilot the intervention.

Need for the Study

Institutions of higher education must maximize their campus resources and identify creative strategies to combat the mental health crisis on college campuses, with upwards of 44% of college students experiencing anxiety (Lee et al., 2021; Nguyen et al., 2021). With both access to nature and MBIs accessible on college campuses the NBMT intervention can reach more students, meeting the increased demand for mental health services and may alleviate the burden of under resourced college counseling centers. While there is research to support the benefits of MBIs and exposure to nature on college student mental health, there is limited evidence on the impact of nature-based mindfulness interventions for college students experiencing anxiety.

Purpose of the Study

With both mindfulness practice and exposure to nature effective in reducing symptoms of anxiety, the integration of mindfulness practice in nature may be a powerful intervention to reduce anxiety symptoms among undergraduate college students. The primary goals of prevention science are to understand the onset, development, and course of presenting problems, and to design and test interventions that promote healthy functioning (Society for Prevention Research, 2011). The purpose of the study is to develop a 90-minute NBMT intervention aimed to reduce anxiety, and to test the intervention to determine its impact on anxiety symptoms among undergraduate college students.

Significance of the Study

Developing and testing a 90-minute NBMT intervention for college students experiencing anxiety is significant for several reasons. Given the mental health crisis across college campuses, it is imperative for researchers, practitioners, and institutions of higher education to develop and test interventions to promote healthy functioning and well-being and begin to consider creative strategies to meet the needs of students experiencing anxiety. Reducing anxiety among college students may lead to improved academic performance, a decrease in suicidal ideation, and improved overall mental health and well-being. The creation of an effective innovative intervention may provide universities a tool to combat the mental health crisis with college counseling centers under resourced and overburdened with students seeking support. Additionally, anxiety is not the only mental health diagnosis of concern among college students. Both mindfulness and exposure to nature appear to have benefits for reducing symptoms of depression among other mental health concerns.

The NBMT intervention is designed to be simple and flexible, with the ability to be adapted to each university based on the presenting mental health concerns of their students, and the clinical and environmental resources at their disposal, as these are top predictors for program adoption (Dusenbury & Hansen, 2004). The development of a NBMT intervention may not only provide college counseling centers a creative and innovative solution to serve college students seeking support, but it may also fuel research and development of nature-based mindfulness interventions to support college students experiencing a variety of mental health concerns.

Research Questions

The overarching research questions to be explored are as follows:

Research Question 1: What is the impact of a 90-minute Nature-Based Mindfulness Training intervention on anxiety scores for undergraduate college students pre to post-test compared to a control (delayed intervention) group?

Research Question 2: What is the impact of a 90-minute Nature-Based Mindfulness Training intervention on mindfulness scores for undergraduate college students pre to post-test compared to a control (delayed intervention) group?

Research Question 3: What is the impact of a 90-minute Nature-Based Mindfulness Training intervention on anxiety scores for undergraduate college students post-test to one-week follow up compared to a control (delayed intervention) group?

Research Question 4: What is the impact of a 90-minute Nature-Based Mindfulness Training intervention on mindfulness scores for undergraduate college students post-test to one-week follow up compared to a control (delayed intervention) group?

With this study of a 90-minute NBMT intervention being a new area for scientific inquiry for undergraduate college students with anxiety, preliminary exploratory questions include:

Research Question 5: How engaged are participants during a 90-minute NBMT intervention?

Research Question 6: How does engagement during a 90-minute NBMT intervention impact change in undergraduate college student anxiety scores from pre to post-test?

Research Question 7: How does engagement during a 90-minute NBMT intervention impact change in undergraduate college student anxiety scores from post-test to one-week follow-up?

Definition of Terms

As the researcher seeks to develop and test a NBMT intervention for undergraduate college students experiencing anxiety by integrating components from Mindfulness and ART, the constructs identified hold different meanings depending on context and discipline. To clarify the terms in this study, anxiety, mindfulness, nature, and nature-based mindfulness are defined.

Anxiety

Anxiety is defined as an emotion characterized by excessive worry and feelings of tension that persists beyond developmentally appropriate periods leading to significant distress or impairment in social, occupational, or other important areas of functioning (American Psychiatric Association, 2013).

Mindfulness

The researcher will use the most common definition of mindfulness utilized in research studies. For the purposes of this study, mindfulness is “the awareness that emerges through paying attention, on purpose, in the present moment, nonjudgmentally to the unfolding of experience, moment by moment” (Kabat-Zinn, 1994, p. 4). To note, this definition focuses on awareness and combines the three axioms in the model of mindfulness described above.

Nature

For the purposes of this research study, nature is an area comprised of living organisms that include plants and nonhuman animals, from a small urban park or creek to the vast expanse of the wilderness. To note, this definition would infer human beings are separate from nature, while the term “exposure to nature” is defined as one’s individual engagement with nature.

Nature-Based Mindfulness

For the purposes of this study, nature-based mindfulness combines the previous definitions of mindfulness and nature and is defined as “the awareness that emerges through paying attention, on purpose, in the present moment, nonjudgmentally to the unfolding of experience, moment by moment” (Kabat-Zinn, 1994, p. 4) in nature.

CHAPTER II: LITERATURE REVIEW

Approximately 18.1%, or 40 million United States adults experience anxiety disorders annually (AADA, 2022) which is likely to increase with the World Health Organization (WHO) estimating the COVID-19 pandemic triggered a 25% increase in the prevalence of anxiety and depression disorders worldwide (WHO, 2022). The Diagnostic and Statistical Manual of Mental Disorder (DSM-5-TR) characterizes anxiety disorders as “excessive fear and anxiety and related behavioral disturbances” (APA, 2022, p. 215). College aged students (Salimi et al., 2021) are particularly susceptible to increased anxiety symptoms during the COVID-19 pandemic with roughly 78% of United States adults indicating COVID-19 as a significant source of stress in their life (APA, 2020). The COVID-19 pandemic sent universities into disarray leaving students socially isolated and disrupting learning. In turn, students were negatively impacted with an increase in perceived stress and anxiety (Hoyt et al., 2021) with an upwards of 44% of college students experiencing anxiety (Lee et al., 2021; Nguyen et al., 2021). Although evidence suggests the COVID-19 pandemic accelerated the mental health crisis on college campuses, pre-COVID-19 anxiety among college students was on the rise as well (Duffy et al. 2019). Research evidence supports Mindfulness Based Interventions (MBIs) reduce anxiety among college students. Additionally, exposure to natural environments, which are accessible to students on college campuses, is effective in reducing anxiety. The author argues the need for integrating mindfulness and nature into a psychoeducation group intervention for college students experiencing anxiety.

Introduction: College Students and Anxiety

Anxiety is listed as the top mental health concern for undergraduate college students seeking mental health services (CCMH, 2021) with the number of students experiencing

moderate to severe anxiety increasing 92% between 2013 and 2018 (Duffy et al., 2019). Anxiety among college students is a risk factor leading to academic distress (Mofatteh, 2021), isolation (Hefner & Eisenberg, 2009), and suicidal ideation (Moskow et al., 2022). Factors contributing to the rise in anxiety symptoms among college students include academic distress (Beiter et al., 2015), financial stress (Archuleta et al., 2013), and limited social supports (i.e., peer support and family support; Hefner & Eisenberg, 2009), which have predicted anxiety in a national sample (Jones et al., 2018). In 2019, 6,263 first year college students completed the Your First College Year survey, with close to 90% of students experiencing anxiety. Specifically, 50.3% of students experienced occasional anxiety and 38.8% of students experienced frequent anxiety; yet, it is important to note that of those students reporting frequent anxiety, 68.8% did not utilize campus mental health resources (Romo & Jacobo, 2020). While the number of students pursuing campus mental health resources has increased over the years (Duffy et al. 2019, Oswald et al., 2020), college students may underutilize mental health services due to lack of information of campus resources and the stigma associated with disclosing mental health issues (Cage et al., 2020). With evidence demonstrating college student anxiety is increasing, it is important to understand contextual factors that may be contributing to the increased incidence of anxiety or offer attractive alternatives that can decrease anxiety.

The Rise of College Student Anxiety

To provide context to the rise in anxiety shown in results in quantitative studies, Martin (2022) interviewed twelve seasoned college counseling practitioners and counseling-center directors. Martin identified themes from counselor perspectives that may be associated with the increase in college student anxiety to include societal changes (e.g., terrorism, political polarization), helicopter parenting (e.g., increased parental interference in college counseling),

competitiveness, and the need for distinctiveness (e.g., recessions and job searching). Regarding the first theme, societal changes, interviewees suggest wide-spread access to technology has accelerated anxiety through repeated exposure to news, while social media use may contribute to the need for distinctiveness. Results from this study support the argument that increased access to technology leads human beings to spend more time indoors, contributing to the increase in anxiety (Bratman et al., 2015b; Bratman et al., 2019), with social media use in emerging adults contributing to the mental health crisis on college campuses (Bettmann et al., 2021; Primack et al., 2017; Vannucci et al., 2017).

Increased social media use is correlated with heightened anxiety among college students (Bettmann et al., 2021). Among a national sample of emerging adults, higher daily social media use was positively correlated with increased anxiety symptoms (Vannucci et al., 2017).

Additionally, the number of social media platforms used is linked with increased anxiety symptoms. Young adults using 7 to 11 social media platforms were three times more likely to report high levels of anxiety symptoms when compared to those using 0 to 2 social media platforms (Primack et al., 2017). A major limitation in these studies and systemic reviews on the impacts of social media use on anxiety is reliance on self-report measures and their cross-sectional design limiting causal inferences (Keles et al., 2020). Nonetheless, the evidence suggests increased social media use is linked with increased anxiety symptoms. College students spent approximately two to three hours per day using social media prior to the pandemic (Tayo et al., 2019), with social media use among college students increasing during the COVID-19 pandemic (Haddad et al., 2021).

Anxiety Amidst the COVID-19 Pandemic

An abundance of evidence demonstrates high levels of anxiety among college students during the COVID-19 pandemic. In a research study exploring young adult perceived stress and anxiety in a diverse sample of full-time college students in the United States, college students experienced high levels of stress and anxiety at the start of the COVID-19 pandemic in April 2020, which remained consistent at a 3 month follow up in July 2020 (Hoyt et al., 2021). Additionally, researchers extrapolated qualitative evidence finding COVID-19 created specific stressors to include educational, economic, and environmental. These qualitative results are supported by a study from a public research university in Kentucky aiming to describe college student mental health early in the COVID-19 pandemic, with COVID-19 imposing barriers for college students to access mental health resources due to geographic restrictions, inadequate insurance coverage, and financial concerns (Lee et al., 2021). Almost half (44%) of the 2,059 students responding to the survey from mid-April 2020 to early May 2020 were experiencing moderate to severe anxiety, with an additional 32% of students experiencing mild anxiety (Lee et al., 2021). Although the survey was sent to 24,146 degree seeking students and are limited in generalizability to one university in Kentucky, researchers analyzed data from the Household Pulse Survey from mid-April 2020 to late-May 2020 and found similar results with 43.5% of 6,803 college-aged young adults reported experiencing anxiety and 34.9% of respondents indicating some or a lot of financial difficulty (Nguyen et al., 2021). This rise in anxiety and other mental health symptoms continued into the following academic year. In September 2020, 1,277 bachelor's degree seeking students were surveyed regarding the impact of COVID-19 on mental health with 18.09% indicating COVID-19 lead to significantly worse mental health symptoms with 88.8% of respondents indicating heightened stress and anxiety (Active Minds,

2021). With evidence demonstrating heightened anxiety among college students during early stages of the COVID-19 pandemic and the following months, the question remains: to what extent did COVID-19 impact college student mental health when compared to pre-pandemic levels?

Evidence supports an increase in mental health concerns, specifically anxiety, among college students from pre-COVID-19 to during the pandemic. In a study aiming to explore the impact of COVID-19 on anxiety and depression, researchers sampled 990 college students from a private Northeastern university from February and early March 2020, prior to COVID-19 pandemic shutdowns, and five months in July 2020 (Haikalis et al., 2022). There was a significant increase in anxiety symptoms from pre-COVID-19 pandemic to during the pandemic and moderated by academic distress and loneliness. Additionally, women demonstrated larger increases in anxiety, consistent with previous research that female college students experience anxiety at a higher rate than male students (Byrd-Bredbenner et al., 2021; Byrd-Bredbenner et al., 2020; Vesga-Lopez et al., 2008). Although anxiety symptoms increased five months into the pandemic, the initial data collection point was only weeks before COVID-19 lockdowns, with inklings the global pandemic present in the media. As such, researchers examining college student mental health in May 2019 at a Canadian University recontacted participants in May 2020 seeking to compare survey results from May 2019 and May 2020 for students with preexisting mental health concerns and no preexisting mental health concerns (Hamza et al., 2021). College students with preexisting mental health concerns experienced a significant decrease in anxiety symptoms, while college students without preexisting mental health concerns experienced a significant increase in anxiety symptoms. Furthermore, they found an increase in social isolation and loneliness scores among students without preexisting mental health concerns

predicted an increase in psychological distress. Based on the average scores of social mistreatment (e.g., isolation and loneliness) for students with preexisting mental health concerns not predictive of psychological distress, students without preexisting mental health concerns may be less accustomed to feeling alone and isolated when the social distancing public health measures were implemented due to the COVID 19 pandemic. Additionally, they suggest students with preexisting mental health concerns may experience reduced stress with more time to sleep and academic course work less demanding when offered remotely (Hamza et al., 2021). A potential limitation of the study, not identified by the authors is determining preexisting mental health conditions with pre-test scores from May 2019 survey results, with the potential for self-report bias as well as the stigma associated with disclosing mental health concerns on college campuses (Cage et al., 2020; Woodhead et al., 2021). As the evidence supports the COVID-19 pandemic accelerated mental health concerns among college students, a primary resource on campus are college counseling centers.

With the return of campus life from the COVID-19 shutdowns, college counseling centers, often under resourced (Lipson et al., 2019), must adapt to serve their community, which is ripe with mental health concerns. With students facing stigma related to disclosing mental health concerns, college counseling centers must effectively engage students in services. Higher levels of engagement during interventions aimed to reduce anxiety is indicative of greater anxiety symptom reduction (Glenn et al., 2013). Researchers have demonstrated student engagement with an intervention aimed to promote psychological adjustment and stress management is correlated with greater benefits post-intervention (Conley et al., 2013). Alongside effectively engaging students in services, college counseling centers must consider how to serve the vast number of students experiencing anxiety. Group counseling is one method that may

reduce the burden of under resourced counseling centers by reaching a larger number of students seeking services than individual counseling. Researchers conducting a pilot study randomly assigned college students experiencing depression and anxiety to either individual or group counseling (Fawcett et al., 2020). Students participating in individual or group counseling experienced a significant reduction for anxiety and depression with no significant differences between individual and group counseling outcomes. Evidence supports group counseling is effective in reducing anxiety symptoms, with several types of groups (e.g., task, counseling, psychoeducational) that employ a variety of theoretical frameworks, such as mindfulness, accessible to college counseling centers. Group MBIs demonstrate promising results to combat anxiety in undergraduate college students (Bamber & Morpeth, 2019; SAMHSA, 2021).

Mindfulness

Mindfulness has only recently been implemented into clinical interventions for mental health disorders with its origins dating back approximately 2,500 years (Shonin et al., 2015). Understanding the benefits of Buddhist teachings and principles, Jon Kabat-Zinn pioneered the translation of eastern mindfulness practice as a clinical intervention in his Mindfulness Based Stress Reduction (MBSR) program, with mindfulness practice flourishing into a variety of evidence-based MBIs to improve mental health such as Mindfulness Based Cognitive Therapy (MBCT), Dialectical Behavior Therapy (DBT), and Acceptance and Commitment Therapy (ACT). With MBIs demonstrating evidence to reduce anxiety, it is important to grasp the roots and theoretical underpinnings of Buddhism which are evidence in a proposed model and theory of mindfulness (Shapiro et al., 2006).

Mindfulness Roots

The origins of present-day mindfulness practice are rooted in Buddhism. Scholars suggest the Buddha, Siddhartha Gautama Sakyamuni, was an enlightened being who sought to explore the intricacies of the human mind. Derived from Pali writings composed in India between the sixth and third centuries B.C.E. (Olendzki, 2015; Segall, 2003), the first teachings of the Buddha were the Four Noble Truths, which are thought to be the first teachings given by the Buddha after he achieved enlightenment. Although simplified, Shonin and colleagues (2015) summarize the Four Noble Truths as follows: 1) Suffering exists, 2) There is a cause of suffering, 3) There is a cessation of suffering, and 4) There is a path that leads to the cessation of suffering. These noble truths are thought to be foundational to human existence, with the Buddha suggesting the five *skandhas* (i.e., aggregates, components, or functions) of the mind (Shonin et al., 2015). The five skandhas (or aggregates) are also referred to as the five-fold model of the mind, and is believed to be a path to cease human suffering from the mind. The five aggregates are:

- *material form*, elements that make up senses (i.e., eye, ear, nose, tongue, body) and external elements (i.e., earth, water, air, fire);
- *consciousness*, knowing or awareness through which material elements manifest;
- *feeling*, hedonic affect ranging from not pleasant to neutral to pleasant;
- *perception*, cognitions or interpretations of one's experience; and
- *emotional responses or formations*, intention and action related to one's experience (Olendzki, 2015; Shonin et al., 2015).

The five-fold model of the mind, rooted in Buddhist thought and practice, is ingrained in the Western clinical applications of mindfulness (Olendzki, 2015).

Mindfulness: Definition, Model, and Theory

Kabat-Zinn's definition of mindfulness (1994) "the awareness that emerges through paying attention, on purpose, in the present moment, nonjudgmentally to the unfolding of experience, moment by moment" (p. 4) is the most widely accepted, even though many other definitions of mindfulness have been proposed (Brown & Ryan, 2003; Carmody, 2009; Carmody & Baer, 2008). His definition embodies the five-fold model of the mind and informs a model of mindfulness which includes three bidirectional axioms, *Attention* "paying attention", *Attitude* "in a particular way", and *Intention* "on purpose", that interact simultaneously in a moment-to-moment process (Shapiro et al., 2006, p. 375). *Attention*, or the "what", is paying attention, moment to moment, of both internal and external experiences. Critical to mindfulness practice, *Attention* is connected to the first two aggregates of the five-fold model of the mind (i.e., *material form* and *consciousness*). *Material form* includes both external elements from the natural world and internal senses, while *consciousness* is the interaction of external elements and internal senses in the moment. Individuals can pay attention to their heartbeat (i.e., internal), or what they see (i.e., external) to increase awareness of their experience in the moment. The second axiom, *Attitude*, "how" we attend to the present moment is connected to the third and fourth components of the five-fold model of the mind (i.e., *feeling* and *perception*). How one pays attention in the present moment is integral to the interpretation of their experience (i.e., *consciousness*) in the present moment. Attention to the moment with a poor attitude may lead one to experience negative affect (e.g., *feeling*) and be judgmental and self-critical (e.g., *perception*) while an open mind may lead to positive affect, kindness, and acceptance. The final axiom, *Intention*, is one's purpose or goal for mindfulness, otherwise known as the "why", and is connected to the final aggregate of the five-fold model of the mind (i.e., *emotional responses or*

formations). *Emotional responses or formations* guide our actions based on the interaction (e.g., *consciousness*) and interpretation (e.g., *feeling* and *perception*) of one's experience to the moment. An individual who is aware of their inability to self-regulate (e.g., *consciousness*) experiencing negative affect (e.g., *feeling*) and distorted thinking (e.g., *perception*) can identify self-regulation as a goal to guide their actions for mindfulness practice. One's *Intention* often changes and evolves based on the interaction and interpretation of the present moment, ranging from self-regulation to self-liberation (Shapiro et al., 2006). In understanding the translation of Buddhist practices and teachings informing a definition and model mindfulness, the question remains: how does mindfulness aid in reducing psychological distress and anxiety?

When combined, *Attention*, *Attitude*, and *Intention*, facilitate a shift in perspective, coined *Reperceiving*, the meta-mechanism of mindfulness (i.e., theory of change; Shapiro et al., 2006). By increasing the ability to be objective to internal and external experiences, *Reperceiving* can lead to additional mechanisms such as 1) self-regulation of emotions, 2) exposure (i.e., distress tolerance), 3) clarification of values, and 4) cognitive, behavioral, and emotional flexibility, in turn, contributing to positive health outcomes (Shapiro et al., 2006). Therefore, mindfulness is a process, with the simultaneous interactions of the three axioms leading to *Reperceiving*, tapping into additional mechanisms to influence mental health outcomes (e.g., mindfulness → reperceiving → additional mechanisms → mental health outcomes). Mindfulness is inherently complex, leading researchers to examine the multi-faceted construct of mindfulness (Baer et al., 2006) and its impact on psychological outcomes (Brown et al., 2015).

Measuring Mindfulness

In dissecting the complex structure of mindfulness, researchers identified five facets of mindfulness and developed the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006),

with the five facets of mindfulness in this assessment connected to the previously described model of mindfulness as indicated in Table 1 (Shapiro et al., 2006). The first facet of mindfulness, *Observing*, involves noticing internal and external experiences (i.e., thoughts, emotions, sensations), while the second facet, *Describing*, involves using words to label one’s internal and external experience (Baer et al., 2008). Both *Observing* and *Describing* capture the *Attention* axiom of mindfulness. The third facet of mindfulness, *Acting with awareness*, involves the ability to attend and intentionally act in the moment (Baer et al., 2008) and is in line with the *Intention* axiom of mindfulness. The fourth facet of mindfulness, *Nonjudging of inner experience*, refers to a neutral and objective stance towards feelings and thoughts, while the fifth and final facet, *Nonreactivity to inner experience* involves the ability to allow thoughts and feelings to come and go without becoming involved with them (Baer et al., 2008). Both *Nonjudging of inner experience* and *Nonreactivity to inner experience* capture the *Attitude* axiom of mindfulness. With mindfulness practice suggested to improve mental health functioning and well-being, researchers have sought to determine which of the five facets of mindfulness are integral to reduce anxiety.

Table 1: Connection of the Five Facets of Mindfulness to the Model of Mindfulness Axioms

Mindfulness Axioms	<i>Attention</i>	<i>Intention</i>	<i>Attitude</i>
Facets of Mindfulness	<i>Observing</i> <i>Describing</i>	<i>Acting with awareness</i>	<i>Nonjudging of inner experience</i> <i>Nonreactivity to inner experience</i>

The Five Facets of Mindfulness and Anxiety

A common theme across studies exploring the individual five facets of mindfulness is the nonsignificant relationship, or at times, positive relationship between *Observing* and psychological adjustment. The *Observing* facet frequently has no relationship with psychological

symptoms (Baer et al., 2006; Baer et al., 2008; de Bruin et al., 2012; Gu et al., 2016; Williams et al., 2014); however, a few researchers have found positive relationships between *Observing* and stress (Brown et al., 2015) and anxious arousal in a clinical sample (Curtiss & Klemanski, 2014). Given the concerns with the *Observing* subscale of the FFMQ, researchers have argued for re-evaluating the subscale (Petrocchi & Ottaviani, 2016), modifying or deleting items from the subscale (Baer, 2011), or excluding the *Observing* facet from the FFMQ altogether (Siegling & Petrides, 2016). Seeking to understand the *Observing* subscale and its relationship to stress and anxiety symptoms researchers identified three factors of the *Observing* facet: 1) Body Observing, 2) Emotion Awareness, and 3) External Perception (Rudkin et al., 2018). Emotion Awareness produced significant negative relationships ($p < 0.01$) for worry ($r = -0.25$), stress ($r = -0.22$), somatic anxiety ($r = -0.18$), and trait anxiety ($r = -0.38$). The researchers argue the FFMQ *Observing* subscale lacks items related to Emotion Awareness contributing to previously non-significant or positively correlated relationship between *Observing* and anxiety related symptoms. However, a major limitation to this study is its focus on solely the *Observing* facet of mindfulness, leaving researchers unable to examine the relationships between the other four facets of mindfulness on *Observing* subscale scores. *Observing* involves noticing internal and external experience, foundational to mindfulness practice, yet higher *Observing* is associated with increased judgment (Brown et al., 2015) and maladaptive responses to increased awareness (Curtiss & Klemanski, 2014). It is how one observes their experience (Desrosiers et al., 2013) and the ability to act with awareness (Carpenter et al., 2019) that are integral in managing symptoms of anxiety.

The individual facets of mindfulness that appear integral to managing anxiety include *Nonjudging of inner experience*, *Nonreactivity to inner experience*, and *Acting with awareness*,

and to a lesser degree, *Describing*. Researchers conducting a cross-sectional study exploring the role of the facets of mindfulness in anxiety found worry and rumination are positively correlated with anxiety (Baraccia et al., 2019). When controlling for gender, age, worry, and rumination, *Nonjudging of inner experience* is the strongest predictor of anxiety, followed by *Acting with awareness*, and *Nonreactivity to inner experience*. Those with a greater judgmental attitude towards their inner experience ruminate and worry more often, leading to anxiety. In a meta-analysis exploring the relationship between the five facets of mindfulness and affective symptoms, researchers demonstrate significant negative correlations with Generalized Anxiety Disorder (GAD; $p < 0.01$) between the *Nonjudging of inner experience* ($r = -0.48$), *Nonreactivity to inner experience* ($r = -0.42$), *Acting with awareness* ($r = -0.40$), and *Describing* ($r = -0.21$) subscales of the FFMQ and a non-significant relationship with the *Observing* subscale (Carpenter et al., 2019). These findings are consistent in studies with college students, examining the relationship between the facets of mindfulness and anxiety and emotion regulation with *Nonjudging of inner experience* the top predictor of anxiety (Medvedev et al., 2018) and emotion regulation (MacDonald, 2021) in college students. The evidence suggests *Nonjudging of inner experience* has the strongest impact on symptoms of anxiety (Baer et al., 2006; Barcaccia et al., 2019; Cash & Whittingham, 2010; Petrocchi & Ottaviani, 2016; Soysa & Wilcomb, 2015).

With the relationships between individual facets of mindfulness and psychological outcomes consistent it is important to consider the meta-mechanism of mindfulness, *Reperceiving*, and its relationship to the facets of mindfulness and anxiety symptoms. Researchers seeking to test the previously described model of mindfulness (Shapiro et al., 2006) developed a structural equation model (SEM) including the five individual facets of mindfulness,

Decentering (i.e., *Reperceiving*), additional mechanisms (i.e., self-regulation of emotions, distress tolerance, clarification of values, and cognitive, behavioral, and emotional flexibility), and psychological outcomes to include alcohol related problems, depression, stress, and anxiety (Brown et al., 2015). With decentering the meta-mechanism of mindfulness contributing to additional mechanisms, items related to self-regulation of emotions, values clarification, and flexibility were all highly correlated, leading to two second order latent variables 1) Mechanisms and 2) Distress Intolerance as the most proximal predictors of psychological outcomes (e.g., mindfulness facets → decentering → mechanisms or distress intolerance → psychological outcomes). With anxiety as the psychological outcome, the double mediated path through Decentering and Distress Intolerance from *Nonreactivity*, *Nonjudging*, *Acting with Awareness*, and *Describing* were all significant except for a nonsignificant path from Observing. Thus, all facets of mindfulness except *Observing* were predictive of higher reperceiving (i.e., objectivity towards one's experience) and distress tolerance.

The individual facets of mindfulness that appear integral to managing anxiety include *Nonjudging of inner experience*, *Nonreactivity to inner experience*, and *Acting with awareness*, and to a lesser degree, *Describing*. Meditation practice and experience may be a confounding variable in measuring mindfulness and psychological well-being (Baer et al., 2006). *Nonreactivity to inner experience* significantly moderates the indirect effect of *Observing* on anxiety symptoms through worry and rumination (Desrosiers et al., 2014). Individuals with little to no meditation experience may *Observe* in a way that is maladaptive and not consistent with other integral aspects of mindfulness practice (i.e., *Nonjudging of inner experience*, *Nonreactivity to inner experience*, *Acting with awareness*; Baer, 2011; Gu et al., 2016). Although most studies described in this section are limited due to their design (e.g., cross-sectional, meta-

analysis), the evidence suggests worry, rumination, and distress intolerance to be related to anxiety symptoms. In understanding the relationships between the facets of mindfulness and anxiety, we examine MBIs that demonstrate evidence to reducing anxiety symptoms.

Mindfulness-Based Interventions for Anxiety

MBIs incorporate elements for mindfulness into clinical interventions aimed to improve mindfulness, improve psychological functioning, and have demonstrated effectiveness in reducing anxiety. Researchers conducting a narrative synthesis of MBIs reviewed 57 studies demonstrating mindfulness meditation shows promise in reducing stress and anxiety in college students (Bamber & Schneider, 2016). However, they recognize there are notable differences in terms of the frequency, duration, and type of MBIs reviewed in the study. In the past several decades, an abundance of research evidence suggests MBIs such as MBSR (Kabat-Zinn, 1982, 2003a, 2003b), MBCT (Segal et al., 2013; Teasdale et al., 2000), DBT (Linehan, 1993, 2014), and ACT (Hayes et al., 1999; Hayes et al., 2006) lead to clinically significant improvements in emotion regulation (Hill & Updegraff, 2012; Heppner et al., 2015), relationship satisfaction (Barnes et al., 2007), and decreased reactivity (Davis & Hayes, 2011), stress (Grossman et al., 2004; Sharma & Rush, 2014), and anxiety (Hofmann & Gomez, 2017; Hofmann et al., 2010). With a variety of MBIs available as clinical interventions, it is important to examine specific MBIs and their impacts on anxiety among college students.

Mindfulness Based Stress Reduction

Jon Kabat-Zinn pioneered the translation of eastern mindfulness practices as clinical interventions in his MBSR program in 1979 at the UMass Medical Center (2003a, 2003b). The standard MBSR curriculum is a structured 8-week intervention, meeting for 2.5 hours per week, with a one day 6-hour retreat (Carmody & Baer, 2009). MBSR provides training in formal

mindfulness practices such as body scans, sitting meditation, and mindful Hatha yoga (Kabat-Zinn, 2003b; Sharma & Rush, 2014). MBSR is effective for reducing stress in cancer patients (Smith et al., 2005), workplace employees (Janssen et al., 2018), and college students with anxiety (Hazlett-Stevens & Oren, 2017) and is the origin for Mindfulness-Based Cognitive Therapy (MBCT; Kabat-Zinn, 2003b).

Mindfulness Based Cognitive Therapy

MBCT was originally designed for managing depressive symptoms (Segal et al., 2013) through an 8-session manualized group intervention (Frantz, 2013). MBCT integrates MBSR with Cognitive Behavioral Therapy (CBT) by attempting to change one's awareness of and relationship to negative thoughts, rather than reframing the contents of thoughts typical of CBT interventions (Teasdale et al., 2000). MBCT has demonstrated effectiveness in reducing stress in nursing students (Yuksel & Yilmaz, 2020), with researchers determining a MBCT-self-help curriculum to be effective in reducing stress and anxiety among college students (Taylor et al., 2014). Two MBI incorporating mindfulness that have grown out of CBT related interventions that appear to be effective in reducing anxiety symptoms are DBT and ACT.

Dialectical Behavior Therapy

Originally developed for clients with borderline personality disorder, DBT consists of four primary skills training modules: Mindfulness, Distress Tolerance, Interpersonal Effectiveness, and Emotional Regulation (Linehan, 2014). DBT focuses on using dialectics to identify strategies of acceptance and change (SAMHSA, 2021). Typically, the duration of DBT is 24 weeks and consists of weekly skills training groups, 1-hour weekly individual therapy, and clinicians providing on-call phone coaching. Researchers have demonstrated DBT Distress Tolerance skills improve college students' ability to manage emotions (Muhomba et al., 2017),

with DBT Mindfulness “What” and “How” skills effective to reduce test anxiety in college students (Lothes II et al., 2021).

Acceptance and Commitment Therapy

Developed by Steven Hayes, ACT aims to increase psychological flexibility through six core processes (Mull et al., 2020). ACT suggests these core processes fall within two grouping 1) Mindfulness and acceptance processes (i.e., Acceptance, Cognitive Defusion, Present Moment, and Self-as-Context) and 2) Commitment and behavior change processes (i.e., Present Moment, Self-as-Context, Values, and Committed Action; Hayes et al., 2006). The frequency and duration of ACT treatment varies, however, it is recommended to hold enough sessions to cover the core six processes (SAMSHA, 2021). In a meta-analysis of the effectiveness of ACT in group formats for depression and anxiety, researchers demonstrated ACT to be effective in reducing anxiety symptoms (Coto-Lesmes et al., 2020), with a web-based ACT intervention effective in decreasing distress (Levin et al., 2020) and decreasing social anxiety among college students (Levin et al., 2017).

Although a common theme across MBSR, MBCT, DBT, and ACT is the duration of the interventions (i.e., at least 8 eight weeks) and frequency of meetings (i.e., at least one time per week), college students may benefit and prefer brief MBIs (Bamber & Schneider, 2022). In a meta-analysis of MBIs for college students with anxiety, researchers determined MBIs to be significant in reducing anxiety among college students when compared to control groups, with no significant differences between structured MBIs (e.g., MBSR, MBCT) and researcher-created interventions (Bamber & Morpeth, 2019). Additionally, they found MBIs with eight or more sessions produced greater effect sizes than interventions with less than eight sessions (Bamber & Morpeth, 2019). However, given college students often have busy schedules (Peltz et al., 2021),

the time that is required to participate in these structured MBIs may be inaccessible and unable to effectively reach and engage college students struggling with anxiety (Ibes & Forestell, 2022). College students prefer MBIs that are delivered face-to-face and can be easily incorporated into their busy schedules, whether brief in nature or through course curriculum (Bamber & Schneider, 2022).

Brief Mindfulness Based Interventions

The evidence supports college students experiencing anxiety would benefit from and prefer brief MBIs that are delivered face-to face and can be integrated into their busy schedules (i.e., offered as requirement for course credit). Although there is no standard definition regarding the frequency and duration of brief MBIs, scholars suggest they range from a single session (Schumer et al., 2018) to four weeks (Howarth et al., 2019). College students referred to a university counseling center who engaged in a brief three session MBI reported increased mindfulness and decreased symptoms of depression, stress, and anxiety when compared to a control group of students in the psychology department (Parcover et al., 2018). In a systematic review of the effectiveness of brief MBIs on health-related outcomes, researchers demonstrated brief MBIs with as little as one session lasting 5 minutes contributes to positive health related outcomes (Howarth et al, 2019). Given that MBIs are effective in reducing anxiety symptoms among college students, and the ability of group interventions to reach a larger number of students than individual services, there is evidence to support the idea of combining MBIs into a group experience for college students. With brief MBIs offered in group settings able to alleviate the burden of college counseling centers, often under resourced, universities have another resource accessible on campus to benefit college students experiencing anxiety. The COVID-19 pandemic left a gap in services for college students who were asked to leave campus and refrain

from social gatherings, with one exception, in the outdoors in nature. This researcher argues the need to develop and test brief group MBIs that integrate theoretical elements from nature for college students experiencing anxiety.

Nature

The belief in the benefits of exposure to nature in human health spans thousands of years, from Aristotle (Lennox, 2002) to more recent transcendentalists such as Ralph Waldo Emerson (1836) and Henry David Thoreau (1917), and naturalists like John Muir (1901). Exposure to nature is linked to positive mental health benefits (Howell et al., 2011; Howell & Passmore, 2013) such as reducing anxiety (Bratman et al., 2015a; Coventry et al., 2021; Lackey et al., 2021) and enhancing well-being (Keniger et al., 2013). Nature has been defined in a variety of ways (Cookson, 2011; Maller et al., 2006; Public Law 88-577, 1964) leading to several theoretical models explaining the impact of influence of nature in the human nature connection (Kaplan & Kaplan, 1989; Roszak, 1992; Ulrich, 1983; Wilson, 1984).

Two dominant theories proposing different pathways in how nature benefits human beings in outdoor therapies (Harper et al., 2021). Stress Reduction Theory (SRT) suggests nature elicits unconscious emotional responses in human beings which leads to a positive influence on physiological responses to reduce stress (Ulrich, 1983), while Attention Restoration Theory (ART) suggests natural environments are the antidote to recover from mental fatigue by restoring attentional capacity (Kaplan, 1995; Kaplan & Kaplan, 1989). With exposure to nature and mindfulness practice suggested to restore attention (Kaplan, 2001), ART may be suitable to integrate with mindfulness in a nature-based mindfulness intervention aimed to reduce anxiety.

Attention Restoration Theory (ART)

Derived from the work of William James (1892), the founders of ART posit mental fatigue arises with prolonged use of *directed attention*, forced attention that requires a great deal of effort on something that is not particularly interesting, while *involuntary attention* requires no effort at all and has the capacity to restore mental fatigue (Kaplan & Kaplan, 1989). The authors propose four components, found in natural environments, provide the opportunity to rest directed attention, thus restoring cognitive capacity and reducing mental fatigue. The first component, *Being Away*, entails a physical distancing, or escape, of oneself from their current day to day environment. Kaplan and Kaplan (1989) identify three patterns from escape: distraction, putting aside ordinary work, and an internal escape (i.e., escape from mental efforts, taking a rest from pursuing current purposes). They suggest the strongest effect is through a combination of these patterns. The second component, *Extent*, includes scope and sense of relatedness one experiences in natural environments. Scope suggests there is more beyond what is immediately perceived, while relatedness refers to the perceptions that the elements of a setting are part of a larger whole, with *Extent* prompting a sense of fascination in the natural world. The third component, *Soft Fascination*, occurs when one is engaged in involuntary attention induced by the natural aesthetics of the environment (e.g., trees, clouds, sunsets, rivers) which captures attention, but does not require directed attention, restoring focus, concentration, and mental capacity, thus reducing fatigue (Kaplan, 1995; Kaplan & Kaplan, 1989). The fourth component, *Compatibility*, suggests natural environments are well suited to one's preference or purpose within that setting (Kaplan, 1995). Therefore, the four components in natural environments (i.e., *Being Away*, *Extent*, *Soft Fascination*, and *Compatibility*), induce *involuntary attention* which restores mental

fatigue (e.g., nature exposure → involuntary attention → restore mental and cognitive capacity → positive health outcomes).

Although there is an abundance of evidence supporting mental health benefits from nature exposure, the components of ART are vague, with inconsistency in the operationalization and definition of constructs (Dillman-Haso, 2020; Joye & Dewitte, 2018). The lack of operational definitions and inconsistent assessments of directed attention present challenges in identifying what aspects of natural environments restore mental capacity (Nielsen et al., 2019). One of the first instruments to operationalize ART's components and attempt to measure the restorative qualities in environments, the Perceived Restoration Scale, provided a two-factor solution, with Coherence (i.e., *Extent*) and General Restorativeness (i.e., *Being Away*, *Soft Fascination*, and *Compatibility*), rather than a four-factor solution consistent with the components of ART (Hartig et al., 1997). In assessing the restorative components of environments (i.e., perceived restorative potential), Herzog and colleagues (2003) developed four items, one per ART component. With neither *Soft Fascination* nor *Extent* predictive of perceived restorative potential, they suggest their definitions of the constructs were redundant in their efforts to make the assessment user friendly. With the challenges in defining and operationalizing the components of ART, it is difficult to parcel out what aspects of environments restore mental fatigue.

The author recognizes the challenges in defining, operationalizing, and measuring the core components of restorative environments. The causal pathways of nature's influence in outdoor therapies are unclear, with researchers conducting an umbrella review including several studies employing ART as a theoretical framework unable to identify a clear theory of change related to the role nature in outdoor therapies (Harper et al., 2021). However, for the purposes of

this research study, the core components of ART are not being measured to determine the restorative capabilities of natural environments, rather *Being Away*, *Extent*, *Soft Fascination*, and *Compatibility* are integrated with components of Mindfulness (i.e., *Attention*, *Intention*, and *Attitude*) in a psychoeducational group intervention aimed to reduce anxiety and improve mindfulness. Nonetheless, an abundance of research evidence supports the benefit of nature exposure to improve mental health functioning and reducing anxiety.

Nature Exposure and Anxiety

Nature exposure has been linked to positive mental health outcomes to include reducing anxiety (Bowler et al., 2010, Bratman et al., 2021; Bratman et al., 2015a; Jimenez et al., 2021; Lackey et al., 2021). Researchers conducting a systematic review of the mental health benefits of nature-based recreation (i.e., forms of leisure that rely on natural environments) identified fifty-one studies, with sixteen quantitative studies focused on stress and anxiety (Lackey et al., 2021). Of these sixteen studies, fourteen demonstrated significant relationships between nature-based recreation and a reduction in stress and anxiety, however most studies assessed were cross-sectional in design limiting the ability to draw causal inferences. A study which randomly assigned sixty adult participants to a 50-minute walk in either an urban or natural environment found those assigned to the nature walk experienced a significant decrease in anxiety, rumination, and negative affect compared to the urban walk (Bratman et al., 2015a). Higher percentages of green space around one's home is correlated with reducing the impacts of stressful life events (van den Berg et al., 2010) and lower levels of depression, stress, and anxiety (Beyer et al., 2014). Access to natural environments is integral for nature exposure and engagement.

Although the research evidence supports the mental health benefits from exposure to nature, individuals may have little to no access to nature. The push towards urbanization and the increase in access to technology leads human beings to spend more time indoors, decreasing regular contact with nature and may explain the increase in mental illness (Bratman et al., 2015b; Bratman et al., 2019). When access to nature is limited, nature-based guided imagery (Nguyen & Brymer, 2018), natural sounds (Jo et al., 2019), and virtual reality psychotherapy (Pisalski et al., 2020) aid in reducing anxiety. Despite these interventions developed through technological advances, with rapid urbanization, scholars suggest conservation efforts of botanical gardens (Wassenberg et al., 2015) and local parks (Keniger et al., 2013; Wood et al., 2017) as they are integral to promoting human health.

In the 21st century institutions of higher education have started to promote, develop, and preserve natural environments on college campuses with evidence to support mental and physical health benefit for college students (Rakow & Ibes, 2022). Initiatives such as Nature Rx (Rakow & Eells, 2019) and the State of the Campus Environment through the National Wildlife Federation (Mason et al., 2002) promote the positive benefits of nature exposure, advocating for developing and preserving natural environments on campus to benefit college students. With the evidence suggesting nature exposure aids in reducing anxiety, college campuses are flush with natural environments (Rakow & Eells, 2019) with students having access to nature to improve mental health functioning.

Nature Exposure and College Students

Natural environments are easily accessible to college students, with evidence supporting nature exposure to be beneficial for college student mental health. College students use campus greenspaces regularly and consider them essential to the campus environment (Speake et al.,

2013) and for alleviating stress (Seitz et al., 2014) with students that use campus greenspaces regularly having higher perceptions of their quality of life (McFarland et al., 2008). Greenspaces on college campuses are therapeutic as they enhance physical, mental, and social well-being of students (Foellmer et al., 2021). Students can engage with nature actively (i.e., exercise) or passively (i.e., sitting, studying, eating), with as little as 10 to 20 minutes of nature exposure needed to reap the benefits of nature (Barton & Pretty, 2010; Meredith et al., 2019).

Green exercise, physical activity in nature, is correlated with improved mental health outcomes. College students experience the greatest benefits when engaging in green exercise for as little as five minutes (Barton & Pretty, 2010). Walking in a natural environment for 15 minutes contributes to lower levels of anxiety among male Japanese college students when compared to those walking in urban areas during spring (Song et al., 2014), winter (Song et al., 2013), and fall (Song et al., 2015). At one university in the Southeastern United States, students actively engaging with nature (i.e., exercise) for 15-minutes per day at least four times per week reported higher quality of life and low stress compared to students passively engaging with nature (i.e., sitting, studying, eating; Holt et al., 2019). However, these results cannot be generalized to all college students in the United States, and we are unable to draw causal inferences based on the cross-sectional design of the study. Although the researchers suggest a greater dose of nature for passive greenspace users may be needed for positive mental health benefits (Holt et al., 2019), the evidence suggests both active and passive nature exposure contribute to mental health benefits for college students (Lee et al., 2011; Meredith et al., 2019).

Passive nature exposure contributes to positive mental health outcomes for college students. Students perceive passive exposure to nature (i.e., viewing natural environments) to be integral to restoring mental fatigue in breaks from their studies (Felsten, 2009). When compared

to urban environments, college students sitting and viewing nature for 15-minutes experience a decrease in physiological markers (cortisol levels, heart rate; Lee et al., 2009) and experience a decrease in stress and anxiety (Lee et al., 2011; Tsunetsugu et al., 2013). Researchers conducting a scoping review of the minimum time (i.e., dose) of nature exposure indicate both active and passive nature exposure contributes to positive mental health outcomes for college students to include reducing anxiety (Meredith et al., 2019). While the review included only 14 studies, the evidence suggests as little as 10 to 20 minutes of sitting or walking in natural environments is beneficial for college student mental health and to reduce stress and anxiety.

Both active and passive nature exposure are beneficial to college students to improve mental health outcomes and reduce anxiety. With the alarming rates of anxiety across college campuses, it is integral for institutions of higher education to prioritize developing and maintaining greenspaces for students to access regularly on college campuses. Not only is accessibility important, but also the ways in which one engages with nature environments (Nejade et al., 2022). Collectively, institutions of higher education, college counseling centers, researchers, and practitioners may be able to maximize mental health benefits for students through interventions intentionally designed to increase nature exposure and reduce mental health symptoms.

Nature-Based Health Interventions

Policymakers and healthcare professionals have increasingly advocated for nature-based health interventions (NBIs) to promote improved health and well-being amid the demand for mental health services (Lovell et al., 2018; Maund et al., 2019). NBIs are strategies, activities, and programs designed to engage people in nature-based experiences aimed to improve health and wellbeing (Shanahan et al., 2019). Nineteen experts across the globe participated in a Delphi

study to identify different types of NBIs and potential health outcomes reached consensus on twenty-seven distinct NBIs focused on health prevention, promotion of general well-being, and treatment of physical, mental, and social health issues (Shanahan et al., 2019). These NBIs fall into two broad categories, those focused on changing the environment (i.e., increased provision of public urban parks and gardens, indoor plants, community gardens) or changing human behavior (i.e., ecotherapy, green exercise, nature prescriptions). A single NBI can impact health and well-being across a variety of domains (e.g., physiological, psychological, social; Shanahan et al., 2015) and can be a cost-effective solution to improve mental health and well-being (Ibes et al., 2018; Shanahan et al., 2019).

NBIs focused on changing human behavior demonstrating effectiveness in reducing anxiety (Coventry et al., 2021; Keenan et al., 2021; Maund et al., 2019). Wetlands for Wellbeing is a NBI designed to treat anxiety and depression through engaging individuals with natural wetland environments (Maund et al., 2019). Sixteen participants engaged in the pilot of the intervention delivered over the course of six weeks, meeting for two hours per week experienced a significant reduction in generalized anxiety disorder scores from pre- to post-intervention. Although the pilot of Wetlands for Wellbeing intervention was unable to achieve statistical power and no control group used as a comparison, the researchers collected qualitative data with several participants indicating the program helped to reduce anxiety. However, the location of the intervention (i.e., wetlands) and the six-week duration of the intervention may be inaccessible for individuals who are interested or need a brief nature exposure evidenced to reduce anxiety (Keenan et al., 2021). Three Good Things in Nature is a brief NBI designed to improve mental health and well-being through five consecutive days of nature walks for 30-minutes per day and writing three good things experienced in nature (Keenan et al., 2021). Fifty participants were

randomly assigned to an experimental group (walking in nature) and a control group (walking in an urban area) with the experimental group experiencing a significant decrease in negative affect and an increase in positive affect post-intervention compared to the control group. In examining the impacts of NBIs on mental and physical health for adults, researchers conducted a systematic review and meta-analysis including randomized control trials, controlled studies, and single group pre-post studies (Coventry et al., 2021). They found large and significant effect sizes for NBIs aimed to reduce anxiety across randomized controlled trials, controlled, and uncontrolled studies, with the optimal dose of nature ranging from 20 to 90 minutes. The evidence to supports the promotion, development, use, and evaluation of NBIs to improve mental health and reduce anxiety.

Nature-based therapy is a comprehensive term describing a subset of NBIs focused on changing human behavior by integrating contact with the natural environment into the therapeutic process (Naor & Mayseless, 2021). Researchers developed a grounded theory for how practitioners experience, perceive, and work with nature towards therapeutic goals (Naor & Mayseless, 2021). They identified four themes: 1) a belief that nature is actively influencing the therapeutic process, 2) the practice of working with nature, 3) the relationship between the practitioner and nature and 4) creating conditions for clients' engagement through nature. The fourth theme includes five primary methods of intervention (creating safety and trust, facilitating internal and external awareness, teaching new ways of knowing, role modeling and invitations, and helping clients in meaning making). In designing NBIs that integrate nature into the therapeutic process, it is vital to include these themes throughout the intervention to support participant mental health benefits.

A variety of factors must be considered when selecting, developing, and implementing NBIs to include financial cost, anticipated health benefits, accessibility, and capability to deliver the intervention (Bloomfield, 2017; Shanahan et al., 2019). When implementing interventions with college students it is important to consider engagement and the attractiveness of the intervention (Bloomfield, 2017) with students preferring brief time commitments or able to easily integrate it into their busy schedules (Bamber & Schneider, 2022). College students have access to nature, with both NBIs and MBIs evidenced to reduce anxiety, scholars suggest connecting with nature enhances mindfulness practice and well-being (Albrecht & Albrecht, 2019; Van Gordon et al., 2018).

Nature-Based Mindfulness

Nature-based mindfulness connects nature with mindfulness techniques to deepen meditation practices (Van Gordon et al., 2018), encourage social activism, assist individuals to cope with climate change (Wamsler et al., 2018), to improve well-being (Kirwin et al., 2019; Sadowski et al., 2020), and enhance mindfulness practice (Albrecht & Albrecht, 2019; Van Gordon et al., 2018). Mindfulness is an integral component of shinrin-yoku (i.e., forest bathing; Owens & Bunce, 2022b), with researchers conducting a systemic review and meta-analysis of the effects of shinrin-yoku finding benefits for mental health, particularly in reducing anxiety (Kotera et al., 2022). Meditation in nature improves psychological outcomes when compared with indoor meditation (Djernis et al., 2019). While the evidence in support of nature-based mindfulness interventions to improve human health and well-being is in its infancy, the practice of integrating nature and mindfulness has been used for centuries (Albrecht & Albrecht, 2019).

Nature and Mindfulness

Scholars have explored the nature-mindfulness connection and its relationship to human health and well-being. The Biophilia Hypothesis suggests human psychological health is related to connection with the natural environment (Wilson, 1984), while Ecopsychology aims to describe the effects of the human-connection on psychological functioning and on the natural environment (Roszak, 1992). With these theories focused on the human-nature connection, the Connectedness to Nature Scale was designed to measure affective and experiential connection to nature (Mayer & Frantz, 2004), while the Nature Relatedness Scale was designed to evaluate the affective, cognitive, and experiential aspects of human connection to nature (Nisbet et al., 2009). While the evidence supports the relationship between mindfulness, psychological health, and nature connectedness (Howell et al., 2011; Wolsko & Lindberg, 2013), researchers measured mindfulness using the Mindfulness Attention Awareness Scale (Brown & Ryan, 2003) which captures only the *Attention* component of the model of mindfulness (Shapiro et al., 2006), rather than the more comprehensive FFMQ. Nature relatedness is correlated with lower levels of anxiety (Martyn & Brymer, 2016) leading researchers to investigate the relationships between nature relatedness, subjective well-being, and mindfulness in a sample of Canadian university students. They determined only the *Nonreactivity to inner experience* and *Observing* facets of mindfulness from the FFMQ partially mediated the positive relationship between positive affect and nature relatedness, while only the *Nonreactivity to inner experience* construct fully mediated the negative relationship between nature relatedness and negative affect. (Sadowski et al., 2020). This author argues nature-based mindfulness is a process, not just one's connection to nature, with scholars suggesting a reciprocal relationship between nature and mindfulness (Van Gordon et al., 2018). While the evidence suggests psychological benefits from mindfulness and

connectedness to nature or nature relatedness, the cross-sectional design of these studies limits the ability to draw causal inferences on the impacts of nature-based mindfulness interventions.

Nature-Based Mindfulness Interventions

Recently, the impacts of nature-based mindfulness interventions have been explored in outdoor education and adventure therapy programs. Researchers examining mindfulness-based experiences for young males with substance use disorders in a 90-day adventure therapy program found improvements in the *Nonjudging of inner experience* and *Nonreactivity to inner experience* facets from the FFMQ correlated with a decrease in overall subjective distress (Russell et al., 2016). In outdoor education, researchers exploring the impact of a nature-based 8-day Outward Bound Mindfulness Program (OBMP) on positive affect and mindfulness conducted a pilot study with 14 adults, with approximately 5 hours per day dedicated to mindfulness practice (Kirwin et al., 2019). When compared to the control group recruited via social media who did not receive any intervention, the participants in the OBMP intervention group demonstrated significant increases in mindfulness scores and positive affect post-intervention, with the results being maintained at a 3-month follow-up. While evidence from these pilot studies supporting the positive benefits for nature-based mindfulness interventions in outdoor education and adventure therapy programs, these interventions may be inaccessible due to the time required to be a remote natural environment (8 days to 90 days) and financial cost of these programs (Russell et al., 2008).

Nature-based mindfulness interventions offered in an outpatient type capacity provide positive mental health benefits and are more accessible than those offered in remote natural settings. Researchers exploring the impacts of a nature-based mindfulness intervention for individuals from high-stress jobs randomly assigned participants to intervention (n = 107) and

waitlist control groups (n = 12; Lucke et al., 2019). Participants in the intervention group met for two evenings per week and one-half day training per month over a period of two months, while participants from the waitlist control group received the same training after the intervention group was completed (Lucke et al., 2019). Those in the intervention group experienced an increase in overall mindfulness scores, self-efficacy scores, and a reduction in psychological and psychiatric symptoms, however there was no statistical difference when compared to the much smaller waitlist control group. Additionally, the researchers used the Freiburg Mindfulness Inventory, a mindfulness measure which includes aspects of attention, acceptance, and mental openness, with previous evidence supporting the awareness component of mindfulness rather than acceptance is more strongly correlated with nature connectedness (Howell et al., 2011; Wolsko & Lindberg, 2013). A limitation of this study is the researchers did not articulate the details of the intervention, whether it was created by the researchers or an adapted version of a structured MBI offered in nature. In a study investigating the benefits of an adapted brief MBSR intervention, participants were randomly assigned to one of three different environments (i.e., natural outdoors, built outdoors, and indoors) meeting one-hour per week over six weeks (Choe et al., 2020). Those in the natural outdoor environment group experienced a decrease in rumination, an increase in reflective attitudes and a decrease in rumination and stress compared to the indoor or built environments, however, the researchers did not control for additional mindfulness practice outside of structured sessions by participants, with mindfulness practice and experience a confounding variable in measuring mindfulness and psychological well-being (Baer et al., 2006). The results of these two studies should be interpreted with caution, with only 56 of the 107 participants in the intervention completing all measures for the study (Lucke et al., 2019) and only 56% of participants completing all six weekly MBSR sessions (Choe et al., 2020).

While the preliminary evidence is promising, the duration of nature-based mindfulness interventions over six to eight weeks are subject to attrition, an important consideration when offering interventions to college students.

Nature-Based Mindfulness Interventions and College Students

While there is research to support the benefits of MBIs and exposure to nature on college student mental health, there is limited evidence on the impact of nature-based mindfulness interventions for college students experiencing anxiety. Researchers investigating the impacts of a 5-day residential program on reducing stress and improving mental health outcomes for Danish university students experiencing moderate to high levels of stress randomly assigned participants to one of three conditions: indoors, natural outdoor setting, and a control group (Djernis et al., 2021). Although researchers found a moderate effect size post-treatment for perceived levels of stress between the indoor and control group participants, the results were non-significant. Contrary to previous research from a systemic review and meta-analysis on the effects of mindfulness training in outdoor settings (Djernis et al., 2019), the authors did not find a difference in mindfulness and perceived stress scores for participants in the indoor and natural outdoor settings (Djernis et al., 2021). The researchers indicate the design of the indoor environment for the study emphasized core components of ART, possibly emulating the restorative qualities of natural environments (Djernis et al., 2021). While the authors argue the advantage of this program can reduce attrition compared to mindfulness programs requiring weekly attendance citing a dropout rate of 3%, college students prefer mindfulness interventions with brief time commitments or able to easily integrate it into their busy schedules (Bamber & Schneider, 2022).

Few researchers have explored the mental health impacts of brief nature-based mindfulness interventions among college students. In exploring the impacts of a 20-minute meditation on mood disturbance, researchers randomly assigned college students to either the outdoor or indoor conditions (i.e., location), and in each location, assigned students to participate in a 20-minute meditation or to a control condition (i.e., activity) of writing daily activities in a typical week (Ibes & Forestell, 2022). Students in the outdoor condition experienced a greater reduction in mood disturbance compared to the indoor condition regardless of activity, and students participating in the 20-minute meditation experienced a greater reduction in mood disturbance compared to the control task, regardless of location. Although they found no added benefit of meditation in the outdoor location in this study, there is evidence to support that brief meditation in nature enhances mental health benefits for college students compared to meditating in indoors, and a control group (Owens & Bunce, 2022a). Interestingly, they found students in the indoor control condition who rarely engaged in outdoor activities experience an increase in mood disturbance. Researchers at a mid-Atlantic university piloted a 1-minute and 5-minute nature-based mindfulness walk with participants asked to respond to written comment cards at the end of each walk to assess psychological effects of the intervention (Ibes et al., 2018). Although 96% of the participants indicate positive psychological effects, with 82% indicating stress reduction the most common effect, only 336 out of the 558 participants in the study, 78% from the 1-minute walk (n = 94) and 55% from the 5-minute walk (n = 242) completed the written comment cards. While the results are promising, this study poses several limitations to include no comparison or control group, no use of standardized assessments, and no pre-test scores. In a more rigorous study exploring the impact of a 20-minute walk on mood, researchers randomly assigned 100 Canadian university students to one of three conditions: a guided walk

outdoors, outdoors with mindfulness, or indoors. Students walking outdoors (with and without mindfulness) experienced an increase in positive mood compared to those walking indoors, while students walking outdoors with mindfulness experienced a greater reduction in negative affect compared to the other two conditions (Nisbet et al., 2019). While the preliminary evidence supports mental health benefits of brief nature-based mindfulness interventions among college students, of the studies reviewed students engaged in these interventions without social interaction.

While the preliminary evidence supports mental health benefits of nature-based mindfulness interventions there are several considerations to note. First, this author argues the social interaction among students may enhance the benefits of brief nature-based mindfulness interventions (Leavell et al., 2019). Second, regarding group nature-based mindfulness interventions, there is limited details of researcher created group nature-based mindfulness interventions (Kirwin et al., 2019; Lucke et al., 2019), such as whether the interventions are process oriented or psychoeducational in nature. Third, a major flaw in the nature-based mindfulness literature is the lack of articulating the integration of nature and mindfulness in the intervention design. While structured MBIs in natural environments appear to result in positive mental health benefits (Choe et al., 2020), this author argues the need to intentionally integrate theoretical components of nature and mindfulness into nature-based mindfulness interventions given the reciprocal relationship between mindfulness and natural environments (Van Gordon et al., 2018). Given the mixed evidence on the benefits of nature-based mindfulness interventions for college students and which constructs of mindfulness are correlated with mental health benefits (Howell et al., 2011; Russell et al., 2016; Sadowski et al., 2020; Wolsko & Lindberg,

2013), it is important to identify the potential pathways in which nature-based mindfulness interventions may reduce anxiety.

Nature-Based Mindfulness Training

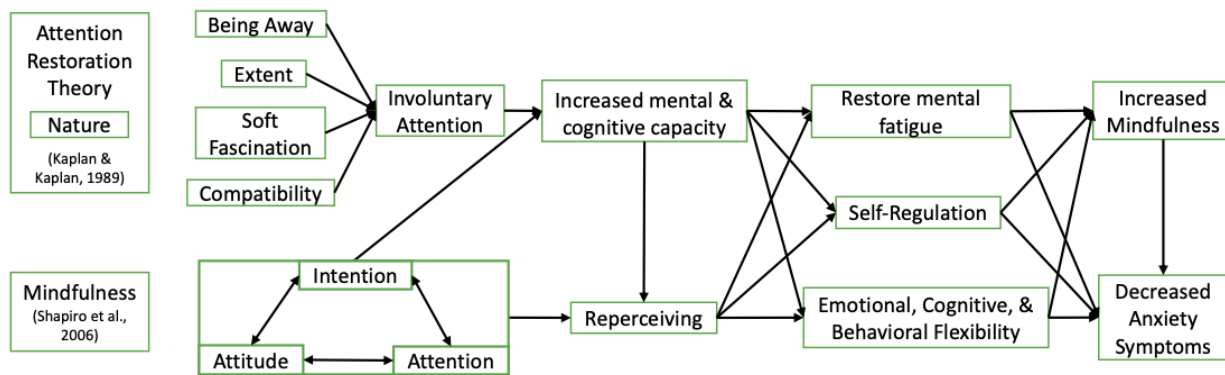
This author developed Nature-Based Mindfulness Training (NBMT) which is designed to be delivered outdoors in nature and integrates key components of ART and Mindfulness in a brief psychoeducational group intervention aimed to reduce anxiety. NBMT is 90-minutes in length and consists of eight to twelve group members. Mindfulness enhances the restorative characteristics of an environment, and natural environments aid in the progression of mindfulness practice; both are suggested to restore attentional capacities, thus restoring mental fatigue (Kaplan, 2001). In developing a nature-based mindfulness intervention integrating theoretical constructs of nature and mindfulness, ART is appropriate as it describes a process as how nature positively impacts human beings, rather than solely one's connection to natural environments. In designing NBIs that integrate nature exposure into the therapeutic process, scholars suggest program developers identify the specific intervention components, proposed causal pathways (i.e., theory of change) specific to the type of nature experience, and the intended mental health outcomes (Harper et al., 2021; Mygind et al., 2019).

Proposed Causal Pathways

While the specific components of the NBMT intervention will be described in future chapters, the author proposes the integration of the core components of Mindfulness (i.e., *Attention, Intention, and Attitude*; Shapiro et al., 2006) and ART (i.e., *Being Away, Extent, Soft Fascination, and Compatibility*; Kaplan & Kaplan, 1989) into the NBMT intervention aimed to improve mindfulness and reduce anxiety. ART suggests “involuntary attention” induced by natural environments leads to increased cognitive capacity to restore mental fatigue, while

mindfulness suggests intentional attention to the present moment leads to a shift in perspective. With both nature activities and quiet activities compatible with reflection (Kaplan, 1993) the author suggests once involuntary attention is induced by nature, the pleasing aesthetics of natural environments offset the potential discomfort of mindfulness practice, expediting *Reperceiving*. As indicated in Figure 1, the author suggests the core components of mindfulness are integrated once involuntary attention has been stimulated. With NBMT newly created by the author, the purpose of this research study is not to test these proposed causal pathways, rather the purpose is to test the NBMT intervention to determine its impact on anxiety symptoms and mindfulness among undergraduate college students.

Figure 1: Integrating Core Components of Attention Restoration Theory and Mindfulness



Tying it Together

While brief nature-based mindfulness interventions appear beneficial to college student mental health and mood, there has yet to be a study examining the impact of a brief nature-based mindfulness intervention among college students experiencing anxiety. With the mental health crisis on college campuses accelerating, specifically anxiety, there is a need to develop and test brief nature-based mindfulness interventions that are accessible, cost-effective, and attractive to college students to promote their mental health and reduce anxiety. The primary goals of prevention science are to understand the onset, development, and course of presenting problems,

and to design and test interventions that promote healthy functioning (Society for Prevention Research, 2011).

Anxiety is increasing among the college student population due to societal changes (Martin et al., 2022), increased social media use (Bettmann et al., 2021), academic distress (Beiter et al., 2015), financial stress (Archuleta et al., 2013), and limited social supports (i.e., peer support and family support; Hefner & Eisenberg, 2009), leading to adverse mental health outcomes (Mofatteh, 2021; Moskow et al., 2022). MBIs are one promising solution to support college students experiencing anxiety, with several structured MBIs (i.e., MBSR, MBCT, DBT, ACT) lasting at least 8 eight weeks and meeting at least one time per week. Although MBIs with eight or more sessions produce greater effects than interventions with less than eight sessions (Bamber & Morpeth, 2019), brief MBIs aid in reducing anxiety (Howarth et al., 2019; Parcover et al., 2018), with college students preferring MBIs that can be easily incorporated into their busy schedules, whether brief in nature or through course curriculum (Bamber & Schneider, 2022). A second promising solution to combat the increase in anxiety among college students is increasing exposure to nature. College campuses are full of natural environments (Rakow & Eells, 2019), with the evidence supporting brief periods of nature exposure effective in reducing anxiety in students (Barton & Pretty, 2010; Tsunetsugu et al., 2013). Both access to nature and MBIs are accessible on college campuses with brief nature-based mindfulness interventions accessible, cost-effective, and attractive to college students with mental health benefits (Ibes et al., 2018; Nisbet et al., 2019; Owens & Bunce, 2022a). The intentional integration of Mindfulness and ART in the NBMT intervention may be a potentially powerful intervention to reduce anxiety symptoms and improve mindfulness. The NMBT intervention can reach more students, meeting

the increased demand for mental health services and may alleviate the burden of under-resourced college counseling centers to support college students experiencing anxiety.

As I have argued throughout chapter I and II, the mental health crisis on college campuses is accelerating, with a need for innovative, attractive, accessible, and brief interventions to support students experiencing anxiety. The next chapter will present the methodology, design, and procedures for the research study. Subsequent chapters will detail the findings of the study and the implications for college students experiencing anxiety, college counseling centers, and institutions of higher education.

CHAPTER III: METHODOLOGY

The need and rationale for the study discussed in Chapter I and II argues for the importance of intentionally integrating theoretical constructs from nature-based theories and mindfulness in designing a Nature-Based Mindfulness Training (NBMT) intervention aimed to reduce anxiety symptoms. The study outlined examines the impact of a 90-minute NBMT intervention on undergraduate college students' anxiety scores, mindfulness scores, and how engagement with the intervention impacts anxiety scores. This chapter includes a description of the methodology for the study to include research questions and hypotheses, participants, intervention development, instruments, procedures, and the plan for data analysis.

Research Questions and Hypotheses

The present study examines the following research questions:

Research Question 1: What is the impact of a 90-minute Nature-Based Mindfulness Training intervention on anxiety scores for undergraduate college students pre to post-test compared to a control (delayed intervention) group?

Hypothesis 1: Participation in the 90-minute Nature-Based Mindfulness Training intervention will result in a significant decrease in anxiety scores from pre to post-test for the intervention group compared to the control (delayed intervention) group.

Research Question 2: What is the impact of a 90-minute Nature-Based Mindfulness Training intervention on mindfulness scores for undergraduate college students pre to post-test compared to a control (delayed intervention) group?

Hypothesis 2: Participation in the 90-minute Nature-Based Mindfulness Training intervention will result in a significant increase in overall mindfulness scores and subscale scores (*Observing, Describing, Acting with Awareness, Nonjudging of inner experience, and*

Nonreactivity to inner experience) from pre to post-test for the intervention group compared to a control (delayed intervention) group.

Research Question 3: What is the impact of a 90-minute Nature-Based Mindfulness Training intervention on anxiety scores for undergraduate college students post-test to one-week follow up compared to a control (delayed intervention) group?

Hypothesis 3: Participation in the 90-minute Nature-Based Mindfulness Training intervention will result in a significant decrease in anxiety scores from post-test to one-week follow up for the intervention group compared to the control (delayed intervention) group.

Research Question 4: What is the impact of a 90-minute Nature-Based Mindfulness Training intervention on mindfulness scores for undergraduate college students post-test to one-week follow up compared to a control (delayed intervention) group?

Hypothesis 4: Participation in the 90-minute Nature-Based Mindfulness Training intervention will result in a significant increase in overall mindfulness scores and subscale scores (*Observing, Describing, Acting with Awareness, Nonjudging of inner experience, and Nonreactivity to inner experience*) from pre to post-test for the intervention group compared to a control (delayed intervention) group.

With this study of a 90-minute NBMT intervention being a new area for scientific inquiry for undergraduate college students with anxiety, preliminary exploratory questions include:

Research Question 5: How engaged are participants during a 90-minute NBMT intervention?

Research Question 6: How does engagement during a 90-minute NBMT intervention impact change in undergraduate college student anxiety scores from pre to post-test?

Hypothesis 6: Higher engagement with the NBMT intervention will result in a significant decrease in anxiety scores from pre- to post-test.

Research Question 7: How does engagement during a 90-minute NBMT intervention impact change in undergraduate college student anxiety scores from post-test to one-week follow-up?

Hypothesis 7: Higher engagement scores with the NBMT intervention will result in a significant decrease in anxiety scores from post-test to one-week follow-up.

Methodology

The present study utilized a quantitative two-group quasi-experimental switching replication with treatment removal design. The first group received the initial intervention (e.g., treatment) while the second group served as a control and delayed intervention group. When the treatment is removed from the first group, it was added to the second group with participants receiving the same intervention, although delayed. This design is appropriate given several considerations. First, the two-group quasi-experimental switching replication with treatment removal design strengthens the rigor of the study, with the second group serving as a control to the initial intervention group. Ethically, this design ensures all participants receive the intervention. Second, due to practical limitations, it was challenging to randomly assign undergraduate college students in the same university to different conditions, specifically given the diversity with student schedules for the 1.5-hour time for the intervention. Although a major threat to validity for this quasi-experimental crossover design is selection bias (Handley et al., 2018; Miller et al., 2020), given the second group serves as a control for comparison to the initial intervention group, the researcher was intentional to reduce selection bias with the group assignment procedures described below. Third, collecting data from multiple time points (i.e.,

pre-test, post-test, and one-week follow up) allowed the researcher to compare results between the initial intervention group(s) and control group, allowing for within group comparisons minimizing error in the study. With the intervention group(s) consisting of a maximum of twelve participants per group, the researcher held several initial intervention groups for the purposes of this study to be compared to several control group. Fourth, given the study involves an intervention, the quasi-experimental design allows the researcher to evaluate the impact of the NBMT intervention in a natural setting (i.e., outdoors in nature on a college campus), which helped to increase the external validity of the study.

Participants

Convenience sampling was obtain the target sample for the study from the researcher's university, undergraduate college students who self-identified experiencing symptoms of anxiety.

Inclusion Criteria

Inclusion criteria for participation in the research study are as follows:

1. Participants must be 18 years of age or older
2. Participants must be enrolled as an undergraduate student at one institution
3. Participant must be currently enrolled in an undergraduate Counseling and Educational Development course at one institution or on the waitlist for counseling services through the Nicholas A. Vacc Counseling and Consulting Clinic
4. Participants must self-identify to experience anxiety

College student status (e.g., full-time versus part-time, residing on campus versus commuting) is not an exclusion criterion. According to G*Power a prior power analysis, to achieve a statistical power of 0.80 with a moderate effect size at the level of significance with

two measurements ($\alpha = 0.05$), a total of 34 participants is needed to rigorously analyze the data. A moderate effect size is appropriate as researchers conducting a meta-analysis exploring the impact of mindfulness meditation on college student anxiety indicated most studies resulted in a medium to large effect size (Bamber & Morpeth, 2019), while a meta-analysis examining mindfulness-based therapy finding moderate effects for improving anxiety (Hofmann et al., 2010). Additionally, a nature-based mindfulness interventions with college students yielded a medium effect size (Djernis et al., 2021). Regarding exploratory research questions 6 and 7, with level of engagement with an intervention indicative of reducing anxiety symptoms (Glenn et al., 2013), a G*Power a prior power analysis, to achieve a statistical power of 0.80 with a moderate effect size at the level of significance with one predictor variable ($\alpha = 0.05$), a total of 55 participants is needed to rigorously analyze the data. Although 34 participants are needed for the primary research questions, a total of 55 participants is needed to answer researcher questions 6 and 7. The researcher acknowledges the potential of not being able to answer exploratory research questions if the necessary sample size is not obtained. Participant involvement in the research study lasted approximately two months.

Intervention

The NBMT intervention presented is a psychoeducational group designed to reduce anxiety, delivered outdoors in nature, consisting of eight to twelve group members, and is 90-minutes in length. Eight to twelve participants per intervention group for NBMT is appropriate for psychoeducational groups as is the timeframe with 1.5 to 2 hours recommended for psychoeducational groups (Corey et al., 2018; Gladding, 1994) including group MBIs (e.g., DBT; Linehan, 2014). The purpose of the training is to reduce college student anxiety symptoms and increase college student mindfulness scores. Specifically, the NBMT intervention integrates

theoretical constructs of Mindfulness (Shapiro et al., 2006) and ART (Kaplan & Kaplan, 1989) with both psychoeducational and experiential components (Appendix A). Participants were provided a journal at the start of the training to be used throughout the 90-minute group, outlining psychoeducation content and prompts for experiential and writing activities (Appendix B). The researcher shared with participants at the start of the group that if they feel distressed or dysregulated, they are able to leave the group and walk themselves to the Counseling Center on campus.

The training started with the group facilitator introducing themselves and asking participants to introduce themselves to the group. The group facilitator serves as a model for participants, creating safety and trust within the group which is one of the primary interventions identified in practitioners providing nature-based therapies (Naor & Mayseless, 2021). The facilitator focused participant's attention to the group setting, outdoors in nature, highlighting the benefits exposure to nature has in reducing symptoms of anxiety (Bratman et al., 2015a; Coventry et al., 2021; Lackey et al., 2021) with as little as 5 to 10 minutes of nature exposure beneficial to college student mental health (Barton & Pretty, 2010; Meredith et al., 2019). Next, the facilitator guided participants in labeling their anxiety, with the phrase "name it to tame it" coined by Dr. Daniel Siegel, suggests naming emotions increase the ability to tame, or manage, this emotion (Dalai Lama Center for Peace and Education, 2014; Siegal & Bryson, 2015). Researchers have demonstrated evidence to support affective labeling as a form of implicit emotion regulation (Torre & Lieberman, 2018), effective in reducing pre-competition anxiety in athletes (Mellalieu et al., 2003), and reducing public speaking anxiety (Niles et al., 2015).

With participants naming their anxiety, the facilitator guided group members to set their intention for NBMT, asking participants to reflect on their purpose (i.e., the why) for

participating in the training and writing their responses in the journal. After setting intentions for the NBMT intervention, the facilitator prompted participants to reflect on a broader life goal statement, asking participants to draw and write this goal and be prepared to share it with the group. With intention a core component of Mindfulness (Shapiro et al., 2006) found in both MBSR and MBCT (Marchand, 2012), NBMT aims to have participants identify intentions both for their time during the intervention and a more global intention in their life. Next, the facilitator provided information to participants to pay attention to the moment to both internal and external experiences (i.e., the what), a core component of mindfulness (Shapiro et al., 2006), followed by a nature-based grounding exercise. Next, the facilitator provided psychoeducation on ways to practice mindfulness (i.e., the how), with researchers demonstrating DBT Mindfulness “What” and “How” skills effective to reduce anxiety among college students (Lothes II et al., 2021). With the participants learning the core components of NBMT to this point, the facilitator guided group members through a 10-minute Nature-Based Guided Meditation developed by the researcher to be specific to the location of the intervention while intentionally incorporating psychoeducational information learned to this point in the training. After the guided meditation, the facilitator directed participants to write responses to three questions outlined in the journal, with reflective journaling a tool to reduce anxiety symptoms among undergraduate college students (Contreras et al., 2020). The intervention concluded with participants writing their top three takeaways from the NBMT interventions and completing the student engagement and post-group feedback questions.

Instruments

Generalized Anxiety Disorder (GAD-7)

To assess anxiety related symptoms, the widely used 7-item Generalized Anxiety Disorder (GAD-7) self-report measure was utilized (Appendix C; Spitzer et al., 2006). Participants were given instructions to respond to statements (i.e., items) indicating how often they have been bothered by specific problems in the past week, an adaption to the original instructions of the GAD-7 which asks participants to respond reflecting on the past two weeks. The GAD-7 is measured on a four-point Likert scale ranging from 0 “not at all” to 3 “nearly every day”. Sample items from the GAD-7 include: “Feeling nervous, anxious, or on edge”, “Not being able to stop or control worrying”, and “Trouble Relaxing” (Spitzer et al., 2006). The GAD-7 includes an eighth question asking participants if they experienced any symptoms of anxiety to indicate how difficult the problems have made it to do work, take care of responsibilities, or to get along with other people with four responses ranging from “not difficult at all” to “extremely difficult”. The GAD-7 score were calculated by summing the scores from the first 7 items with higher values indicating more severe anxiety. The cutoff scores for the GAD-7 are as follows: 0-4 = minimal anxiety; 5-9 = mild anxiety; 10-14 = moderate anxiety; 15-21= severe anxiety. Given the length of the GAD-7, it is less time consuming to complete compared to the 21-item Beck Anxiety Inventory (BAI; Beck et al., 1988) and the 40-item State-Trait Anxiety Inventory (Spielberger et al., 1983). The GAD-7 considers cognitive-affective, somatic, functional, and behavioral impairments (Sriken et al., 2022) making it more appropriate than the 6-item anxiety subscale of the Brief Symptom Inventory assessing only cognitive and affective symptoms (Derogatis, 2001). Additionally, the GAD-7 is more appropriate than the anxiety subscale of the Depression Anxiety Stress Scale (DASS; Lovibond & Lovibond, 1995), with the 7-item anxiety

subscale of the DASS-21 (Antony et al., 1998) assessing for symptoms more closely resembling panic disorder than anxiety (Brown et al., 1997). The initial study developing GAD-7 in a sample of 2,740 adult patients demonstrated great internal consistency ($\alpha = 0.92$), convergent validity with both the BAI ($r = 0.72$) and the anxiety subscale of the Symptom Checklist-90 ($r = 0.74$; Spitzer et al., 2006), and items loading onto a single factor which is consistent with recent research (Borgogna et al., 2021; Byrd-Bredbenner et al., 2020; Lowe et al., 2008; Parkerson et al., 2015; Sriken et al., 2022). Although researchers indicate the GAD-7 may underestimate anxiety symptoms for Black/African Americans (Parkerson et al., 2015), in a study exploring the factorial validity and measurement invariance of GAD-7 scores for college students, researchers found the GAD-7 demonstrated great reliability ($\alpha = 0.91$), discriminant validity with Alcohol Use Disorder Identification Test ($r = 0.11$) and the Social Justice Scale ($r = 0.04$), with strong measurement invariance across genders (e.g., men and women) and racial groups (e.g., White and Nonwhite; Sriken et al., 2022). Researchers have demonstrated scalar or partial scalar invariance for the GAD-7 across gender identities and sexual orientations in a sample of diverse college students (Borgogna et al., 2021). Additionally, researchers have demonstrated the GAD-7 to be able to detect treatment related changes in adults with anxiety (Mossman et al., 2017; Toussaint et al., 2020).

Mindfulness (FFMQ-15)

To assess mindfulness, the 15-item self-report measure of the Five Facet Mindfulness Questionnaire (FFMQ-15) was utilized (Appendix D; Baer et al., 2012; Gu et al., 2016). The FFMQ-15 was developed from the original 39-item assessment (FFMQ-39; Baer et al., 2006) and measures five constructs of mindfulness, Observing, Describing, Acting with awareness, Nonjudging of inner experience, and Nonreactivity to inner experience. Participants were given

instructions to respond to how true the statements (i.e., items) are for them, measured on a five-point Likert scale ranging from 1 “never or very rarely true” to 5 “very often or always true” (Gu et al., 2016). Sample items from each of the FFMQ-15 subscales include: “I pay attention to sensations, such as the wind in my hair or sun on my face” (Observing), “I am good at finding words to describe my feelings” (Describing), “I find myself doing things without paying attention” (Acting with awareness), “I tell myself I shouldn’t be feeling the way I’m feeling” (Nonjudging of inner experience), and “When I have distressing thoughts or images I am able just to notice them without reacting” (Nonreactivity to inner experience; Gu et al., 2016). The total mindfulness score ranges from 15 to 75 and were calculated by summing all items, with items 3, 4, 7, 8, 9, 13, and 14 reversed scored. The mindfulness subscale scores range from 3 to 15 and were calculated by summing all items (accounting for reverse scored items) for each of the five facets: Observing (1, 6, and 11), Describing (2, 7, and 12), Acting with awareness (3, 8, and 13), Nonjudging of inner experience (4, 9, and 14), and Nonreactivity to inner experience (5, 10, and 15). Higher total mindfulness and subscale scores indicate a higher tendency to be mindful in daily life. The FFMQ-15 demonstrates good internal consistency for total mindfulness scores ($\alpha = 0.80 - 0.85$), and adequate to strong internal consistency for mindfulness subscale scores ($\alpha = 0.60 - 0.94$) when measured across the course of a MBSR program (Baer et al., 2012). Additionally, the FFMQ-15 demonstrates convergent validity with the FFMQ-39 with adequate internal consistency across subscales pre-MBCT intervention ($\alpha = 0.64 - 0.80$) and post-MBCT intervention ($\alpha = 0.69 - 0.83$) and is recommended as an alternative measure when shorter forms are needed (Gu et al., 2016).

Researchers have indicated nonsignificant relationships between the Observing construct and psychological adjustment in a sample of nonmeditators (Baer et al., 2008), suggesting a four-

factor structure may be more appropriate for those with little or no meditation experience (Gu et al., 2016). The nonsignificant relationship between the Observing construct and other facets of mindfulness is reflected in previous literature (Baer et al., 2006; Baer et al., 2008; Curtiss & Klemanski, 2014; Williams et al., 2014), with researchers suggesting those with little to no meditation experience may observe in a way that is maladaptive and not consistent with common mindfulness practice (i.e., nonjudging, acting with awareness; Gu et al., 2016).

Student Engagement (SE)

To assess participant engagement, the researcher used a 6-item Student Engagement (SE) scale self-report measure (Appendix E; Hansen et al., 2019). The researcher adapted the language in the SE scale to reflect the NBMT intervention. As the SE scale was intended for middle school aged students in a drug prevention program, the researcher evaluated the adapted SE scale during the pilot study, described below. The SE scale consists of single items measuring participant enjoyment, activity during intervention, attentiveness, and program value, with two items measuring group leader enthusiasm. Participants were given instructions to respond to each question (i.e., item) by selecting one answer from either three or four response categories. Sample items from the adapted version of the SE scale include: “Did your group leader pay attention to you when you spoke in group?” (Group leader enthusiasm), “Did you enjoy Nature-Based Mindfulness Training?” (Enjoyment), “How often did you share your opinion during Nature-Based Mindfulness Training?” (Activity during NBMT), “How often did you pay attention during Nature-Based Mindfulness Training?” (Attentiveness), and “Did Nature-Based Mindfulness Training help you think about what was important to you to manage your mental health?” (Program value). Items with three response categories hold weights of 0, 5, or 10, while items with four response categories held weights of 0, 3.33, 6.67, or 10. The total SE scale

summary score ranges from 0 to 10 and were calculated by adding the weighted values 6-items for each participant and dividing by 6, with higher values indicative of greater levels of engagement during the intervention. Although the researchers identified a value of 8 or higher indicating a superior level of engagement, they acknowledge this value is arbitrary and is sample specific (Hansen et al., 2019). The SE scale was developed for *All Stars Core*, a drug prevention program geared towards middle school aged students, with all six items loading on a single factor (eigenvalue = 2.95) and demonstrating good internal consistency ($\alpha = 0.79$; Hansen et al., 2019). With a variety of engagement measures either lengthy (Appleton et al., 2006; Macgowan & Frederick, 2005), geared towards digital or eHealth interventions (Couper et al., 2010; Perski et al., 2020; Short et al., 2018), objective measures (e.g., regular attendance, homework completion; Bijerk et al., 2022), or measuring client satisfaction (Attkisson & Zwick, 1982), the researcher opted for the SE scale for its brevity, ease of use, and ability to be adapted to the NBMT intervention.

Demographics

Participants were asked to provide demographic information including grade level in school, age, gender identity, race, and ethnicity. Participants were asked to provide frequency of mindfulness practice for at least 10 minutes per day and frequency of intentional nature exposure for at least 5 to 10 minutes per day. Please refer to Appendix F for the list of questions used to collect demographic information.

Weather

The researcher recorded the following weather characteristics for each intervention group: temperature, cloud cover, precipitation, humidity, and windspeed.

Intervention Feedback Questions

To gain information about the impact of spending time in nature and interaction with peers on better understanding mindfulness and impact on anxiety, the researcher used a combination of slider scale questions, Likert scale questions, and open-ended questions. To gain information about participant self-efficacy after engaging in the intervention, the researcher used one Likert scale question and three open-ended questions. Please refer to Appendix N for intervention feedback questions.

Procedures

Convenience sampling was used to recruit participants, undergraduate college students experiencing anxiety, from the researcher's current institution. The researcher marketed the NBMT intervention to undergraduate college students interested in receiving services through the Nicholas A. Vacc Counseling and Consulting Clinic (Vacc Clinic) and to undergraduate students enrolled in Counseling and Educational Development (CED) courses. NBMT was offered as an alternative option for students enrolled in undergraduate CED classes to receive course credit in lieu of either 1) individual counseling services through the Vacc Clinic or 2) a written assignment. It is a requirement for students enrolled in undergraduate CED courses to meet with a counselor at the Vacc Clinic for three to four individual counseling sessions or complete a written assignment. The researcher developed a marketing flyer (Appendix G) including the title of the study, a short purpose statement for the study, inclusion criteria, time requirements for the study, location for the NBMT intervention, anticipated group dates and times, contact information for the researcher, and a QR code directing prospective participants to a Qualtrics survey. Additionally, the researcher developed a short PowerPoint Presentation (Appendix H) that was used for recruiting participants. The researcher coordinated with

instructors for CED undergraduate courses to attend each CED course and delivered a 5-10-minute in-person presentation to recruit for the research study. During these presentations, the researcher introduced himself, provided a brief description of the study, outlined the time requirements for participating in the study (i.e., completing five rounds of Qualtrics surveys one time per week for approximately 5 minutes per survey administration, participating in one 90-minute NBMT intervention group followed by a 5-minute Qualtrics survey at the conclusion of the group), and provided possible benefits from study participation. The researcher was clear to articulate that full participation in the study, completing the five Qualtrics surveys within a 72-hour timeframe, participating in one 90-minute NBMT intervention group, and completing one 5-minute post-group Qualtrics survey serves as course credit in lieu of the two assignment options. The researcher distributed a paper version of the marketing flyer during the presentations to prospective participants and had undergraduate course instructors post an electronic version of the flyer to their undergraduate course pages. After all recruitment presentations were completed, the researcher emailed instructors for undergraduate CED courses a follow-up email to share with their students, outlining the details discussed during the presentation. The researcher emailed the marketing flyer to students currently on the Vacc Clinic waitlist. Participants who signed up for the study were removed from the Vacc Clinic waitlist.

The researcher asked students interested in participating in the NBMT intervention to use the QR code from the marketing flyer to complete a Qualtrics Survey to enroll in the study. Participants who scan the QR code arrived at a set of questions in the Qualtrics Survey to determine inclusion criteria to indicate if they are an undergraduate student at the researcher's institution, if they are enrolled in a CED undergraduate course or if they are currently on the waitlist at the Vacc Clinic, and whether they currently experience anxiety. If participants meet all

inclusion criteria and expressed a desire to participate in the research study, they arrived to the informed consent document, with the researcher asking participants to review the informed consent document, and to sign and date the document. Next, the participants were asked to complete a set of demographic questions (see Appendix F). Next, participants identified and ranked their preference for when they are available to participate in predetermined dates and times for the NBMT intervention. Lastly, participants were asked to provide their email address and phone number and indicate if they consent to the researcher reaching out to participants via phone to leave a voicemail. Interested participants had approximately two and a half weeks to complete the initial Qualtrics survey to be eligible to participate in the research study.

Intervention and Control Group Assignment

Upon collecting initial survey responses from eligible and interested participants, the researcher assigned participants based on the following three steps to either one of the initial intervention groups or the delayed intervention/control group. These included (1) compatibility with the participants availability and the dates and times of groups offered, (2) frequency of intentional nature exposure for 5-10 minutes per day, and (3) frequency of mindfulness practice for at least 10 minutes per day.

First, participants were assigned based on their preferred availability with the dates and times of groups being offered. Participants who offered availability for more than one group, were matched into intervention and control/delayed intervention groups based on weekly frequency of intentional nature exposure and weekly frequency of mindfulness practice to initial intervention groups and the delayed intervention/control group to reduce selection bias. A duration of at least 10 minutes of mindfulness practice per day was selected with evidence from a systemic review of brief MBIs positively impacting health-related outcomes finding the median

length of interventions lasting 10 minutes (Howarth et al., 2019). Duration of intentional nature exposure for at least 5 to 10 minutes per day was selected with researchers indicating this timeframe is the minimum dose of nature exposure needed to experience mental health benefits from nature exposure (Barton & Pretty, 2010; Meredith et al., 2019). Each intervention group consisted of between five to nine participants, either below or meeting the recommended group size for psychoeducation groups (Corey et al., 2018; Gladding, 1994).

The researcher set up a panel in Qualtrics to distribute weekly surveys to participants. Each participant was assigned a deidentified 4-digit number. The first number indicated whether participants are in the initial intervention group or the control/delayed intervention group, the second number indicated the date and time for the specific group, while the last two numbers were specific to each participant. The researcher used Qualtrics to email weekly surveys over five weeks to participants based on their group status. All surveys emailed through Qualtrics to participants had a unique survey link based on the deidentified number to ensure accurate data collection and protecting participant confidentiality. The researcher scheduled two reminder messages in Qualtrics to resend the deidentified survey link to participants who did not complete the weekly measure at 48 hours and 64 hours after the initial survey link was sent. Additionally, the researcher sent all participants an email 20 hours before the closure of the weekly survey as an added reminder to complete the weekly survey.

Upon developing the initial intervention groups and control/delayed intervention group, the researcher reached out to all participants indicating the date, time, and location for their group, and follow up instructions for completing future weekly Qualtrics surveys. Participants received an email four days after the Qualtrics screening survey closed to provide them date and time for the NBMT intervention.

NBMT Intervention Setting

The NBMT intervention was offered outdoors in nature, with the location on the outskirts of the researcher's (and student's) campus in nature. The setting is away from the heart of campus, with open fields, a variety of vegetation (e.g., trees, grass, plants, flowers), and wildlife (e.g., birds). As this is the best location on campus to conduct the NBMT intervention in nature, with little foot traffic and flush with nature, it sits near a moderately trafficked road, with participants likely able to hear cars passing in the distance. Please see Appendix I for pictures of the intervention setting. In preparation of inclement weather (i.e., precipitation), the group was anticipated be held in a nearby open structure with a roof to protect participants from the elements, however no inclement weather was present during the intervention groups. Please see Appendix J for a campus map identify the location for the NBMT intervention and the alternative location.

Data Collection

Table 1 represents the time points (TP) for data collection. O indicates participants completing assessment(s) (i.e., pre-assessments, post-assessment and follow ups) , while X indicates participants receiving the NBMT intervention. There was approximately one week in-between each time point during data collection.

Table 2: Data Collection Time Points

	Week 1	Week 2	Week 3	Week 4	Week 5
NBMT Intervention Group	O1	X O2	O3	O4	O5
Control Group	O1	O2	O3	X O4	O5

Note: 'X'=NBMT, 'O'=assessment

Week One: Time Point 1

At 12:00am on the Wednesday prior to the week of the initial intervention group(s), all participants received an email with a link to complete a Qualtrics survey (i.e., pre-test) and instructed to complete the survey by Saturday 12:00am. This time was chosen as participants were scheduled for fall break on the Monday and Tuesday after Time Point 1. Participants were asked to respond to two questions regarding their frequency of intentional nature exposure and mindfulness practice over the past week, and to complete both the GAD-7 and FFMQ-15. Participants had 72 hours to complete the pre-test survey, if participants did not complete the pre-test survey within the 72 hours of receiving the email, they were notified by the researcher via email that they were excluded from the group itself as this information is necessary for data analysis.

Week Two: Time Point 2

Participants in the initial intervention groups (NBMT) participated in the NBMT intervention lasting approximately 90 minutes either Thursday or Friday of week two. The researcher pre-scheduled the date and time for Qualtrics to email the post-test survey to participants. At the end of the intervention, the researcher asked participants to use their cell phone to access the Qualtrics survey link in their email. If participants did not have a cell phone, an electronic device was provided to participants to complete the survey. The survey lasted approximately 5 minutes, with participants asked to complete the 6-item SE scale to assess engagement in the group and respond to slider scale, Likert scale, and open-ended questions around the impact of nature and social interaction with peers to better understand mindfulness and the impact on anxiety after the NBMT intervention.

At 12:00am on the Saturday after the week of the initial intervention group(s), all participants received an email with a link to complete a Qualtrics survey (i.e., post-test) and instructed to complete the survey by Tuesday 12:00am. Participants were asked to respond to two questions regarding their frequency of intentional nature exposure and mindfulness practice over the past week, and to complete both the GAD-7 and FFMQ-15. Participants had 72 hours to complete the survey.

Week Three: Time Point 3

At 12:00am on the Saturday prior to the delayed intervention control groups, all participants received an email with a link to complete a Qualtrics survey (i.e., one-week follow-up) and instructed to complete the survey by Tuesday 12:00am. Participants were asked to respond to two questions regarding their frequency of intentional nature exposure and mindfulness practice over the past week, and to complete both the GAD-7 and FFMQ-15. Participants had 72 hours to complete the survey.

Week Four: Time Point 4

Participants in the delayed intervention/control group(s) participated in the NBMT intervention lasting approximately 90 minutes either Thursday or Friday of week four. The researcher pre-scheduled the date and time for Qualtrics to email the post-test survey to participants. At the end of the intervention, the researcher asked participants to use their cell phone to access the Qualtrics survey link in their email. If participants did not have a cell phone, an electronic device was provided to participants to complete the survey. The survey lasted approximately 5 minutes, with participants asked to complete the 6-item SE scale to assess engagement in the group and respond to slider scale, Likert scale, and open-ended questions

around the impact of nature and social interaction with peers to better understand mindfulness and the impact on anxiety after the NBMT intervention.

At 12:00am on the Saturday after the delayed intervention/control group(s), all participants received an email with a link to complete a Qualtrics survey (i.e., delayed intervention group post-test) and instructed to complete the survey by Tuesday 12:00am. Participants were asked to respond to two questions regarding their frequency of intentional nature exposure and mindfulness practice over the past week, and to complete both the GAD-7 and FFMQ-15. Participants had 72 hours to complete the survey.

Week Five: Time Point 5

At 12:00am on the Saturday a week after the delayed intervention/control group(s), all participants received an email with a link to complete a Qualtrics survey (i.e., delayed intervention group one-week follow-up) and instructed to complete the survey by Tuesday 12:00am. Participants were asked to respond to two questions regarding their frequency of intentional nature exposure and mindfulness practice over the past week, complete both the GAD-7 and FFMQ-15, and respond to a Likert scale question and open-ended questions regarding self-efficacy. Participants had 72 hours to complete the survey.

At the completion of the study, participants were thanked for their participation. One week after the completion of the study, the researcher emailed a signed letter to each participant indicating their attendance for the intervention and completion of all required measures to provide to their instructor for course credit. Additionally, the researcher provided participants their responses to frequency of intentional nature exposure and frequency of mindfulness practice, as well as scores from the GAD-7 and the FFMQ-15 across the five weeks of observations.

Data Analysis Plan

The researcher conducted a preliminary analysis to explore the impact of the NBMT intervention on participant GAD-7 and FFMQ-15 scores based on the variables controlled for in group assignment (i.e., frequency of intentional nature exposure and frequency of mindfulness practice). When comparing the initial intervention groups to control/delayed intervention groups (i.e., Research Questions 1, 2, 3, and 4), TP1, TP2, and TP3 were used for both groups. To answer research questions 1 and 2, measuring pre- and post- NBMT intervention changes in undergraduate college student anxiety and mindfulness scores, the researcher used a repeated measures ANOVA with the pre- and post-test scores of the GAD-7 (Spitzer et al., 2006) and the FFMQ-15 (Gu et al., 2016). This equates to TP1 and TP2 for both the intervention groups and control/delayed intervention group. It is important to note for research question 2, the researcher analyzed both the total mindfulness scores as well as each of the five mindfulness subscale scores to answer this question. To answer research questions 3 and 4, measuring post-test and one-week follow-up changes in undergraduate college student anxiety and mindfulness scores, the researcher used a repeated measures ANOVA with the post-test and one-week follow-up scores of the GAD-7 (Spitzer et al., 2006) and the FFMQ-15 (Gu et al., 2016). This equates to the TP2 and TP3 for both the intervention groups and control/delayed intervention groups. Again, for research question 4, the researcher analyzed both the total mindfulness scores as well as each of the five mindfulness subscale scores to answer this question. For intervention feedback questions, means and standard deviations were computed, with qualitative feedback responses used to add depth to the quantitative feedback results.

Regarding exploratory questions, to answer research question 5, the researcher analyzed descriptive statistics on the SE scale (Hansen et al., 2019) to determine engagement with the

NBMT intervention from both initial intervention groups and the control/delayed intervention group. To answer research question 6, the researcher calculated pre- to post-test change scores for the GAD-7 (Spitzer et al., 2006) by subtracting post-test scores from the pre-test scores for both the intervention groups (TP1 – TP2) and control/delayed intervention groups (TP3 – TP4). A correlation analysis was conducted to examine the relationship between anxiety change scores from pre-test to post-test and SE scores (Hansen et al., 2019). To test research question 7, the researcher calculated post-test to one-week follow-up change scores for the GAD-7 (Spitzer et al., 2006) by subtracting the follow-up scores from the post-test scores for both the intervention groups (TP2 – TP3) and control/delayed intervention groups (TP4 – TP5). A correlation analysis was conducted to examine the relationship between anxiety changes scores from post-test to one-week follow-up and SE scores (Hansen et al., 2019).

Pilot Study

With the NBMT intervention newly developed by the author and yet to be implemented before, the purpose of the pilot study was to administer the NBMT intervention. The pilot study sought to answer the following questions:

Research Question 1: What is the resulting length of the intervention?

Research Question 2a: Was the content in the Nature-Based Mindfulness Training clear and easy to understand?

Research Question 2b: Did the content of the Nature-Based Mindfulness Training intervention help participants be able to identify ways to reduce their anxiety?

Research Question 2c: Did the content of the Nature-Based Mindfulness Training intervention help participants better understand mindfulness?

Research Question 3a: Was the time devoted to and information provided during the Group Introduction section appropriate?

Research Question 3b: Was the time devoted to and information provided during the Nature Restores section appropriate?

Research Question 3c: Was the time devoted to and information provided during the Anxiety section appropriate?

Research Question 3d: Was the time devoted to and information provided during the Why NBMT? section appropriate?

Research Question 3e: Was the time devoted to and information provided during the LEAF Goals section appropriate?

Research Question 3f: Was the time devoted to and information provided during the What is NBMT? NEST section appropriate?

Research Question 3g: Was the time devoted to and information provided during the BEST: Nature-Based Grounding section appropriate?

Research Question 3h: Was the time devoted to and information provided during the How to Practice NBMT? section appropriate?

Research Question 3i: Was the time devoted to and information provided during the Nature-Based Guided Meditation section appropriate?

Research Question 3j: Was the time devoted to and information provided during the Reflective Journaling section appropriate?

Research Question 4a: Is the altered language on the Student Engagement scale changing “teacher” to “group leader” clear to participants during a 90-minute Nature-Based Mindfulness Training intervention?

Research Question 4b: Is the altered language on the Student Engagement scale changing “class” to “group” clear to participants during a 90-minute Nature-Based Mindfulness Training intervention?

Research Question 4c: Is the altered language on the Student Engagement scale changing “share your opinion” to “share your experience” clear to participants during a 90-minute Nature-Based Mindfulness Training intervention?

Research Question 4d: Is the altered language on the Student Engagement scale changing “as you grow older” to “to manage your mental health” clear to participants during a 90-minute Nature-Based Mindfulness Training intervention?

Participants

Convenience sampling was used to obtain the target sample for the present pilot study. Inclusion criteria for the pilot study include being currently enrolled as an undergraduate college student and 18 years of age or older. The researcher will recruit participants for the pilot study through a cultural broker, an upper classman mentor with Ashby College, a small residential college on the researcher’s university campus. In research, cultural brokers are individuals who build trust between a researcher and cultural groups where there are barriers to accessing the population (Association of Maternal & Child Health Programs, 2022). Given the difference in age and education level between the researcher the pilot study participants a cultural broker will be used to increase participation in the pilot study. Ashby College is a co-ed student community providing a small liberal arts college experience within the larger public university. Ashby’s student community consists of over 100 freshman and sophomore students and a handful of upper-class mentors. Participants from this sample will be similar to participants in the proposed research study, however, pilot study participants did not need be enrolled in a CED

undergraduate course or on the Vacc Clinic waitlist to avoid decreasing sample size from the target sample. With this pilot study designed to administer the NBMT intervention for the first time and solicit feedback on the curriculum, the group must be large enough to provide opportunities for interactions, yet small enough for everyone to be involved (Corey et al., 2018). For the purposes of this pilot study, a minimum of seven participants was needed to have a total of eight group members, which includes the researcher. Additionally, although all participants self-identified to experience anxiety in the initial pilot study Qualtrics survey, this was not a requirement for the pilot study to ensure the researcher will achieve the appropriate sample size for the pilot study. The pilot study lasted 2 hours and included seven participants. The age of pilot study participants ranged from 19 to 21 ($M = 19.43$, $SD = 0.79$), with two participants junior students and the remaining five participants sophomore students. Two participants practice mindfulness occasionally (3 to 5 days per week) for at least ten minutes per day while the remaining participants practice mindfulness infrequently (0 to 2 days per week). One participant frequently (6 to 7 days per week) intentionally spends 5 to 10 minutes per day outside in nature while the remaining six participants spend time in nature infrequently (0 to 2 days per week).

Intervention

The pilot study consisted of the researcher engaging a group of seven undergraduate college students in a 90-minute NBMT intervention as described above for the full study. There were four deviations from the aforementioned methodology. First, the pilot study focused solely on the NBMT intervention and portions of the post-intervention survey, not to include pre-test or follow-up measures. Second, only four items from the SE scale were included in the post-intervention measure, each followed by a Likert scale question to assess wording changes. Third, the FFMQ-15 and GAD-7 measure were not included in the pilot study post-intervention survey

to reduce the time requirements for pilot study participants and allow for post-intervention feedback discussion. Fourth, after completion of the post-intervention survey, the researcher engaged participants in a discussion of the word changes from the SE scale and solicited feedback from participants regarding the NBMT intervention.

Instruments

Length of Intervention

To measure the length of time of the intervention, a timer was used. The timer was started as soon as the researcher began the NBMT intervention with pilot study participants and was stopped at the end of the intervention.

Feedback Questions

To assess the clarity of the NBMT intervention content, whether the content helped participants identify ways to reduce anxiety, and better understand mindfulness, a combination of Likert scale items and open-ended feedback questions were utilized. Please refer to Appendix K for feedback questions administered to pilot study participants.

Intervention Component Feedback Questions

To assess the appropriateness of the time devoted and information provided for each NBMT intervention component, a combination of Likert scale items and open-ended feedback questions were utilized. Please refer to Appendix L for intervention component feedback questions administered to pilot study participants.

Student Engagement Scale Items

To assess if the altered language on the SE scale was clear to participants, a series of Likert scale response questions were utilized. Please refer to Appendix M for changes in SE scale questions and Likert scale items.

Procedures

Convenience sampling was used to obtain the target sample for the present pilot study. The researcher coordinated with the cultural broker from Ashby College to set a date and time to conduct the pilot study for August 14, 2022 from 1:00pm to 3:00pm. As participants in the pilot study are upper-class mentors from Ashby College, the cultural broker coordinated the date and time with pilot study participants to ensure the time selected does not conflict with orientation activities. Additionally, the cultural broker provided the researcher names and email addresses for prospective participants. The researcher developed a marketing flyer including the title of the pilot study, a short purpose statement for the study, inclusion criteria, time requirements for the study, the proposed week for the study, location for the study, contact information for the researcher, and a QR code and link directing prospective participants to a Qualtrics survey. The researcher emailed the flyer to the prospective participants identified by the cultural broker from Ashby College on August 1, 2022. Interested participants scanned the QR code and completed an initial survey to include questions determining inclusion criteria whether prospective participants are enrolled as an undergraduate student and whether participants are interested in participating in the pilot study scheduled for Sunday August 14. Additional demographics collected included whether participants self-identify to experience anxiety, year in school and age, frequency of intention nature exposure for at least 5 to 10 minutes per day, frequency of mindfulness practice at least 10 minutes per day, and participant name, phone number, and email address. The recruitment survey closed on August 10th. The researcher emailed interested participants on August 11th, to provide additional instructions for the pilot study.

At the day and time of the pilot study, the researcher provided participants with the NBMT journal and facilitated the 90-minute NBMT intervention described above. The

researcher started a timer at the start and conclusion of the intervention. The researcher pre-scheduled the date and time for Qualtrics to email the post-intervention survey to participants, which was delivered shortly before the conclusion of the NBMT intervention. At the end of the intervention, participants used their cell phone to access the Qualtrics survey link in their email. After completing the post-intervention survey, the researcher engaged participants in a 15-minute discussion of the word changes from the SE scale and solicited feedback from participants regarding the NBMT intervention. Following the group discussion, the researcher thanked participants for engaging in the pilot study and sent each participant a \$10 Amazon e-gift card for their time and feedback.

Data Analysis Plan

To answer the first research question, the researcher kept track of time with a stopwatch to determine how long from start to finish it took to complete the NBMT intervention. To answer the second research question, the researcher examined responses from Likert scale questions and open-ended responses for items 1 to 9 from Appendix K and solicited verbal feedback regarding content of the NBMT intervention. Means and standard deviations of the Likert scaled questions were computed and the general content of the open-ended questions and verbal feedback were explored. To answer the third research question, the researcher examined responses from Likert scale questions and open-ended responses for items 1 to 20 from Appendix L and solicited verbal feedback regarding the time devoted and information provided during each NBMT intervention component. Means and standard deviations of the Likert scaled questions were computed and the general content of the open-ended questions and verbal feedback were explored. To answer the fourth research question, the researcher examined responses from Likert scale questions regarding language change for the SE scale (see Appendix M) and solicited verbal feedback from

participants. Means and standard deviations of the Likert scaled questions were computed and verbal feedback regarding the clarity of language change was explored.

Results of Pilot Study

Seven participants engaged in the pilot study for NBMT on Sunday August 14th at Peabody Prairie located on the UNCG campus. Although self-identifying to experience anxiety was not an inclusion criterion for the pilot study, all seven participants reported experiencing anxiety. All participants completed the posttest survey; however, one participant only partially completed the survey with their responses included in the results until RQ3g. Additionally, for research questions 3a to 3j, with the exception of research question 3i, all neutral (neither agree nor disagree) and negative responses (disagree) for these questions is from one participant (003), which will be addressed in the implications section below.

Research Question 1: The total time of the training was 95 minutes. This time was solely for the NBMT intervention itself, not including the post group feedback survey. In response to RQ1, all participants agreed the 90-minute time frame was appropriate for the intervention ($M = 4.29$, $SD = 0.49$). It is important to note all the pilot study participants were upper class mentors in Ashby College and were familiar with each other and appeared comfortable to be vulnerable sharing within in the group setting. The previous relationships among pilot study group members may explain the 5-minute increase in time for the intervention during the pilot study. This finding suggests the NBMT training is appropriate for a 90-minute time frame.

Research Question 2a: In response to RQ2a, all participants strongly agreed the content in the NBMT intervention was presented in a way that was clear and easy to understand ($M =$

5.0, $SD = 0.00$). This finding suggests the content from the NBMT intervention was presented clearly and easily understood by participants.

Research Question 2b: In response to RQ2b, 71.4% of participants agreed the NBMT training helped them identify ways to reduce anxiety. The remaining two participants had a neutral response (neither agree nor disagree) that they identified ways to reduce anxiety as a result of their participation in the NBMT intervention ($M = 4.14$, $SD = 0.90$). For participants with neutral responses, qualitative data suggests participating in NBMT “just allowed me to slow down for a minute” and “help me realized that I am in my own head a little bit too much, and if I did get out through NBMT or something else, it would definitely be helpful”. These finding suggests the NBMT intervention helps to identify ways to decrease anxiety, with the neutral responses appear beneficial for participants to be able to “slow down” and become more aware of being “in my own head”.

Research Question 2c: In response to RQ2c, 71.4% of participants agreed the NBMT intervention helped them better understand mindfulness. The remaining two participants had a neutral response (neither agree nor disagree) that they were better able to understand mindfulness ($M = 4.14$, $SD = 0.90$). However, one participant states “I think NBMT reaffirmed what I already knew about mindfulness”, suggesting the participant has previous based knowledge regarding mindfulness. These findings suggest the NBMT intervention helps to increase knowledge of mindfulness.

Research Question 3a: In response to RQ3a, 85.7% of participants agreed the time devoted and information provided during the Group Introductions section was appropriate, with the remaining participant having a neutral response (neither agree nor disagree; $M = 4.57$. $SD = 0.79$). The participant with a neutral response reported “more time or smaller groups would be

appropriate, just to allow everyone to speak at their leisure”. These findings suggest the time devoted and information provided during the Group Introduction section is appropriate.

Research Question 3b: In response to RQ3b, 100% of participants agreed the time devoted and information provided during the Nature Restores section was appropriate ($M = 4.57$, $SD = 0.79$). This finding suggests the time devoted and information provided during the Nature Restores section is appropriate.

Research Question 3c: In response to RQ3c, 85.7% of participants agreed the time devoted and information provided during the Anxiety section was appropriate, with the remaining participant having a neutral response (neither agree nor disagree; $M = 4.71$, $SD = 0.76$). The participant with a neutral response reported “some more time to drill down and think about our responses would have been nice”. During the group feedback discussion following the post-intervention survey all participants reported removing the lines from this section in the journal would be beneficial to provide open space to write or draw. These findings suggest the time devoted and information provided during the Anxiety section is appropriate.

Research Question 3d: In response to RQ3d, 100% of participants agreed the time devoted and information provided during the Why NBMT? section was appropriate ($M = 4.29$, $SD = 0.49$). This finding suggests the time devoted and information provided during the Why NBMT? section is appropriate.

Research Question 3e: In response to RQ3e, 85.7% of participants agreed the time devoted and information provided during the LEAF Goals section was appropriate, with the remaining participant having a neutral response (neither agree nor disagree; $M = 4.57$, $SD = 0.79$). The participant with a neutral response reported “I went off the rails and acted like I was at least 30 years older than I actually am so I don’t think I’m a great source of information for this

one”. These findings suggest the time devoted and information provided during LEAF Goals section is appropriate.

Research Question 3f: In response to RQ3f, 85.7% of participants agreed the time devoted and information provided during the What is NBMT? NEST section was appropriate, with the remaining participant having a negative response (disagree; $M = 4.43$. $SD = 1.13$). The participant with the negative response reported “I wish we were given some strategies to bring us back to the moment rather than simply being told to come back”. However, participants who strongly agreed with the timing and information provided during this section reported “I felt that I had enough time to learn what NBMT was, and then practice putting it into play”, “it helped keep me in the moment”, and it “allowed me to properly think about a few things that were affecting me”. These findings suggest the time devoted and information provided during the What is NBMT? NEST section is appropriate.

Research Question 3g: In response to RQ3g, 100% of participants agreed the time devoted and information provided during the BEST: Nature-Based Grounding section was appropriate ($M = 4.29$. $SD = 0.49$). This finding suggests the time devoted and information provided during the BEST: Nature-Based Grounding section is appropriate.

Research Question 3h: In response to RQ3h, 83.3% of participants agreed the time devoted and information provided during the How to Practice NBMT? section was appropriate, with the remaining participant having a negative response (disagree; $M = 4.33$. $SD = 1.21$). The participant with the negative response reported “I just kept getting distracted and probably would have benefited from a series of strategies to come back down to earth”. The previous section, BEST: Nature-Based Grounding, is a strategy that all participants agreed was appropriate, however this specific strategy may not be beneficial to the participant (003) with a negative

response. Participants who strongly agreed with the timing and information provided during this section reported “this was one of my favorite parts because I think it can be beneficial to remember to be honest and to focus on one thing at a time”, “this part nailed it home about things that I’ve been thinking about during this session”, and it “we not only learned how to practice it, but our group applied those thoughts to what we already were doing and even recommended actions to each other”. These findings suggest the time devoted and information provided during the How to Practice NBMT? section is appropriate.

Research Question 3i: In response to RQ3i, 83.3% of participants agreed the time devoted and information provided during the Nature-Based Guided Meditation section was appropriate, with the remaining participant having a negative response (disagree; $M = 4.33$. $SD = 1.21$). During the NBMT intervention, in their qualitative response from the post-group survey, and during the group feedback discussion, this participant with a negative response reported “I really struggle with meditation”. Participants who strongly agreed with the timing and information provided during this section reported, “It was a good practical example of NBMT”, “I like meditation and find it very calming, so it was a win to me”, and “I am not always fond of meditations, mainly because my brain works quite fast. However, doing it in nature was a much better experience because I felt grounded and was much more present”. Although participants vary in their inclination towards meditation, the time devoted and information provided during the Nature-Based Guided Meditation section is appropriate.

Research Question 3j: In response to RQ3j, 83.3% of participants agreed the time devoted and information provided during the Reflective Journaling section was appropriate, with the remaining participant having a neutral response (neither agree nor disagree; $M = 4.5$. $SD = 0.84$). The participant with the neutral response reported “I got everyone done, but I felt as

though, once again, I didn't do it right so I don't feel like I'm a good source of information". Participants who strongly agreed with the timing and information provided during this section reported, "I really enjoyed journaling after being able to meditate because during my meditation a few things became clear to me that I had not thought of in previous conversations", "time to reflect on the session helped me in gathering my thoughts", and "this was a good way to sum up the experience". These findings suggest the time devoted and information provided during the Reflective Journaling section is appropriate.

Research Question 4a: In response to RQ4a, which asked if the altered language from the SE scale changing "teacher" to "group leader" was clear, 100% of participants agreed the new wording of the question was easy to understand ($M = 4.83$, $SD = 0.41$). This suggests the adaption from the SE scale (Hansen et al., 2019) is appropriate to use with prospective participants in the research study.

Research Question 4b: In response to RQ4b, which asked if the altered language from the SE scale changing "class" to "group" was clear, 100% of participants agreed the new wording of the question was easy to understand ($M = 4.50$, $SD = 0.55$). This suggests the adaption from the SE scale (Hansen et al., 2019) is appropriate to use with prospective participants in the research study.

Research Question 4c: In response to RQ4c, which asked if the altered language from the SE scale changing "share your opinion" to "share your experience" was clear, 100% of participants agreed the new wording of the question was easy to understand ($M = 4.83$, $SD = 0.41$). This suggests the adaption from the SE scale (Hansen et al., 2019) is appropriate to use with prospective participants in the research study.

Research Question 4d: In response to RQ4d, which asked if the altered language from the SE scale changing “as you grow older” to “to manage your mental health” was clear, 100% of participants agreed the new wording of the question was easy to understand ($M = 4.83$, $SD = 0.41$). This suggests the adaption from the SE scale (Hansen et al., 2019) is appropriate to use with prospective participants in the research study.

Implications of Pilot Study

With the pilot study primarily focused on soliciting feedback on the NBMT curriculum and intervention, the findings from this pilot study informed the next steps for this research study in several important ways. First, although the length of the NBMT intervention during the pilot study was 95 minutes in length, the 90-minute timeframe for the NBMT intervention is appropriate. It is important to note all the pilot study participants were upper class mentors in Ashby College, a tight knit group, and appeared comfortable to be vulnerable sharing within the group setting. The previous relationships among pilot study group members may explain the 5-minute increase in time for the intervention during the pilot study. Additionally, the familiarity of group participants was evident in their communication throughout the NBMT intervention, reflecting characteristics of the working stage in group development (Corey et al., 2018). With the time of the intervention appropriate by time measurement and participant feedback, was highly feasible to implement the 90-minute timeframe for the NBMT intervention groups moving forward in the dissertation study as group members were assigned based on availability, frequency of nature exposure, and frequency of mindfulness practice, and not based on current social relationships. The findings for RQ2a-RQ2c, are important as they suggest all participants found the training clear and easy to understand, with the majority of participants indicating the intervention was helpful in identifying ways to reduce anxiety and to better understand

mindfulness. Regarding RQ2b, although two participants reported a neutral response related to the content of the intervention identify ways to reduce anxiety, anecdotal feedback suggests the participants may have benefited from NBMT to slow down and become more aware of their thoughts. Previous evidence suggests those new to mindfulness practice may observe in a way that is maladaptive and not consistent with other integral aspects of mindfulness practice (Baer, 2011, Gu et al., 2016). One of the participants (i.e., participant 003) providing a neutral response to RQ2b also provided several neutral or negative responses to research questions 3a to 3j related to the timing and informed provided for specific intervention components. All participants agreed the time and information provided during the Nature Restores (i.e., RQ3b), Why NBMT? (i.e., RQ3d), and BEST: Nature-Based Grounding (i.e., RQ3g) sections is appropriate. Regarding the Nature-Based Guided Meditation (i.e., RQ3i), one participant indicating a negative response, expressed early on during the pilot study their struggles with meditation and stated, “As someone who struggles with meditation, I felt that the meditation section was too long. I really struggle with having to do meditation at all, so having to sit through it was challenging. However, I believe that if I did enjoy meditation, the meditation length was probably objectively fine”. Although one participant struggled with meditation, anecdotal evidence suggests this intervention component is appropriate moving forward in this dissertation study, with the researcher recognizing that not every technique in the NBMT curriculum works for every participant. For the remaining components of the NBMT intervention, (i.e., Group Introductions, Anxiety, LEAF Goals, What is NBMT? NEST, How to Practice NBMT?, and Reflective Journaling), participant 003 provided either neutral or negative responses to these intervention components.

During the Group Introductions section, participant 003 shared with the group their “Asperger's” diagnosis (a form of autism spectrum disorder). A theme in participant 003 qualitative responses to intervention components rated neutral or negative, is that he was distracted, expressed challenges with the transition between intervention components, and felt he didn't “do it right” and twice stated he did not “believe they were a good source of information”. A characteristic of individuals diagnosed with autism spectrum disorder Level 1 is challenges switching between activities (APA, 2022), which may explain the neutral and negative responses from the participant. Additionally, participant 003 sat directly next to the researcher during the pilot study, not in direct line of sight of the researcher. While prior knowledge of the mental health diagnosis for participant 003 may have been valuable, the researcher is apprehensive to require future participants to disclose current mental health diagnoses (i.e., autism spectrum disorder) with college students experiencing stigma related to disclosing mental health disorders (Cage et al., 2020). The inclusion criteria for the study, self-identifying to experience anxiety, is intended to make this intervention widely accessible to students experiencing anxiety, regardless of co-occurring mental health disorders.

The group feedback discussion provided valuable anecdotal evidence to improve and enhance the NBMT intervention. All group participants indicated based on the duration of the group, that integrating some form of movement into the intervention would be extremely valuable. The researcher integrated a short standing “stretch break” approximately halfway through the intervention when transitioning from focusing on internal experiences (i.e., What is NBMT? NEST) to external experiences (i.e., BEST: Nature-Based Grounding), and asked participants to change seating arrangements in the groups. The stretch break and change in seating provides participants a different view of the natural environment as well as provide the

researcher a more direct view of participants who sit directly next to the researcher at the start of the intervention. Given the participants sat in the grass, the researcher was clear to share this information to future participants and asked participants to bring anything that will allow them to be comfortable to be seated on the ground for 90-minutes (i.e., blankets). The researcher provided camp chairs to participants to increase comfortability being seated during the intervention. Additionally, the researcher revised the Anxiety section in the NBMT journal based on feedback from the group discussion to remove the lines from this page and create more space for participants to be able to draw during this activity. The findings of RQ4a-RQ4d suggest the adapted language from the SE scale (Hansen et al., 2019) is clear and easy to understand which was highly feasible to implement in the proposed dissertation study. Finally, although all pilot study participants indicated the timing of the intervention was appropriate, in their qualitative feedback for the Group Introductions section, participant 003 reported “more time or smaller groups would be appropriate, just to allow everyone to speak at their leisure”. While the pilot study included seven participants, the NBMT intervention is designed for eight to twelve participants. The researcher aimed for NBMT groups to consist of eight to ten participants.

CHAPTER IV: RESULTS

The purpose of this study was to examine whether a 90-minute psychoeducational group intervention, Nature-Based Mindfulness Training (NBMT), decreased anxiety symptoms and increased mindfulness scores for college students experiencing anxiety. An exploration of whether student engagement influenced the changes in anxiety scores was also explored. Results of the study are presented in this chapter, to include demographics of study participants, descriptive statistics, and results of the analyses that were used to test the research hypothesis.

Sample

A total of fifty undergraduate students consented to participate in the study with twenty-six participants in the intervention group(s), and twenty-four in the delayed intervention/control group(s). As can be seen in Table 3, six participants, three from the intervention group(s) and three from the delayed intervention/control group(s), did not complete the survey at Time Point 1 (TP1). As indicated in the procedures, these participants were removed from the study, with the sample from the study starting with forty-four participants ($n = 44$). There was an attrition of 13 total participants across all time points and groups ($n = 3$ from intervention, 13%; and $n = 4$ from delayed intervention/control, 19%). Forty participants completed the weekly survey at Time Point 2 (TP2), and thirty-nine participants completed the survey at Time Point 3 (TP3). Thus, the total sample used for data analysis for the primary research questions (which utilizes data from the first three time points) consisted of thirty-nine participants, twenty participants in the intervention group(s) and nineteen participants in the delayed intervention/control group(s). As two participants in the delayed intervention/control group did not participate in their assigned NBMT group, only thirty-seven participants were included in exploratory research questions (Research Questions 5 through 7). See Table 3 for total attrition and attrition across conditions.

Table 3: Study Attrition

Condition	TP1	Intervention	TP2	TP3	Delayed Intervention	TP4	TP5	Percent Attrition
Intervention (<i>n</i>)	23	20	20	20	-	20	20	13%
Control/Delayed Intervention (<i>n</i>)	21	-	20	19	17	17	17	19%
Total	44	-	40	39	37	37	37	15.9%

Of the total sample ($n = 39$), six were freshman students, seven sophomore students, fourteen junior students, and twelve senior students (see Table 4). Of the total sample, seventeen participants identified as being a woman, twenty-one as male, and one as woman and gender queer. Of the total sample, most participants identified as White ($n = 15$), eight participants identified as Black or African American, eight participants identified as Latina/o/x or Hispanic, one participant identified as Middle Eastern or Middle Eastern American, one preferred not to say, and six participants identified as biracial or multiracial. Of participants identifying as biracial or multiracial, the following is a breakdown of specific racial and ethnic identities:

- 1 - Biracial or Multiracial
- 2 - White and Latina/o/x or Hispanic
- 1 - Latina/o/x or Hispanic and Native American, North or South American Indian or Alaskan Native
- 1 – Black or African American and Latina/o/x or Hispanic
- 1 – White, Black or African American, Latina/o/x or Hispanic, and Asian or Asian American

Ages of the participants in the total sample ranged from 18 to 53, with a mean age of 23.60, $SD = 7.67$ ($median = 21$) for the intervention group(s) and a mean age of 20.79, $SD = 3.05$, ($median = 20$) for the delayed intervention group. The variance of the intervention group(s) was impacted by the presence of a singular outlier whose age was 53, with 79.5% of the total sample 22 years of age or young, and only three participants (7.7%) thirty years or older. Regarding frequency of intentional nature exposure for 5 – 10 minutes per day per week, of the

total sample, thirteen participants responded frequently (i.e., 6 – 7 days per week), ten participants responded occasionally (i.e., 3 – 5 days per week), and sixteen participants responded infrequently (i.e., 0 – 2 days per week). Regarding frequency of mindfulness practice for at least 10 minute per day per week, of the total sample, four participants responded frequently, seven responded occasionally, and twenty-eight responded infrequently.

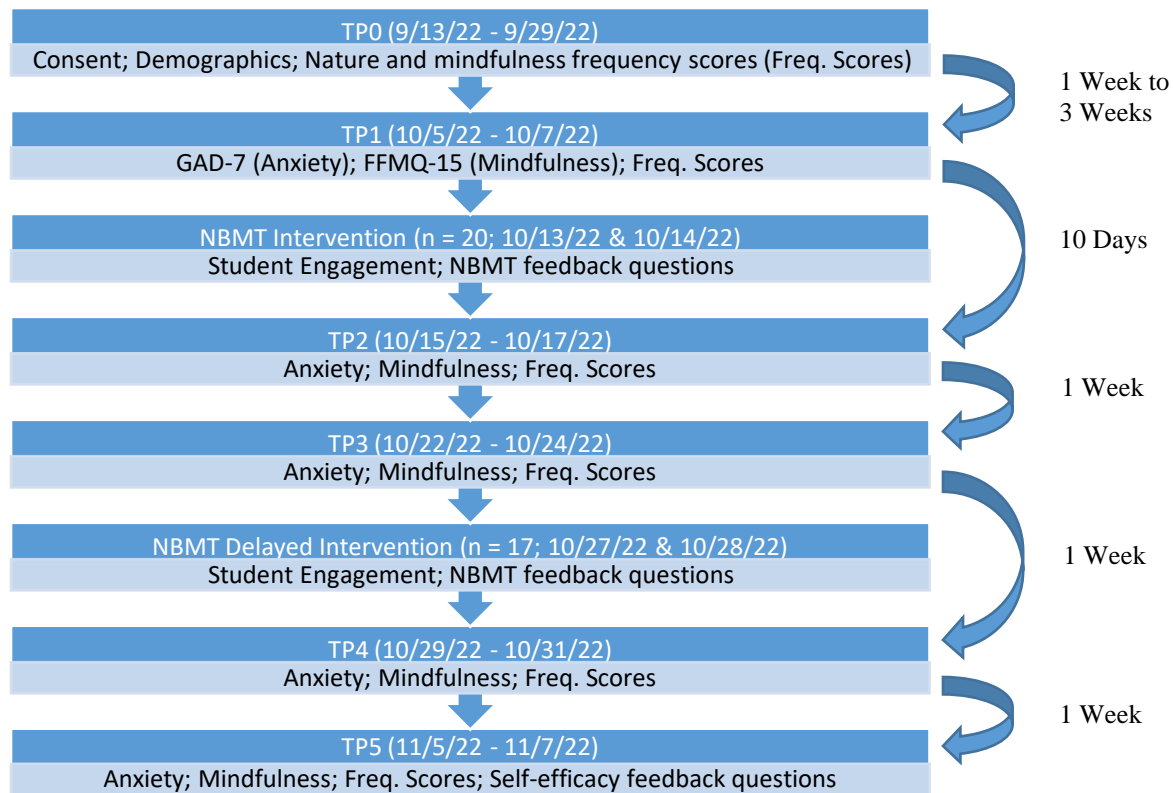
Table 4: Sample Demographics by Treatment Condition

	Total (n = 39)	Intervention (n = 20)	Control/Delayed Intervention (n = 19)
Age (<i>Mean & SD</i>)	22.23 (SD = 5.989)	23.60 (SD = 7.674)	20.79 (SD = 3.047)
Grade Level	6 Freshman 7 Sophomore 14 Junior 12 Senior	0 Freshman 2 Sophomore 11 Junior 7 Senior	6 Freshman 5 Sophomore 3 Junior 5 Senior
Gender Identity	17 Woman 21 Man 1 Woman & Gender Queer	9 Woman 11 Man 0 Woman & Gender Queer	8 Woman 10 Man 1 Woman & Gender Queer
Racial & Ethnic Identities	15 White 8 Black or African American 8 Latina/o/x or Hispanic 1 Middle Eastern or Middle Eastern American 6 Biracial or Multiracial 1 Prefer not to say	8 White 4 Black or African American 5 Latina/o/x or Hispanic 1 Middle Eastern or Middle Eastern American 2 Biracial or Multiracial 0 Prefer not to say	7 White 4 Black or African American 3 Latina/o/x or Hispanic 0 Middle Eastern or Middle Eastern American 4 Biracial or Multiracial 1 Prefer not to say
Frequency: Nature exposure (5-10 minutes per day)*	13 Frequent 10 Occasional 16 Infrequent	7 Frequent 4 Occasional 9 Infrequent	6 Frequent 6 Occasional 7 Infrequent
Frequency: Mindfulness practice (10 minutes per day)*	4 Frequent 7 Occasional 28 Infrequent	3 Frequent 3 Occasional 14 Infrequent	1 Frequent 4 Occasional 14 Infrequent

* Frequency scores: Days per week (Infrequent = 0 – 2 days per week; Occasional = 3 – 5 days per week; Frequent = 6 – 7 days per week).

The design implemented was a quantitative two-group quasi-experimental treatment removal design. As the procedures discussed in the Chapter III are detailed, the specific dates for the identified time points (TP) and the duration between data collection time points can be found in Figure 2. All participants in both the intervention and delayed intervention/control group completed assessments at TP1, TP2, TP3, TP4, and TP5 during the same 72-hour timeframe, while the intervention group ($n = 20$) completed the post-group survey in mid-October just before TP2 and the delayed intervention/control group ($n = 17$) completed the post-group survey in late-October just before TP4.

Figure 2: Study Timeframe: Dates & Data Collected



Weather

The researcher recorded the temperature, cloud cover, precipitation, humidity, and windspeed for each intervention group (Table 5).

Table 5: NBMT Group Weather Characteristics

Date & Time	Temperature	Cloud Cover	Windspeed	Humidity	Precipitation
October 13 12-1:30pm	69° F	Mostly Cloudy	6 mph	82%	None
October 14 12-1:30pm	66° F	Sunny	3 mph	35%	None
October 14 2-3:30pm	70° F	Sunny	5 mph	26%	None
October 27 12-1:30pm	59° F	Mostly Cloudy	12 mph	54%	None
October 27 2-3:30pm	63° F	Mostly Cloudy	9 mph	48%	None
October 28 12-1:30pm	59° F	Sunny	10 mph	57%	None

Preliminary Analysis

All survey responses were inspected for outliers using box plot analyses. No outliers were identified for anxiety scores, although two outliers were identified for total FFMQ scores at TP1. However, these two participants were not true outliers as the results for the research questions were not impacted when outliers were removed from the analysis. Given that participants were not randomly assigned to groups, an independent-samples t-test was conducted to compare the anxiety scores for the intervention group and control group at baseline. There was no significant difference in scores for the intervention group ($M = 10.20, SD = 4.20$) and the control group ($M = 10.89, SD = 4.48$); $t(37) = -0.50, p = 0.62$, two-tailed) at baseline. The magnitude of the difference in the means (mean difference = -0.70 , 95% CI [$-3.51, 2.12$]) was very small ($\eta^2 = .007$). Additionally, an independent-samples t-test was conducted to compare the mindfulness scores for the intervention group and control group at baseline. There was no significant difference in scores for the intervention group ($M = 45.10, SD = 6.22$) and the control group ($M = 46.32, SD = 6.38$); $t(37) = -0.60, p = 0.55$, two-tailed). The magnitude of the difference in the means (mean difference = -1.21 , 95% CI [$-5.30, 2.87$]) was small ($\eta^2 = .01$).

Testing of Hypotheses

Impact of Nature-Based Mindfulness Training: Intervention versus Control

Research Question 1: What is the impact of a 90-minute Nature-Based Mindfulness Training intervention on anxiety scores for undergraduate college students pre to post-test compared to a control (delayed intervention) group?

Hypothesis 1: Participation in the 90-minute Nature-Based Mindfulness Training intervention will result in a significant decrease in anxiety scores from pre to post-test for the intervention group compared to the control (delayed intervention) group.

To test Hypothesis 1, a repeated measures ANOVA was conducted with GAD-7 (i.e., anxiety) scores using TP1 (pre-test scores for the intervention group and first baseline scores for the delayed intervention/control group) to TP2 (post-test scores for the intervention group and second baseline scores for the delayed intervention/control group) as the within factor and the treatment condition (i.e., intervention and delayed intervention/control group) as the between factor. See Table 6 for mean, standard deviation, and n for each TP. Mean scores on the GAD-7 for the intervention group decreased 2.2 points, that is a decrease in the presence of anxiety symptoms from TP1 to TP2 after receiving the intervention. Mean scores on the GAD-7 for the delayed intervention group decreased 2.1 points from TP1 to TP2. Results of the analysis indicated there was a significant difference in anxiety scores from TP1 to TP2 $F(1,37) = 13.951, p < 0.001, \eta_p^2 = 0.274$. The interaction between TP and group (i.e., intervention versus delayed intervention/control group) was nonsignificant $F(1,37) = 0.007, p = 0.935, \eta_p^2 = 0.00$ with inadequate statistical power (observed power = 0.051). Thus, hypothesis 1 was not supported. These findings indicate that there were not significant differences between the groups from TP1 to TP2 in anxiety scores and that NBMT did not appear to impact anxiety from pre-test

to post-test given the lack of differences between groups. This finding may be due to low statistical power (observed power = 0.051) when comparing group differences. However, while NBMT did not directly impact anxiety within the first week, it is also acknowledged the change in mean scores for both groups significant decreased, with a large effect size.

Table 6: Descriptive Statistics: Means for Anxiety Scores Pre & Post-Test by Group

	Group	Mean	Std. Deviation	N
Anxiety1	Intervention	10.20	4.20	20
	Control	10.89	4.48	19
	Total	10.54	4.30	39
Anxiety2	Intervention	8.00	3.61	20
	Control	8.79	3.98	19
	Total	8.38	3.77	39

A post-hoc repeated measures ANOVA was conducted removing the seven participants with lower scores from the analysis ($n = 32$) with equal participants in the intervention group ($n = 16$) and delayed intervention/control group ($n = 16$). With the inclusion criteria for study participation having experienced anxiety, two participants ($n = 2$) indicated a score in the minimal anxiety range (0 – 4) and five participants ($n = 5$) indicated a score of 5 or 6 on the lower end of the mild anxiety range (5 – 9) at TP1. With a low baseline anxiety score, these participants may experience a smaller impact on anxiety scores from the intervention. Mean scores on the GAD-7 for the intervention group decreased 3.25 points, that is a decrease in the presence of anxiety symptoms from TP1 to TP2 after receiving the intervention. Mean scores on the GAD-7 for the delayed intervention group decreased 2.69 points from TP1 to TP2. Rerunning the analysis without participants with lower anxiety scores at TP1 ($n = 7$) did not change the results.

Research Question 2: What is the impact of a 90-minute Nature-Based Mindfulness Training intervention on mindfulness scores for undergraduate college students pre to post-test compared to a control (delayed intervention) group?

Hypothesis 2: Participation in the 90-minute Nature-Based Mindfulness Training intervention will result in a significant increase in overall mindfulness scores and subscale scores (*Observing, Describing, Acting with Awareness, Nonjudging of inner experience, and Nonreactivity to inner experience*) from pre to post-test for the intervention group compared to a control (delayed intervention) group.

To test Hypothesis 2, six repeated measures ANOVA were conducted with FFMQ (i.e., mindfulness) total and subscale scores using TP1 (pre-test scores for the intervention group and first baseline scores for the delayed intervention/control group) to TP2 (post-test scores for the intervention group and second baseline scores for the delayed intervention/control group) as the within factor and the treatment condition (i.e., intervention and delayed intervention/control group) as the between factor. For Research Question 2, letters a through f will be used to differentiate results, with Hypothesis 2a referencing total mindfulness scores. See Table 7 for mean, standard deviation, and n for FFMQ total and subscale scores for each TP by group. Mean scores on the FFMQ-15 for the intervention group increased 2.05 points, that is an increase in the ability to be mindful in daily life from TP1 to TP2 after receiving the intervention. Mean scores on the FFMQ-15 for the delayed intervention group increased 1.63 points from TP1 to TP2. Results of the analysis indicated there was a significant difference in total mindfulness scores from TP1 to TP2 ($F(1,37) = 7.941, p = 0.008, \eta_p^2 = 0.177$). Regarding Hypothesis 2a, the interaction between TP and group (i.e., intervention versus delayed intervention/control group) was nonsignificant $F(1,37) = 0.103, p = 0.751, \eta_p^2 = 0.003$ with inadequate statistical power (observed power = 0.061). These findings indicate that there were not significant differences between the groups from TP1 to TP2 in total mindfulness scores and that NBMT did not appear to impact overall mindfulness from pre-test to post-test. This finding may be due to low

statistical power (observed power = 0.061), however, it is also acknowledged the change in mean scores for both groups was significantly higher from T1 to T2 with a large effect size.

Table 7: Descriptive Statistics: Means for Mindfulness Scores Pre & Post-Test by Group

	Group	Mean	Std. Deviation	N
FFMQ1	Intervention	45.10	6.22	20
	Control	46.32	6.38	19
	Total	45.69	6.25	39
FFMQ2	Intervention	47.15	5.93	20
	Control	47.95	8.06	19
	Total	47.54	6.97	39
Observing1	Intervention	8.95	3.09	20
	Control	9.95	2.61	19
	Total	9.44	2.87	39
Observing2	Intervention	10.55	2.19	20
	Control	10.53	1.95	19
	Total	10.54	2.05	39
Describing1	Intervention	9.20	2.55	20
	Control	9.26	2.62	19
	Total	9.23	2.55	39
Describing2	Intervention	9.15	3.22	20
	Control	9.89	2.89	19
	Total	9.51	3.04	39
Awareness1	Intervention	9.30	1.72	20
	Control	8.95	2.09	19
	Total	9.13	1.89	39
Awareness2	Intervention	9.60	2.21	20
	Control	9.11	2.33	19
	Total	9.36	2.25	39
Nonjudging1	Intervention	8.90	2.00	20
	Control	10.42	2.50	19
	Total	9.64	2.36	39
Nonjudging2	Intervention	9.00	2.43	20
	Control	10.00	2.87	19
	Total	9.49	2.66	39
Nonreactivity1	Intervention	8.75	2.45	20
	Control	7.74	2.45	19
	Total	8.26	2.47	39
Nonreactivity2	Intervention	8.85	2.32	20
	Control	8.42	2.46	19
	Total	8.64	2.38	39

To test Hypothesis 2b, a repeated measures ANOVA was conducted with Observing subscale scores from the FFMQ using TP1 (pre-test scores for the intervention group and first baseline scores for the delayed intervention/control group) to TP2 (post-test scores for the intervention group and second baseline scores for the delayed intervention/control group) as the

within factor and the treatment condition (i.e., intervention and delayed intervention/control group) as the between factor. Mean scores on the Observing subscale for the intervention group increased 1.6 points, that is an increase in noticing internal and external experiences from TP1 to TP2 after receiving the intervention. Mean scores on the Observing subscale for the delayed intervention group increased 0.58 points from TP1 to TP2. Results of the analysis indicated there was a significant difference in Observing subscale scores from TP1 to TP2 ($F(1,37) = 9.869, p = 0.003, \eta_p^2 = 0.211$). The interaction between TP and group (i.e., intervention versus delayed intervention/control group) was nonsignificant ($F(1,37) = 0.149, p = 0.149, \eta_p^2 = 0.055$) with inadequate statistical power (observed power = 0.300). These findings indicate that there was not a significant difference between the groups from TP1 to TP2 in Observing subscale scores, thus, the NBMT intervention did not appear to impact the ability to notice internal and external experiences from pre-test to post-test. This finding may be due to low statistical power (observed power = 0.300), however, it is also acknowledged the intervention group experienced a larger increase in mean scores compared to the delayed intervention/control group.

To test Hypothesis 2c, a repeated measures ANOVA was conducted with Describing subscale scores from the FFMQ using TP1 (pre-test scores for the intervention group and first baseline scores for the delayed intervention/control group) to TP2 (post-test scores for the intervention group and second baseline scores for the delayed intervention/control group) as the within factor and the treatment condition (i.e., intervention and delayed intervention/control group) as the between factor. Mean scores on the Describing subscale for the intervention group decreased 0.05 points, that is a slight decrease in using words to label one's internal and external experience from TP1 to TP2 after receiving the intervention. Mean scores on the Describing subscale for the delayed intervention group increased 0.63 points from TP1 to TP2. Results of

the analysis indicated there was a not a significant difference in Describing subscale scores from TP1 to TP2 ($F(1,37) = 0.914, p = 0.345, \eta_p^2 = 0.024$) with inadequate statistical power (observed power = 0.154). The interaction between TP and group (i.e., intervention versus delayed intervention/control group) was nonsignificant ($F(1,37) = 1.256, p = 0.270, \eta_p^2 = 0.033$) with inadequate statistical power (observed power = 0.194). These findings indicate that there were not significant differences within groups between T1 and T2, nor was there a difference between the groups from TP1 to TP2 in Describing subscale scores. This also suggests that NBMT did not appear to impact the ability to use words to label one's internal and external experiences from pre-test to post-test, however, no changes generally occurred with the Describing subscale.

To test Hypothesis 2d, a repeated measures ANOVA was conducted with Acting with Awareness subscale scores from the FFMQ using TP1 (pre-test scores for the intervention group and first baseline scores for the delayed intervention/control group) to TP2 (post-test scores for the intervention group and second baseline scores for the delayed intervention/control group) as the within factor and the treatment condition (i.e., intervention and delayed intervention/control group) as the between factor. Mean scores on the Acting with Awareness subscale for the intervention group increased 0.3 points, that is an increase in the ability to attend and intentionally act in the moment from TP1 to TP2 after receiving the intervention. Mean scores on the Acting with Awareness subscale for the delayed intervention group increased 0.16 points from TP1 to TP2. Results of the analysis indicated there was not a significant difference in Acting with Awareness subscale scores from TP1 to TP2 ($F(1,37) = 0.423, p = 0.519, \eta_p^2 = 0.011$) with inadequate statistical power (observed power = 0.097). The interaction between TP and group (i.e., intervention versus delayed intervention/control group) was nonsignificant

($F(1,37) = 0.041, p = 0.841, \eta_p^2 = 0.001$) with inadequate statistical power (observed power = 0.054). These findings indicate that there were not significant differences between the groups from TP1 to TP2 in Acting with Awareness subscale scores and that NBMT did not appear to impact the ability to attend and intentionally act in the moment from pre-test to post-test.

To test Hypothesis 2e, a repeated measures ANOVA was conducted with Nonjudging subscale scores from the FFMQ using TP1 (pre-test scores for the intervention group and first baseline scores for the delayed intervention/control group) to TP2 (post-test scores for the intervention group and second baseline scores for the delayed intervention/control group) as the within factor and the treatment condition (i.e., intervention and delayed intervention/control group) as the between factor. Mean scores on the Nonjudging subscale for the intervention group increased 0.1 points, that is an increase in the ability to be neutral and objective towards thoughts and feelings from TP1 to TP2 after receiving the intervention. Mean scores on the Nonjudging subscale for the delayed intervention group decreased 0.42 points from TP1 to TP2. Results of the analysis indicated there was not a significant difference in Nonjudging subscale scores from TP1 to TP2 ($F(1,37) = 0.394, p = 0.534, \eta_p^2 = 0.011$) with inadequate statistical power (observed power = 0.094). The interaction between TP and group (i.e., intervention versus delayed intervention/control group) was nonsignificant ($F(1,37) = 1.036, p = 0.315, \eta_p^2 = 0.027$) with inadequate statistical power (observed power = 0.168). These findings indicate that there were not significant differences between the groups from TP1 to TP2 in Nonjudging subscale scores and that NBMT did not appear to impact the ability to be neutral and objective towards thoughts and feelings from pre-test to post-test.

To test Hypothesis 2f, a repeated measures ANOVA was conducted with Nonreactivity subscale scores from the FFMQ using TP1 (pre-test scores for the intervention group and first

baseline scores for the delayed intervention/control group) to TP2 (post-test scores for the intervention group and second baseline scores for the delayed intervention/control group) as the within factor and the treatment condition (i.e., intervention and delayed intervention/control group) as the between factor. Mean scores on the Nonreactivity subscale for the intervention group increased 0.1 points, that is an increase the ability to allow thoughts and feelings to come and go without becoming involved in them from TP1 to TP2 after receiving the intervention. Mean scores on the Nonreactivity subscale for the delayed intervention group increased 0.68 points from TP1 to TP2. Results of the analysis indicated there was not a significant difference in Nonreactivity subscale scores from TP1 to TP2 ($F(1,37) = 1.155, p = 0.289, \eta_p^2 = 0.030$) with inadequate statistical power (observed power = 0.182). The interaction between TP and group (i.e., intervention versus delayed intervention/control group) was nonsignificant ($F(1,37) = 0.641, p = 0.428, \eta_p^2 = 0.017$) with inadequate statistical power (observed power = 0.122). These findings indicate that there were not significant differences between the groups from TP1 to TP2 in Nonreactivity subscale scores and that NBMT did not appear to the ability to allow thoughts and feelings to come and go without becoming involved in them from pre-test to post-test.

Research Question 3: What is the impact of a 90-minute Nature-Based Mindfulness Training intervention on anxiety scores for undergraduate college student's post-test to one-week follow up compared to a control (delayed intervention) group?

Hypothesis 3: Participation in the 90-minute Nature-Based Mindfulness Training intervention will result in a significant decrease in anxiety scores from post-test to one-week follow up for the intervention group compared to the control (delayed intervention) group.

To test Hypothesis 3, a repeated measures ANOVA was conducted with GAD-7 (i.e., anxiety) scores using TP2 (post-test scores for the intervention group and second baseline scores for the delayed intervention/control group) to TP3 (one week follow-up scores for the intervention group and third baseline scores for the delayed intervention/control group) as the within factor and the treatment condition (i.e., intervention and delayed intervention/control group) as the between factor. See Table 8 for Mean, standard deviation, and n for each TP. Mean scores on the GAD-7 for the intervention group decreased 1.85 points, that is a decrease in the presence of anxiety symptoms from TP2 to TP3 approximately one week after receiving the intervention. Mean scores on the GAD-7 for the delayed intervention group decreased 0.84 points from TP2 to TP3.

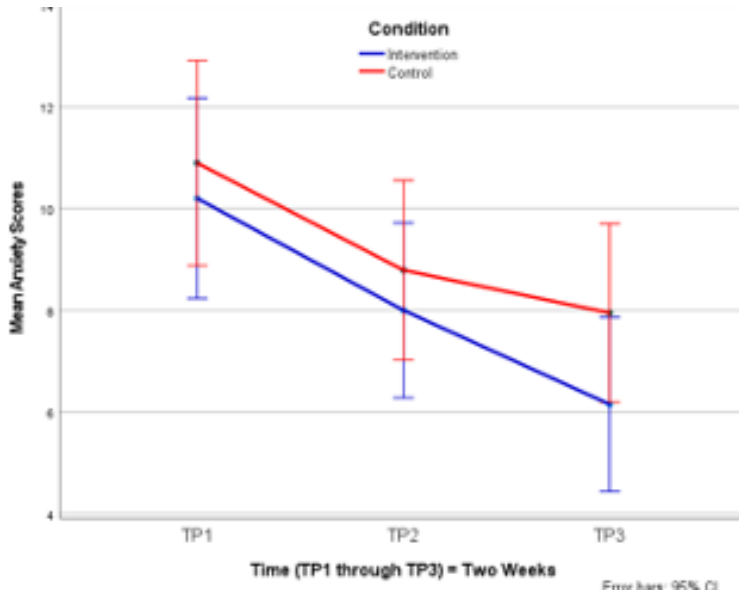
Table 8: Descriptive Statistics: Means for Anxiety Scores Post-Test & Follow-Up by Group

	Group	Mean	Std. Deviation	N
Anxiety2	Intervention	8.00	3.61	20
	Control	8.79	3.98	19
	Total	8.38	3.77	39
Anxiety3	Intervention	6.15	3.35	20
	Control	7.95	4.18	19
	Total	7.03	3.84	39

Results of the analysis indicated there was a significant difference in anxiety scores from TP2 to TP3 ($F(1,37) = 7.798, p = 0.001 = 8, \eta_p^2 = 0.174$). The interaction between TP and group (i.e., intervention versus delayed intervention/control group) was nonsignificant ($F(1,37) = 1.093, p = 0.303, \eta_p^2 = 0.029$) with inadequate statistical power (observed power = 0.175). These findings indicate that there were not significant differences between the groups from TP2 to TP3 in anxiety scores and that NBMT does not appear to impact anxiety. This finding may be due to low statistical power (observed power = 0.303) given the small sample size ($n = 39$). However, as seen in Figure 3, the intervention group experienced a decrease in

anxiety scores by more than one point compared to the delayed intervention/control group from TP2 to TP3.

Figure 3: Anxiety Scores TP1 through TP3 by Group



Two additional repeated measures ANOVAs were conducted, the first using GAD-7 (i.e., anxiety) scores from TP1 and TP3 and the second using GAD-7 scores from TP1, TP2, and TP3 for both intervention and delayed intervention/control groups. These additional analyses did not change the results with significant differences within participants across time points, but no significant results between the intervention and control group.

Similar to Research Question 1, a post-hoc repeated measures ANOVA was conducted with post-test and one week follow up GAD-7 (i.e., anxiety) scores after removing the seven participants with lower anxiety scores from the analysis ($n = 32$) with equal participants in the intervention group ($n = 16$) and delayed intervention/control group ($n = 16$). Mean scores on the GAD-7 for the intervention group decreased 2.25 points, that is a decrease in the presence of anxiety symptoms from TP2 to TP3 one week after receiving the intervention. Mean scores on the GAD-7 for the delayed intervention group decreased 0.5 points from TP2 to TP3. After

rerunning the analysis without the seven participants with lower anxiety scores at TP1 did not change the results.

Research Question 4: What is the impact of a 90-minute Nature-Based Mindfulness Training intervention on mindfulness scores for undergraduate college students post-test to one-week follow up compared to a control (delayed intervention) group?

Hypothesis 4: Participation in the 90-minute Nature-Based Mindfulness Training intervention will result in a significant increase in overall mindfulness scores and subscale scores (*Observing, Describing, Acting with Awareness, Nonjudging of inner experience, and Nonreactivity to inner experience*) from pre to post-test for the intervention group compared to a control (delayed intervention) group.

To test Hypothesis 4, six repeated measures ANOVA were conducted with FFMQ (i.e., mindfulness) total and subscale scores using TP2 (post-test scores for the intervention group and second baseline scores for the delayed intervention/control group) to TP3 (one week follow-up scores for the intervention group and third baseline scores for the delayed intervention/control group) as the within factor and the treatment condition (i.e., intervention and delayed intervention/control group) as the between factor. For Research Question 4, letters a through f will be used to differentiate results, with Hypothesis 4a referencing total mindfulness scores. See Table 9 for mean, standard deviation, and *n* for FFMQ total and subscale scores for each TP by group.

Table 9: Descriptive Statistics: Means for Mindfulness Scores Post-Test & Follow-Up by Group

	Group	Mean	Std. Deviation	N
FFMQ2	Intervention	47.15	5.93	20
	Control	47.95	8.06	19
	Total	47.54	6.97	39
FFMQ3	Intervention	49.15	4.85	20
	Control	46.47	6.36	19

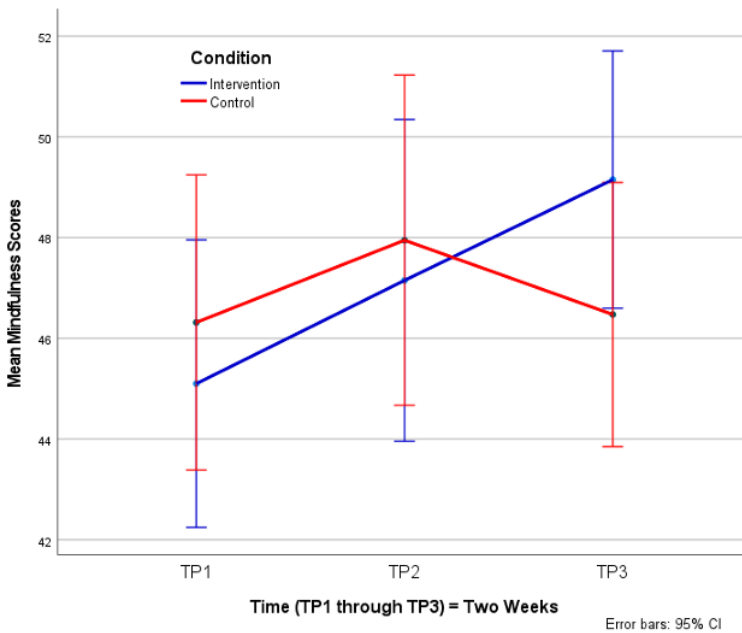
	Total	47.85	5.72	39
Observing2	Intervention	10.55	2.19	20
	Control	10.53	1.95	19
	Total	10.54	2.05	39
Observing3	Intervention	10.75	2.55	20
	Control	9.42	2.61	19
	Total	10.10	2.58	39
Describing2	Intervention	9.15	3.22	20
	Control	9.89	2.89	19
	Total	9.51	3.04	39
Describing3	Intervention	9.65	2.60	20
	Control	9.37	2.22	19
	Total	9.51	2.39	39
Awareness2	Intervention	9.60	2.21	20
	Control	9.11	2.33	19
	Total	9.36	2.25	39
Awareness3	Intervention	9.75	1.77	20
	Control	9.16	1.77	19
	Total	9.46	1.78	39
Nonjudging2	Intervention	9.00	2.43	20
	Control	10.00	2.87	19
	Total	9.49	2.66	39
Nonjudging3	Intervention	9.15	2.74	20
	Control	10.42	3.01	19
	Total	9.77	2.91	39
Nonreactivity2	Intervention	8.85	2.32	20
	Control	8.42	2.46	19
	Total	8.64	2.38	39
Nonreactivity3	Intervention	9.85	2.60	20
	Control	8.11	2.00	19
	Total	9.00	2.46	39

Mean scores on the FFMQ-15 for the intervention group increased 2.00 points, that is an increase in the ability to be mindful in daily life from TP2 to TP3 one week after receiving the intervention. Mean scores on the FFMQ-15 for the delayed intervention group decreased 1.48 points from TP2 to TP3. Results of the analysis indicated there was not a significant difference in total mindfulness scores from TP2 to TP3 ($F(1,37) = 0.140, p = 0.710, \eta_p^2 = 0.004$) with inadequate statistical power (observed power = 0.065). Regarding Hypothesis 4a, the TP and interaction between groups was significant ($F(1,37) = 6.103, p = 0.018, \eta_p^2 = 0.142$). As seen below in Figure 4, these findings indicate that there was a significant difference between the groups from TP2 to TP3 in total mindfulness scores and that NBMT did appear to impact overall mindfulness from post-test to one week follow-up with a large effect size.

A post-hoc repeated measures ANOVAs was conducted using total mindfulness scores from TP1 (baseline scores for the intervention group and the delayed intervention/control group) and TP3 (one week follow-up scores for the intervention group and third baseline scores for the delayed intervention/control group) as the within factor and the treatment condition (i.e., intervention and delayed intervention/control group) as the between factor. Results of the analysis indicated there was a significant difference in mindfulness scores from TP1 and TP3 ($F(1,37) = 8.540, p = 0.006, \eta_p^2 = 0.188$). The interaction between TP and group (i.e., intervention versus delayed intervention/control group) was significant ($F(1,37) = 7.306, p = 0.010, \eta_p^2 = 0.165$).

A second post-hoc repeated measures ANOVA was conducted using total mindfulness scores from TP1 (baseline scores for the intervention group and the delayed intervention/control group), TP2 (post-test scores for the intervention group and second baseline scores for the delayed intervention/control group), and TP3 (one week follow-up scores for the intervention group and third baseline scores for the delayed intervention/control group) as the within factor and the treatment condition (i.e., intervention and delayed intervention/control group) as the between factor. Results of the analysis indicated there was a significant difference in total mindfulness scores from TP1, TP2, and TP3 ($F(2,74) = 5.478, p = 0.006, \eta_p^2 = 0.129$). The interaction between TP and group (i.e., intervention versus delayed intervention/control group) was significant ($F(2,74) = 4.757, p = 0.011, \eta_p^2 = 0.114$). As seen below in Figure 4, these findings indicate there was a significant difference between the groups from TP1 through TP3 in mindfulness scores and that NBMT did appear to impact the ability to be mindful in daily life.

Figure 4: FFMQ Total Scores TP1 through TP3 by Group

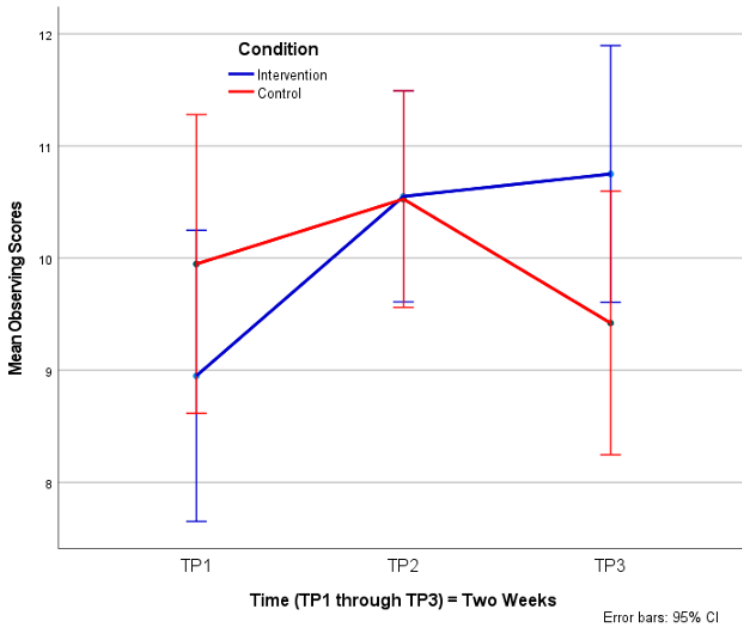


To test Hypothesis 4b, a repeated measures ANOVA was conducted with Observing subscale scores using TP2 (post-test scores for the intervention group and second baseline scores for the delayed intervention/control group) to TP3 (one week follow-up scores for the intervention group and third baseline scores for the delayed intervention/control group) as the within factor and the treatment condition (i.e., intervention and delayed intervention/control group) as the between factor. Mean scores on the Observing subscale for the intervention group increased 0.2 points, that is an increase in noticing internal and external experiences from TP2 to TP3 one week after receiving the intervention. Mean scores on the Observing subscale for the delayed intervention group decreased 1.11 points from TP2 to TP3. Results of the analysis indicated there was not a significant difference in Observing subscale scores from TP2 to TP3 ($F(1,37) = 2.925, p = 0.096, \eta_p^2 = 0.073$) with inadequate statistical power (observed power = 0.385). The interaction between TP and group (i.e., intervention versus delayed intervention/control group) was significant ($F(1,37) = 6.082, p = 0.018, \eta_p^2 = 0.141$).

A post-hoc repeated measures ANOVAs was conducted using Observing scores from TP1 (baseline scores for the intervention group and the delayed intervention/control group) and TP3 (one week follow-up scores for the intervention group and third baseline scores for the delayed intervention/control group) as the within factor and the treatment condition (i.e., intervention and delayed intervention/control group) as the between factor. Results of the analysis indicated there was not a significant difference in Observing subscale scores from TP1 and TP3 ($F(1,37) = 2.479, p = 0.124, \eta_p^2 = 0.063$) with inadequate statistical power (observed power = 0.335). The interaction between TP and group (i.e., intervention versus delayed intervention/control group) was significant ($F(1,37) = 8.269, p = 0.007, \eta_p^2 = 0.183$).

A second post-hoc repeated measures ANOVA was conducted using Observing scores from TP1 (baseline scores for the intervention group and the delayed intervention/control group), TP2 (post-test scores for the intervention group and second baseline scores for the delayed intervention/control group), and TP3 (one week follow-up scores for the intervention group and third baseline scores for the delayed intervention/control group) as the within factor and the treatment condition (i.e., intervention and delayed intervention/control group) as the between factor. Results of the analysis indicated there was a significant difference in Observing subscale scores from TP1, TP2, and TP3 ($F(2,74) = 5.079, p = 0.009, \eta_p^2 = 0.121$). The interaction between TP and group (i.e., intervention versus delayed intervention/control group) was significant ($F(2,74) = 5.763, p = 0.005, \eta_p^2 = 0.135$). As seen below in Figure 5, these findings indicate there was a significant difference between the groups from TP1 through TP3 in Observing subscale scores and that NBMT did appear to impact the ability to notice internal and external experiences from pre-test to one week after the intervention.

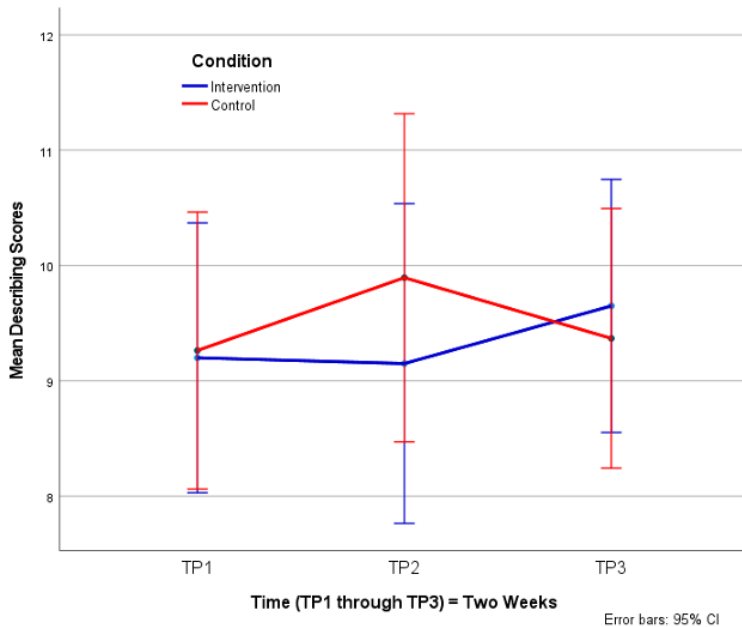
Figure 5: Observing Subscale Scores TP1 through TP3 by Group



To test Hypothesis 4c, a repeated measures ANOVA was conducted with Describing subscale scores using TP2 (post-test scores for the intervention group and second baseline scores for the delayed intervention/control group) to TP3 (one week follow-up scores for the intervention group and third baseline scores for the delayed intervention/control group) as the within factor and the treatment condition (i.e., intervention and delayed intervention/control group) as the between factor. Mean scores on the Describing subscale for the intervention group increased 0.50 points, that is an increase in using words to label one’s internal and external experience from TP2 to TP3 one week after receiving the intervention. Mean scores on the Describing subscale for the delayed intervention group decreased 0.52 points from TP2 to TP3. Results of the analysis indicated there was a not a significant difference in Describing subscale scores from TP2 to TP3 ($F(1,37) = 0.003, p = 0.960, \eta_p^2 = 0.000$) with inadequate statistical power (observed power = 0.050). The interaction between TP and group (i.e., intervention versus delayed intervention/control group) was nonsignificant ($F(1,37) = 3.807, p = 0.059, \eta_p^2 =$

0.093) with inadequate statistical power (observed power = 0.476). This finding indicates that there were not significant differences between the groups from TP2 to TP3 in Describing subscale scores which may be due to low statistical power (observed power = 0.476) given the small sample size ($n = 39$). However, as seen in Figure 6, the intervention group experienced an increase in Describing subscale scores compared to a decrease in the delayed intervention/control group from TP2 to TP3 between a moderate and large effect size. Two additional repeated measures ANOVAs were conducted, the first using Describing scores from TP1 and TP3 and the second using Describing scores from TP1, TP2, and TP3 for both intervention and delayed intervention/control groups. These additional analyses did not change the results with no significant differences within participants across timepoints and no significant differences between the intervention and control group.

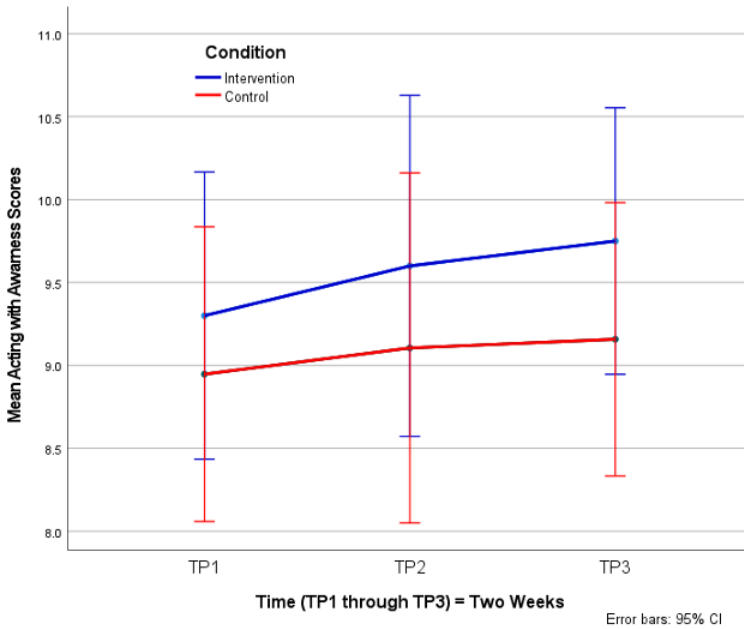
Figure 6: Describing Subscale Scores TP1 through TP3 by Group



To test Hypothesis 4d, a repeated measures ANOVA was conducted with Acting with Awareness subscale scores using TP2 (post-test scores for the intervention group and second baseline scores for the delayed intervention/control group) to TP3 (one week follow-up scores

for the intervention group and third baseline scores for the delayed intervention/control group) as the within factor and the treatment condition (i.e., intervention and delayed intervention/control group) as the between factor. Mean scores on the Acting with Awareness subscale for the intervention group increased 0.15 points, that is an increase in the ability to attend and intentionally act in the moment from TP2 to TP3 one week after receiving the intervention. Mean scores on the Acting with Awareness subscale for the delayed intervention group increased 0.05 points from TP2 to TP3. Results of the analysis indicated there was not a significant difference in Acting with Awareness subscale scores from TP2 to TP3 ($F(1,37) = 0.146, p = 0.705, \eta_p^2 = 0.004$) with inadequate statistical power (observed power = 0.066). The interaction between TP and group (i.e., intervention versus delayed intervention/control group) was nonsignificant ($F(1,37) = 0.034, p = 0.855, \eta_p^2 = 0.001$) with inadequate statistical power (observed power = 0.054). These findings indicate that there were not significant differences between the groups from TP2 to TP3 in Acting with Awareness subscale scores and that NBMT did not appear to impact the ability to attend and intentionally act in the moment from post-test to one week follow-up. Two additional repeated measures ANOVAs were conducted, the first using Acting with Awareness scores from TP1 and TP3 and the second using Acting with Awareness scores from TP1, TP2, and TP3 for both intervention and delayed intervention/control groups. These additional analyses did not change the results with no significant differences within participants across timepoints and no significant differences between the intervention and control group.

Figure 7: Acting with Awareness Subscale Scores TP1 through TP3 by Group

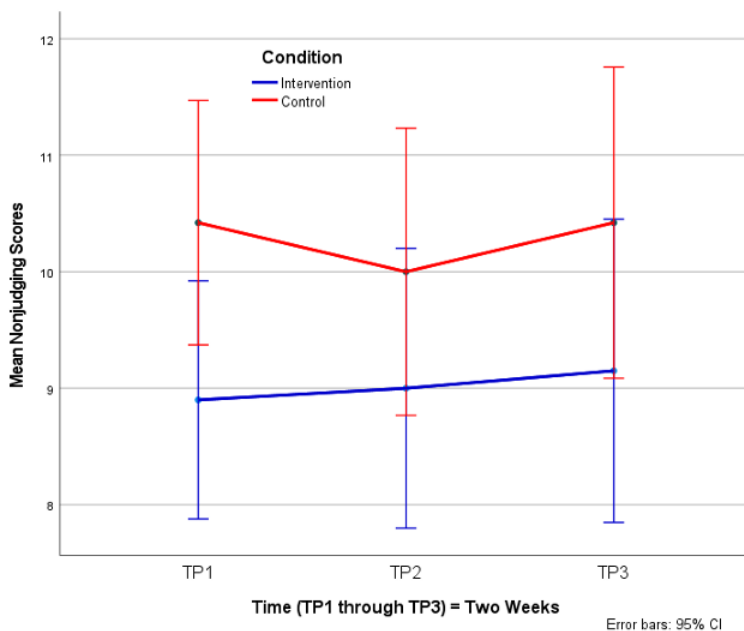


To test Hypothesis 4e, a repeated measures ANOVA was conducted with Nonjudging subscale scores using TP2 (post-test scores for the intervention group and second baseline scores for the delayed intervention/control group) to TP3 (one week follow-up scores for the intervention group and third baseline scores for the delayed intervention/control group) as the within factor and the treatment condition (i.e., intervention and delayed intervention/control group) as the between factor. Mean scores on the Nonjudging subscale for the intervention group increased 0.15 points, that is an increase in the ability to be neutral and objective towards thoughts and feelings from TP2 to TP3 one week after receiving the intervention. Mean scores on the Nonjudging subscale for the delayed intervention group increased 0.42 points from TP2 to TP3. Results of the analysis indicated there was not a significant difference in Nonjudging subscale scores from TP2 to TP3 ($F(1,37) = 0.870, p = 0.357, \eta_p^2 = 0.023$) with inadequate statistical power (observed power = 0.149). The interaction between TP and group (i.e., intervention versus delayed intervention/control group) was nonsignificant ($F(1,37) =$

0.196, $p = 0.661$, $\eta_p^2 = 0.005$) with inadequate statistical power (observed power = 0.072).

This finding indicates that there was not significant difference between the groups from TP2 to TP3 in Nonjudging subscale scores and that NBMT did not appear to impact the ability to be neutral and objective towards thoughts and feelings from post-test to one week follow-up. Two additional repeated measures ANOVAs were conducted, the first using Nonjudging scores from TP1 and TP3 and the second using Nonjudging scores from TP1, TP2, and TP3 for both intervention and delayed intervention/control groups. These additional analyses did not change the results with no significant differences within participants across timepoints and no significant differences between the intervention and control group.

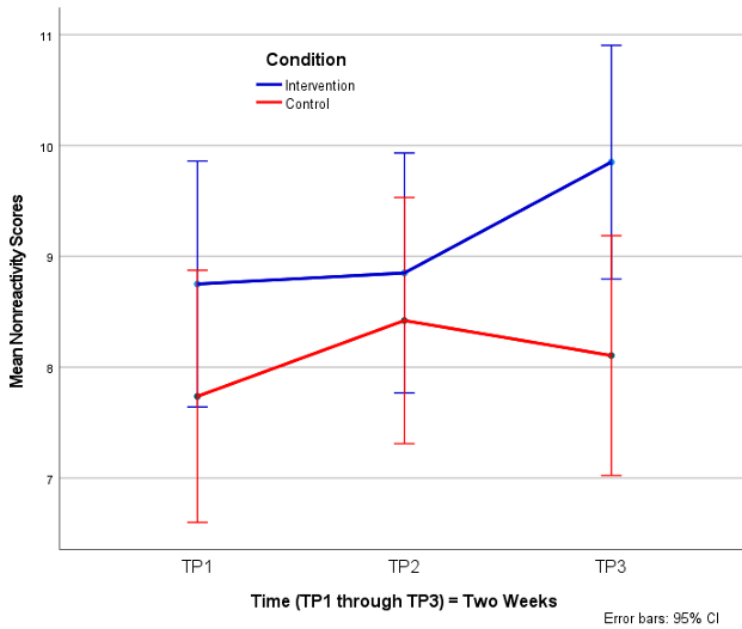
Figure 8: Nonjudging Subscale Scores TP1 through TP3 by Group



To test Hypothesis 4f, a repeated measures ANOVA was conducted with Nonreactivity subscale scores using TP2 (post-test scores for the intervention group and second baseline scores for the delayed intervention/control group) to TP3 (one week follow-up scores for the intervention group and third baseline scores for the delayed intervention/control group) as the

within factor and the treatment condition (i.e., intervention and delayed intervention/control group) as the between factor. Mean scores on the Nonreactivity subscale for the intervention group increased 1.0 points, that is an increase the ability to allow thoughts and feelings to come and go without becoming involved in them from TP2 to TP3 one week after receiving the intervention. Mean scores on the Nonreactivity subscale for the delayed intervention group decreased 0.31 points from TP2 to TP3. Results of the analysis indicated there was not a significant difference in Nonreactivity subscale scores from TP2 to TP3 ($F(1,37) = 0.835, p = 0.367, \eta_p^2 = 0.022$) with inadequate statistical power (observed power = 0.145). The interaction between TP and group (i.e., intervention versus delayed intervention/control group) was nonsignificant ($F(1,37) = 3.088, p = 0.087, \eta_p^2 = 0.077$) with inadequate statistical power (observed power = 0.402). This finding indicates that there were not significant differences between the groups from TP2 to TP3 in Nonreactivity subscale scores which may be due to low statistical power (observed power = 0.402) given the small sample size ($n = 39$). However, as seen in Figure 9, the intervention group experienced an increase in Nonreactivity subscale scores compared to a decrease in the delayed intervention/control group from TP2 to TP3 with a moderate effect size. Two additional repeated measures ANOVAs were conducted, the first using Nonreactivity scores from TP1 and TP3 and the second using Nonreactivity scores from TP1, TP2, and TP3 for both intervention and delayed intervention/control groups. These additional analyses did not change the results with no significant differences within participants across timepoints and no significant differences between the intervention and control group.

Figure 9: Nonreactivity Subscale Scores TP1 through TP3 by Group



Student Engagement

Research Question 5: How engaged are participants during a 90-minute NBMT intervention?

To assess the level of student engagement during the NBMT intervention, the researcher ran descriptive statistics for individual items and SE total scores ranging from 0 to 10 with higher scores indicating higher level of engagement (See Table 10).

Table 10: Descriptive Statistics: Student Engagement Scores

	SE Total	Group Leader Enthusiasm 1	Group Leader Enthusiasm 2	Enjoyment	Activity During NBMT	Attentiveness	Program Value
Mean	9.5348	10	9.91	9.59	8.3797	10	9.32
N	37	37	37	37	37	37	37
Std. Deviation	0.54390	0.00	0.54745	1.384	1.86172	0.00	1.733
Minimum	7.78	10	6.67	5	3.33	10	5
Maximum	10	10	10	10	10	10	10
Range	2.22	0	3.33	5	6.67	0	5

The means for all individual SE items and SE totals are above 8, indicating a high level of engagement among participants during NBMT (Hansen et al., 2019). For Group Leader

Enthusiasm 1 all participants responded “Yes, a lot” and for Attentiveness all participants responded “Often”. The lowest mean score for a single SE scale items was around Activity During NBMT (Mean = 8.38), with 20 participants reporting sharing of their experience often, 16 participants reporting sharing their experience occasionally, and 1 participant reporting rarely sharing their experience. Please see Appendix E for specific question for individual items.

Relationship Between Student Engagement and Anxiety Change Scores

Research Question 6: How does engagement during a 90-minute NBMT intervention impact change in undergraduate college student anxiety scores from pre to post-test?

Hypothesis 6: Higher engagement with the NBMT intervention will result in a significant decrease in anxiety scores from pre- to post-test.

To answer Research Question 6, the researcher calculated pre- to post-test change scores for the GAD-7 (Spitzer et al., 2006) by subtracting post-test scores from the pre-test scores for both the intervention groups (TP1 – TP2) and control/delayed intervention groups (TP3 – TP4). To test Hypothesis 6, the relationship between student engagement (as measured by the SE scale) and anxiety change scores (as measured change in GAD-7 scores from pre-test to post-test) was investigated using a Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of normality and linearity. There was a small positive correlation between the two variables ($r = 0.21, n = 37, p = 0.20$), with high levels of engagement associated with a decrease in anxiety scores. However, these results should be interpreted with caution as the results were not significant at $\alpha = 0.05$ and this finding may be due to low statistical power (observed power = 0.084).

Research Question 7: How does engagement during a 90-minute NBMT intervention impact change in undergraduate college student anxiety scores from post-test to one-week follow-up?

Hypothesis 7: Higher engagement scores with the NBMT intervention will result in a significant decrease in anxiety scores from post-test to one-week follow-up.

To answer Research Question 7, the researcher calculated post-test to one-week follow-up change scores for the GAD-7 (Spitzer et al., 2006) by subtracting the follow-up scores from the post-test scores for both the intervention groups (TP2 – TP3) and control/delayed intervention groups (TP4 – TP5). To test Hypothesis 7, the relationship between student engagement (as measured by the SE scale; Hansen et al., 2019) and anxiety change scores (as measured change in GAD-7 scores from post-test to one week follow-up) was investigated using a Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of normality and linearity. There was a very small positive correlation between the two variables ($r = 0.07$, $n = 37$, $p = 0.69$), with high levels of engagement associated with a decrease in anxiety scores. However, these results should be interpreted with caution as the results were not significant at $\alpha = 0.05$ and may be due to low statistical power (observed power = 0.297).

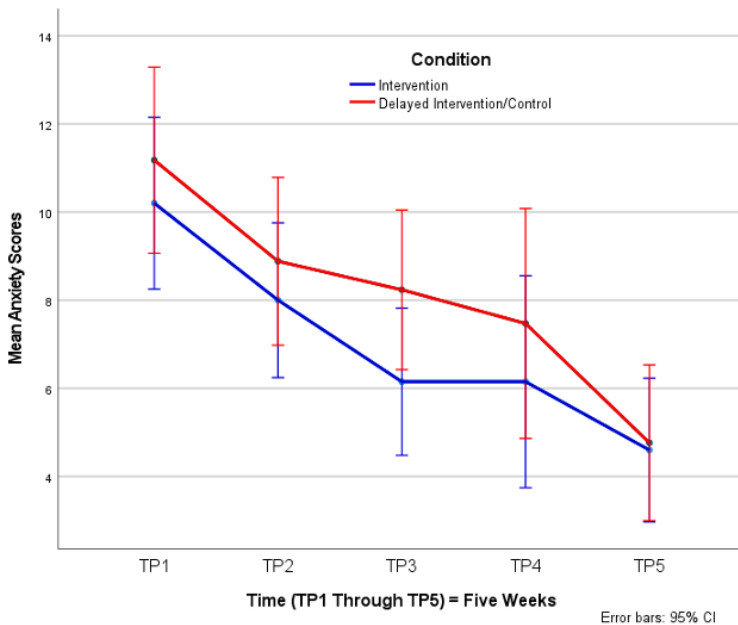
Exploratory Post-Hoc Analyses

It is important to note both groups experienced a larger decrease in anxiety scores when compared to the other group at the one-week follow-up after receiving the intervention (i.e., TP2 – TP3 for the intervention group, TP4 – TP5 for the delayed intervention/control group). Mean scores on the GAD-7 for the intervention group decreased 1.85 points, that is a decrease in the presence of anxiety symptoms from TP2 to TP3 approximately one week after receiving the

intervention while mean scores on the GAD-7 for the delayed intervention group decreased 0.64 points from TP2 to TP3, with a mean difference of 1.21. Similarly, from TP4 to TP5 (i.e., one-week follow-up for the delayed intervention group), mean scores on the GAD-7 for the delayed intervention group decreased 2.71 points, that is a decrease in the presence of anxiety symptoms from TP4 to TP5 approximately one week after receiving the intervention, while mean scores on the GAD-7 for the intervention group decreased 1.55 points from TP4 to TP5, with a mean difference of 1.16.

To further explore the impact of NBMT on anxiety scores over a longer length of time, an exploratory post-hoc repeated measures ANOVAs was conducted using GAD-7 scores from all five TPs for all participants ($n = 37$) who received the intervention, with the TPs as the within factor and condition (i.e., intervention versus delayed intervention/control) as the between factor (see Figure 10). Those in the intervention group ($n = 20$) received the NBMT intervention in mid-October just before TP2 and the delayed intervention/control group ($n = 17$) received the NBMT intervention in late-October just before TP4. Results of the analysis indicated there was a significant difference in anxiety scores from TP1 to TP5 ($F(4,140) = 20.665, p < 0.001, \eta_p^2 = 0.371$) with a large effect size. The interaction between TPs and group (i.e., intervention versus delayed intervention/control group) was nonsignificant ($F(4,140) = 0.517, p = 0.723, \eta_p^2 = 0.015$) with inadequate statistical power (observed power = 0.171).

Figure 10: Anxiety Scores TP1 through TP5 by Group



A post-hoc repeated measures ANOVAs was conducted using anxiety scores from TP4 and TP5. Results of the analysis indicated there was a significant difference in anxiety scores from TP4 and TP5 ($F(1,35) = 13.724, p < 0.001, \eta_p^2 = 0.282$). The interaction between TP and group (i.e., intervention versus delayed intervention/control group) was not significant ($F(1,35) = 1.012, p = 0.321, \eta_p^2 = 0.028$) with inadequate statistical power (observed power = 0.165). A second post-hoc repeated measures ANOVA was conducted using anxiety scores from TP3, TP4, and TP5. Results of the analysis indicated there was a significant difference in anxiety scores from TP3, TP4, and TP5 ($F(2,70) = 9.024, p < 0.001, \eta_p^2 = 0.205$). The interaction between TPs and group (i.e., intervention versus delayed intervention/control group) was not significant ($F(2,70) = 1.153, p = 0.322, \eta_p^2 = 0.032$) with inadequate statistical power (observed power = 0.246).

Intervention Feedback Responses

As this is the first investigation of NBMT for college students experiencing anxiety, the researcher aimed to explore how spending time in nature and interaction with peers during NBMT impacted participant understanding mindfulness and anxiety using two slider scale questions (e.g., 0 = Nature impacted mindfulness/anxiety more than interaction with peers in the group; 50 = Nature and interaction with peers impacted mindfulness/anxiety equally; 100 = Interaction with peers in the group impacted mindfulness/anxiety more than nature). All results from the intervention feedback questions combine participants from the intervention and delayed intervention/control group ($n = 37$). As seen in Table 11, on average, participants indicated an equal impact of time spent in nature and interaction with peers in the group to better understand mindfulness ($Mean = 49.49$; $Median = 50$). However, regarding anxiety, participants indicated time spent in nature to have a larger impact than interaction with peers in the group regarding anxiety ($Mean = 40.62$; $Median = 36$).

Table 11: Descriptive Statistics: Slider Scale Post-NBMT Responses – Impact of Nature versus Peer Interaction to Better Understand Mindfulness and the Impact on Anxiety

	Mindfulness	Anxiety
Mean	49.49	40.62
N	37	37
Std. Deviation	30.279	33.696
Median	50	36
Range	0 – 100	0 – 100

In addition to slider scale questions, participants responded to Likert scale questions to further explore the impact of time spent in nature and interacting with peers in the group to better understand mindfulness and to reduce anxiety (see Table 12).

Table 12: Descriptive Statistics: Likert Scale Post-NBMT Responses – Impact of Nature and Peer Interaction to Better Understand Mindfulness and Reduce Anxiety

	Peer Interaction (Mindfulness)	Peer Interaction (Anxiety)	Nature (Mindfulness)	Nature (Anxiety)
Mean	4.41	3.92	4.70	4.43
N	37	37	37	37
Std. Deviation	0.551	0.829	0.463	0.689
Range	3 – 5	2 – 5	4 – 5	2 – 5

Social Interaction

In response to the question regarding the impact of peer interaction helping to better understand mindfulness, thirty-six participants (97.3%) agreed or strongly agreed interacting with peers in the group helped to better understand mindfulness, with one participant (2.7%) indicating a neutral response (i.e., neither agree nor disagree; $M = 4.41$, $SD = 0.551$). The participant who indicated a neutral response stated, “We shared a good bit of personal struggles ... I think none of us knew exactly the correct definition of it [mindfulness] and could work more on it”. In response to the question exploring the impact of peer interaction on reducing anxiety, twenty-nine participants agreed or strongly agreed (78.4%), five participants (13.5%) indicated a neutral response (i.e., neither agree nor disagree), and three participants (8.1%) disagreed that peer interaction helped to reduce anxiety ($M = 3.92$, $SD = 0.829$). One of the participants who disagreed stated, “nature helped more here”. A theme among participants indicating a neutral response is experiencing social anxiety. While NBMT is designed as a group intervention with social interaction essential, those experiencing social anxiety did not indicate a negative response to the impact of NBMT on reducing anxiety.

Nature

Additionally, participants responded to two questions exploring the impact of nature to better understand mindfulness and to reduce anxiety. All thirty-seven participants (100%) agreed

or strongly agreed spending time in nature helped them to better understand mindfulness ($M = 4.70$, $SD = 0.463$). In response to the question exploring the impact of spending time in nature on reducing anxiety, thirty-five participants (94.6%) agreed or strongly agreed, one participant (2.7%) indicated a neutral response (i.e., neither agree nor disagree), and one participant disagreed ($M = 4.43$, $SD = 0.689$). Both participants indicating a neutral or negative response indicate being in nature to be anxiety provoking, “being that it is so unpredictable” and “I have a serious fear of bugs and snakes and creatures”, however, both participants also reported, “but at the same time, the stillness was nice” and “but the weather and sounds of nature made it better”.

Self-Efficacy

In the final survey, all participants ($n = 37$) indicated whether participating in NBMT helped to improve self-efficacy to better manage anxiety symptoms with mean and standard deviation scores presented in Table 13. Thirty-three participants (89.1%) agreed or strongly agreed participating in NBMT impacted their self-efficacy to better manage symptoms of anxiety, while four participants (10.9%) indicated a neutral response (neither agree nor disagree; $M = 4.24$, $SD = 0.641$) with no differences between participants in the intervention group and delayed intervention/control group. Two participants with neutral responses indicated a lack of engagement with NBMT skills outside of the intervention group contributing to the impact of NBMT on their self-efficacy, with another participant stating, “I think it would’ve been completely agree if I could be consistent. The first day we met as a group was great because I was able to talk it out but after than I didn’t really get to”. The qualitative data from participants indicating neutral responses to improving self-efficacy suggests either an increased in frequency of NBMT groups or practicing NBMT skills outside of group may positively impact self-efficacy to better manage anxiety.

Table 13: Descriptive Statistics: Self-Efficacy Likert Scale Responses

	Self-Efficacy
Mean	4.24
N	37
Std. Deviation	0.641
Range	3 – 5

CHAPTER V: DISCUSSION

With anxiety on college campuses increasing at an alarming rate (CCMH, 2021; Lee et al., 2021; Nguyen et al., 2021), Chapter II presented evidence on the impact of Mindfulness Based Interventions (MBIs; Bamber & Schneider, 2016; Hazlett-Stevens & Oren, 2017; Levin et al., 2020; Lothes II et al., 2021; Taylor et al., 2014), nature exposure (Barton & Pretty, 2010; Holt et al., 2019; Lee et al., 2011; Meredith et al., 2019; Seitz et al., 2014; Tsunetsugu et al., 2013), and brief nature-based mindfulness interventions (Ibes & Forestell, 2022; Ibes et al., 2018; Nisbet et al., 2019; Owens & Bunce, 2022a) with support for developing innovative and attractive nature-based mindfulness interventions for college students with anxiety. In addition, as indicated in Chapter II, this study appears to be one of the first of its kind by examining the impact of a brief group nature-based mindfulness intervention among college students experiencing anxiety. Chapter III outlined a new 90-minute psychoeducational group intervention, Nature-Based Mindfulness Training (NBMT) aimed to reduce anxiety and improve mindfulness and presented the methodology for the research study. Chapter IV presented the findings of the study. This final chapter, Chapter V, provides a summary discussion of study findings, comparisons with other studies, a discussion regarding feasibility, implications for students, practitioners, institutions of higher education, and researchers, study limitations, and suggestions for future research.

Summary of Study Findings & Connections to Prior Research

Anxiety

Anxiety scores started in the moderate range for both the intervention group (10.20) and the delayed intervention/control group (10.89). Although there was a significant difference in anxiety scores across both groups ($M = 2.16$) with a large effect size across the first two time

points (TP; i.e., TP1 and TP2), the interaction between TP and group was nonsignificant. It is important to note that the participants' university was closed for fall break for two days between TP1 and TP2 and the instructions provided indicated to respond to the GAD-7 (i.e., anxiety) questions within the past week. History, specific events occurring between measurement TPs, is a threat to internal validity (Campbell & Stanley, 1963). With school breaks influencing college student affect and behavior (Vidal Bustamante et al., 2022), and fall break occurring between TP1 and TP2, it appears fall break may have contributed to the significant decrease in anxiety scores across both the intervention and delayed intervention/control groups. Future studies exploring NBMT may consider implementing the intervention prior to scheduled breaks during the semester.

Additionally, there was a significant decrease in anxiety scores from TP2 to TP3 across both groups, and the interaction between TP and group was nonsignificant. Although the intervention group experienced a decrease in anxiety scores by more than one point compared to the delayed intervention/control group from TP2 to TP3, the results were insignificant. These results may be due to low statistical power (observed power = 0.303) given the small sample size ($n = 39$) and perhaps, it may take more time for this brief intervention to take effect in reducing anxiety (Howarth et al., 2019). The largest decrease in anxiety scores for the intervention group occurred from TP1 to TP2, coinciding with the scheduled fall break, with the second largest decrease in anxiety scores from TP2 to TP3, one week after receiving the NBMT intervention.

The delayed intervention group experienced a decrease in anxiety scores by more than one point compared to the intervention group from TP4 to TP5 (i.e., one-week follow-up for the delayed intervention group). While there was a significant decrease in anxiety scores from TP4 to TP5 across both groups, the interaction between TP and group was nonsignificant. Given the

duration of the study being only 5 weeks, study procedures were asked to only consider the past week when responding to the GAD-7 as opposed to the past two weeks (Spitzer et al., 2006) which may have influenced the results. While the developers of the GAD-7 indicate a shorter timeframe (e.g. one week) may be appropriate to measure changes in anxiety in response to therapy (Spitzer et al., 2006), NBMT is designed to be brief (i.e., one 90-minute group). It may more take longer than one week to see changes in anxiety from brief mindfulness interventions (Howarth et al., 2019), with more research needed on the impact of brief mindfulness interventions over time (Schumer et al., 2018). Future studies may consider increasing the number of data collection points (i.e., more baseline and follow-up measures) and collecting follow-up data (e.g., 3 months, etc.) to examine the impact of NBMT over a longer period time.

While the results examining changes in anxiety were not statistically significant across groups, constructs examined in counseling research may be unstable (i.e., anxiety) and it is worth considering practical significance (i.e., effect size) to clarify direction and magnitude of outcomes (Balkin & Lenz, 2021; Thompson, 2002). Partial eta squared is an effect size recommended to improve comparability of studies which indicates the sum of squares effect in relation to the sum of squares of the effect plus the sum of squares error associated with the effect $\eta_p^2 = \frac{SS_{between}}{SS_{between} + SS_{error}}$ (Lakens, 2013; Richardson, 2011). Although there was not a statistical difference between TP and group in anxiety scores at the one week follow up for the intervention group (i.e., TP2 and TP3), the effect size was between small and moderate ($\eta_p^2 = 0.029$). Similarly, although there was not a statistical difference between TP and group in anxiety scores at the one week follow up for the delayed intervention/control group (i.e., TP4 and TP5), the effect size was also between small and moderate ($\eta_p^2 = 0.028$). While an a priori moderate effect size was deemed appropriate for this study based on previous literature (Bamber

& Morpeth, 2019; Hofmann et al., 2010), the moderate effect size from the nature-based mindfulness interventions with college students (Djernis et al., 2021) was found from a 5-day residential retreat, as opposed to a single 90-minute brief nature-based mindfulness intervention. While it is difficult to compare the findings to previous literature because the present study is the first to use the GAD-7 (Spitzer et al., 2006) to assess the impact of the newly created nature-based mindfulness intervention (i.e., NBMT) on anxiety, these findings add to the existing literature with a small effect size recommended for future research on brief group nature-based mindfulness interventions for college students with anxiety.

It is also worth exploring clinical significance (i.e., value for those receiving an intervention or treatment) in counseling intervention and outcome research (Balkin & Lenz, 2021; Thompson, 2002). The percent improvement index ($100 \times \frac{[Preintervention\ scores - Postintervention\ scores]}{Preintervention\ scores}$) is a strategy to estimate clinical significance for data related to the frequency or severity of symptoms (Blanchard & Schwarz, 1988). It can be used for individual and group level data and is based on the notion that when gains from treatment surpass a certain threshold, these gains will be meaningful and lasting (Balkin & Lenz, 2021). For the intervention group ($n = 20$), the group percent improvement index from TP1 to TP5 is 54.9% ($100 \times \frac{[10.2 - 4.6]}{10.2}$) is regarded as clinically significant improvement as it is above the 50% threshold (Lenz, 2020). Thus, it took four weeks post-intervention to see clinically significant improvement in anxiety for participants in the intervention group. While slight improvement (e.g., 25% – 50%) is seen two weeks post-intervention for the delayed intervention group ($n = 17$) using pretreatment scores at TP3 and posttreatment scores at TP5 ($100 \times \frac{[8.24 - 4.76]}{8.24} = 42\%$), the longer time frame potentially allows participants to implement the skills learned during NBMT in their daily life. The findings from post-hoc analysis suggests more time

post-intervention may be needed to reduce anxiety scores (Howarth et al., 2019; Schumer et al., 2018; see Figure 10) which is supported by studies assessing college student anxiety using the GAD-7 (Byrd Bredbenner et al., 2020). Future studies exploring the impact of NBMT may benefit from collecting additional data several weeks after the delayed intervention group. With participants experiencing a nonsignificant decrease in anxiety scores with a small effect size, a proposed causal pathway to reduce anxiety is through increased mindfulness (see Figure 1).

Mindfulness

One of the major intentions of NBMT is to improve mindfulness, as an increase in mindfulness is correlated with a decrease in anxiety in college students (Hazlett-Stevens & Oren, 2017; Lothes II et al., 2021; Taylor et al., 2014; Yuksel & Yilmaz, 2020). It is important to note mindfulness is the pathway to reduce anxiety. While the anticipated long-term impact of NBMT is to reduce anxiety (i.e., distal outcome), the anticipated short-term impact of NBMT is to increase mindfulness (i.e., proximal outcome). While there was a significant difference in total mindfulness scores increasing across both groups ($M = 1.85$) with a large effect size across the first two time points (TP; i.e., TP1 and TP2), the interaction between TP and group was nonsignificant, revealing no significant group differences. Once again, this significant increase in mindfulness scores between these first two time points may be attributed to fall break, however, more likely, these findings may be due to a testing effect, a threat to internal validity (Campbell & Stanley, 1963). With participants completing the FFMQ-15 at TP1, exposure to the pre-test may have influenced scores on the post-test, with participants prompted to be more mindful. However, there was a significant difference between groups in total mindfulness scores from TP2 to TP3 as total mindfulness scores increased in the intervention group and decreased in the delayed intervention/control group (see Figure 4). This suggests that participation in NBMT

improves one's ability to be mindful in daily life, the proposed pathway (i.e., proximal outcomes) to reduce anxiety (i.e., distal outcome).

While the impacts of brief nature-based mindfulness interventions on a mental health outcome variable is explored, the impacts of these interventions on mindfulness is not examined (Ibes & Forestell, 2022; Ibes et al., 2018; Owens & Bunce, 2022a). Additionally, studies examining MBIs among college students employ a variety of measures for mindfulness and to assess psychological well-being (Dawson et al., 2020) making it difficult to compare findings to the present literature. Nonetheless, the significant increase in mindfulness scores following NBMT are consistent with brief nature-based mindfulness interventions among college students, although different measures of mindfulness were utilized (Nisbet et al., 2019). While there was a significant increase in mindfulness scores (i.e., FFMQ-39) at a 3-month follow-up for college students in a 5-day residential retreat (Djernis et al., 2021), a deeper dive into the FFMQ subscales was not reported.

It is important to note that this study consisted of three intervention groups and three delayed intervention groups. For all six groups, researcher was flexible and adapted to the needs of the group by spending more time during the intervention on activities and discussions relating to internal and external awareness (i.e., *Attention*; Shapiro et al., 2006) and providing strategies to limit reactions to thoughts and feelings once noticed (i.e., *Nonreactivity to Inner Experience*; Baer et al., 2008). The findings support this observation as *Observing* subscale significantly increased from TP2 to TP3 and both the *Describing* and *Nonreactivity* subscales close to a statistically significant increase during the same time for the intervention group. Anecdotal evidence suggests NBMT may benefit from increasing the length of the intervention to more than 90-minutes or to include follow-up NBMT groups with experiential activities,

psychoeducation, and group discussion focused on the *Intention* and *Attitude* components of Mindfulness (Shapiro et al., 2006) to improve scores for the *Acting with Awareness* and *Nonjudging of Inner Experience* facets of mindfulness (Baer et al., 2008).

The FFMQ-15 measures trait mindfulness, one's propensity to be mindful in daily life, although continued mindfulness practice on a regular basis may be needed to improve trait mindfulness (Goldberg et al., 2016) to improve psychological well-being (Gu et al., 2015). While many of the results regarding mindfulness were not statistically significant, except Research Question 4a (Total Mindfulness) and 4b (*Observing*), it is worth considering practical significance (i.e., effect size) to clarify direction and magnitude of outcomes (Balkin & Lenz, 2021; Thompson, 2002). When examining the effect sizes for FFMQ subscale scores from TP2 to TP3 that were not statistically significant, a moderate effect size was found for the *Describing* and *Nonreactivity* subscales, and no effect was found for the *Acting with Awareness* and *Nonjudging* subscales.

Interestingly, when compared to the delayed intervention/control group, the significant increase in *Observing* subscale scores from TP2 to TP3 produced a large effect size, and the increase in the *Nonreactivity to Inner Experience* subscale scores produced a moderate effect size, while during the same time, anxiety scores decreased with the effect size between small and moderate. While the author is not exploring the relationship between mindfulness subscales and anxiety, this trend is inconsistent with mindfulness literature with the *Observing* subscale often having no relationship with psychological symptoms (Baer et al., 2006; Baer et al., 2008; de Bruin et al., 2012; Gu et al., 2016; Williams et al., 2014) or a positive relationship with psychological symptoms (Brown et al., 2015; Curtiss & Klemanski, 2014). Additionally, while the literature suggests *Nonjudging of Inner Experience* has the strongest impact on anxiety

symptoms (Barcaccia et al., 2019; Carpenter et al., 2019; Cash & Whittingham, 2010; Medvedev et al., 2018), the results in this study for the *Nonjudging* subscale were not significant, which may have contributed to the nonsignificant changes in anxiety scores.

Recently, researchers developed a conceptual model for how mindful engagement functions with experiences in nature suggest mindful engagement can be used to refocus attention, respond with less reactivity, and enhance clarity of one's internal and external experiences (Macaulay et al., 2022). Scholars have found that decentering (i.e., *Reperceiving*) partially mediates the relationship between connection with nature and mindfulness, specifically the *Nonreactivity* and *Observing* subscales, suggesting that those who are more observant and less reactive may be less inclined to over-identify with thoughts and emotions (Hanley et al., 2017). NBMT specifically highlights elements of the natural environment through a nature-based grounding exercise. By deidentifying with one's subjective experience, one may be able to be more present in and connected to nature, which may contribute to improved psychological symptoms (Macaulay et al., 2022). These findings propose an interesting consideration, as whether nature-based mindfulness impacts psychological symptoms differently than mindfulness practice in indoor spaces. Another factor to consider is many of the brief nature-based mindfulness interventions with college students are often implemented in isolation, with NBMT innovative by incorporating social interaction into the intervention components and intervention strategy (Vitagliano et al., 2023).

Social Interaction

While there is limited evidence highlighting social interaction among participants in brief nature-based mindfulness interventions, the importance of social interaction is foundational to Wilderness Therapy (WT). The Concurrent Model of the WT Process highlights the Social Self

as one of three primary components inherent in the WT process (Russell & Farnum, 2004), which is informed by Social Learning Theory (SLT). SLT posits people can learn a new behavior through observing others by attending, retaining, reproducing, and identifying motivating factors to reproduce the behavior (Vahedi, 2020). As an intervention strategy, the social interaction among participants is essential to enhance the benefits of NBMT. It was vital for the researcher to create a safe environment for group members in the early stages of the intervention. Modeling authenticity through appropriate self-disclosure early in the intervention allows group members to experience the power of vulnerability, establishes safety, and sets the stage for others to share their experience to learn from one another. Anecdotal evidence and qualitative responses from participants support the group facilitator was seen as approachable, relatable, and in a positive light, just as WT clinical staff are perceived more positively by clients than counselors in other settings (Russell, 2006). One participant stated, “hearing the peers in my group express their anxiety, and [author’s name], made me feel more welcome about talking about how I feel, as it eliminated any thoughts of judgment”. These group facilitator characteristics allow for group members to learn from each other, increase self-efficacy, and improve mental health functioning (Vitagliano et al., 2023). By translating these characteristics, NBMT offers an innovative strategy to aid in the development of group nature-based interventions that are attractive, more accessible than remote nature-based services, and can reach more clients than individual counseling (Vitagliano et al., 2023).

Intervention Feasibility

While MBIs with a greater frequency of weekly meetings produce greater effects in reducing college student anxiety, (Bamber & Morpeth, 2019; Bergen-Cico et al., 2013; Call et al., 2014; Crowley et al., 2022; Karing & Beelmann, 2021), the challenges include offering

interventions, that are brief to meet college students' preferences (Bamber & Schneider, 2022), as well as attractive and cost-effective (Bloomfield, 2017) to reach more students than individual services, while also resulting in promising outcomes. With NBMT designed to be accessible (Vitagliano et al., 2023), and the research questions in this study focused on the preliminary outcomes of mindfulness and anxiety with college students, it is important to consider intervention feasibility (i.e., can it work?). Orsmond and Cohn (2015) highlight five main objectives to evaluate in feasibility studies including 1) recruitment capability and sample characteristics (i.e., recruiting appropriate participants), 2) data collection procedures and outcome measures (i.e., appropriateness of data collection procedures and measures), 3) acceptability and suitability of the intervention and study procedures, 4) resources and ability to manage and implement the study and intervention, and 5) preliminary evaluation of participant responses to the intervention. NBMT is a newly created intervention (Vitagliano et al., 2023) with its first implementation in this study, and while the research questions were not specifically designed to establish feasibility, additional data collected during the study allows to evaluate intervention feasibility.

Recruitment and Sampling

NBMT was offered as an alternative assignment for students in ten undergraduate counseling (CED) classes to participate in to receive course credit. As such, while the sampling pool was limited to less than 200 students ($n = 198$) enrolled in the ten classes, 25.3% of students from the recruitment pool ($n = 50$) signed up for this study. All participants in the study sought course credit, which appeared to be an effective incentive for recruitment purposes. The initial recruitment survey was available for approximately 3 weeks and recruitment strategies included 1) distributing an electronic flyer distributed to students in CED classes through course

instructors and to students on the waiting list for the counseling training clinic (which includes students from CED class) and 2) 10-minute presentations in the ten CED classes. Anecdotal evidence suggests that in-person presentations was an effective recruitment strategy. The electronic flyer was distributed at the start of the recruitment period, however, the first participant signed up for the study directly after the authors first presentation in a CED course approximately one week into recruitment. While the recruitment procedures appear promising, this evidence is anecdotal, as data was not collected on the effectiveness of the recruitment strategy. Another factor to consider is initial anxiety scores were not collected during the recruitment process.

Although the eligibility criteria “self-identifying to experience anxiety” was intended to increase access to the intervention, as college counseling centers are overburden (Lipson et al., 2019), it may have led to including participants that were not ideal candidates for the study. Out of the participants who completed the survey at TP1 ($n = 44$), two participants ($n = 2$; 4.55%) indicated a score in the minimal anxiety range (0 – 4) and five participants ($n = 5$; 11.4%) indicated a score of 5 or 6 in the lower end of the mild range (5 – 9). Participants with minimal (i.e., 0 – 4) to lower mild anxiety scores (i.e., 5 – 6) who received the intervention may experience limited benefits from NBMT as their anxiety symptoms are already nominal. Participants with lower baseline anxiety scores may have influenced the results as they are unable to experience a notable decrease in anxiety compared to participants with higher anxiety baseline scores. In future studies of NBMT, researchers may consider adding a brief screening tool to recruitment surveys which is normed on college students, such as the GAD-2 (Kroenke et al., 2007; Plummer et al., 2016) that does not overburden potential participants to ensure they are at least experiencing mild anxiety.

Additionally, the eligibility criteria “currently enrolled in an undergraduate CED course at one institution” warrants further examination. Although there were no differences in the two groups in anxiety and mindfulness scores at the start of the study, study participants were recruited from only ten CED classes. As seen in Figure 10, both the intervention and delayed intervention/control group experienced a decrease in anxiety scores over the five weeks of data collection. With participants in the intervention group in the same classes as those in the delayed intervention group social interaction may have contributed to the decrease in anxiety scores for participants in the delayed intervention group prior to receiving the NBMT intervention, a threat to internal validity (Cook & Campbell, 1979). Sampling participants for the intervention group from different classes than those in the delayed intervention group in the future could reduce this threat to internal validity by limiting the potential for comingling and social interaction between participants in the two groups (i.e., intervention and delayed intervention). Additionally, while the sample pool was limited to CED classes with incentives provided for course credit in hopes to reduce attrition and strengthen data collection procedures, future studies of NBMT may consider expanding eligibility criteria for a larger and more diverse sample to increase generalizability of the study findings.

Data Collection Procedures and Outcome Measures

The data collection procedures appear appropriate regarding its completeness and usability, there was no missing data from participants who completed the measures. The use of a four digit de-identified through Qualtrics allowed for participant confidentiality to be maintained, while ensuring the data collected was specific to each participant. The researcher scheduled two reminder emails for weekly data collection, which aided in collecting the data for this study. No participants indicated challenges with the use of Qualtrics throughout data collection. As

previously noted, the frequency of weekly measures for anxiety (i.e., GAD-7) to fit within the academic calendar may have limited the ability to assess for greater changes over time as well as the impact of fall break on anxiety scores. Additionally, with 25.6% ($n = 10$) of the sample identifying as Black or African American, the GAD-7 may have underestimated anxiety symptoms among these participants by two to three points specifically on items 1 (i.e., Feeling nervous, anxious, or on edge), 5 (i.e., Being so restless that it is hard to sit still), and 6 (i.e., Becoming easily annoyed or irritable; Parkerson et al., 2015). This study may have benefitted from additional measures of anxiety such as the stress subscale of the DASS-21 (Antony et al., 1998) as the anxiety subscale consists of items more closely resembling panic disorder (Brown et al., 1997) to triangulate the data and strengthen findings. Future studies may consider using additional measures to assess psychological functioning and well-being among a diverse sample of college students to include the Perceived Stress Scale (Cohen et al., 1983; Roberti et al., 2006), and Quality of College Life Scale (Sirgy et al., 2007).

The FFMQ-15 (Baer et al., 2012) captures the three core components of the Model of Mindfulness (see Table 1; Shapiro et al., 2006) and demonstrates the ability to assess changes in mindfulness after participating in an MBI (Gu et al., 2016). However, the FFMQ-15 measures trait mindfulness, an individual's propensity to be aware in the present moment in a nonjudgmental and nonreactive way, as opposed to state mindfulness which considered the ability to present at any given moment (Carpenter et al., 2019). College students with higher levels of trait mindfulness have lower anxiety and perceived stress and improved state mindfulness after receiving mindfulness training (Sousa et al., 2021). While frequency of mindfulness practice scores was collected from participants on a weekly basis, the sample was too small to analyze frequency of mindfulness practice. To capture a more comprehensive

understanding of the impact of NBMT on mindfulness, future studies may benefit from collecting data on both trait mindfulness (i.e., FFMQ-15; Baer et al., 2012; Gu et al., 2016) and state mindfulness (i.e., State Mindfulness Scale; Tanay & Bernstein, 2013) to capture information after engaging in mindfulness practice.

As indicated previously, the delayed intervention/control group experienced an increase in total mindfulness and *Observing* subscale scores from TP1 to TP2 with exposure to the FFMQ-15 at pretest potentially influencing mindfulness scores, a threat to internal validity (Campbell & Stanley, 1963). However, the influence of pre-test bias was not sustained as total mindfulness (see Figure 4) and *Observing* subscale (see Figure 5) scores decreased from TP2 to TP3 for the delayed intervention/control group. The intervention group experienced a significant increase in total mindfulness scores and *Observing* subscale scores when compared to the delayed intervention/control group from TP2 to TP3 suggesting participating in NBMT increases the ability to be mindful in daily life and the ability to notice internal and external experiences (Baer et al., 2008). While these findings are promising, the author did not collect data on whether participants continued to implement the skills learned while participating in NBMT. As continued mindfulness practice is needed to improve trait mindfulness (Goldberg et al., 2016), future studies may benefit by collecting data on whether participants continued to practice the skills learned during NBMT after the intervention, and the frequency and duration of this continued practice.

Acceptability and Suitability of Intervention and Study Procedures

Factors to assess when evaluating the acceptability and suitability of an intervention and study procedures include adherence and understanding of study procedures, intervention attendance, retention, attrition, time required, safety and unexpected adverse events, and

engagement (Orsmond & Cohn, 2015). With engagement a consideration for acceptability and suitability of an intervention, NBMT demonstrates promising results with the means for all individual Student Engagement (SE) items and SE totals above 8 (range 0 – 10), indicating a high level of engagement among participants during NBMT (Hansen et al., 2019; see Table 13 in Chapter IV). The pilot study prior to this dissertation study determined the content in NBMT to be clear and easy to understand, as well as the intervention improving participant understanding of mindfulness and identify ways to reduce anxiety. Additionally, to assess the ability to manage anxiety symptoms after participating in NBMT, participants responded to a Likert scale question and open-ended questions around self-efficacy to manage anxiety after completing NBMT.

With over 89% of participants ($n = 33$) agreeing that participating in NBMT aided in improving their ability to manage anxiety symptoms, the intervention appears to be suitable and acceptable for college students. Qualitative responses and anecdotal evidence indicate NBMT to be valuable in increasing participant awareness of the presence of anxiety symptoms and improving the ability to attend to the present moment. As the author is a current student on the same campus as participants, a participant approached the author after the intervention in passing and shared that he continues to use the skills he learned in NBMT and they continue to be helpful. This participant was from the intervention condition and stated, “NBMT has helped me tremendously in getting a grasp on my anxiety ... I am someone who tends to clutter their mind with several things and NBMT has helped me put things in perspective better simply just by getting outside. While I’m outside, I’m listening and aware of things I never noticed but was there all along. It has helped me to better put my thoughts in perspective which has been extremely helpful!”. This participant experienced a noticeable decrease in anxiety scores after the NBMT intervention (TP1 = 11, TP2 = 16, TP3 = 5, TP4 = 5 and TP5 = 2). Future studies

may benefit from additional qualitative data and utilizing standardized assessment tools to measure self-efficacy, such as the time spent in nature (TSN) self-efficacy subscale (Maddock et al., 2022).

This study demonstrates promise regarding adherence and understanding of study procedures, intervention attendance, retention, attrition, time required, safety and unexpected adverse events (Orsmond & Cohn, 2015). Out of the forty-four participants in the study, 84.1% ($n = 37$) attended the NBMT intervention and completed all the surveys during the study with 15.9% attrition across both groups for the study (see Table 3). To assure participant safety during the group intervention, the researcher provided participants instructions to remove themselves from the group and walk less than 5 minutes away to the crisis center if they felt being in the group setting was more harmful than helpful. In addition, participants appeared to understand and adhere to study procedures with anecdotal evidence of participants sharing with the researcher the details in the instructions provided for data collection and how to find the intervention location were helpful in completing the necessary requirements of the study.

Resources and Ability to Manage and Implement the Study and Intervention

This study and the NBMT intervention were designed and managed by one person, the author of this dissertation. The resources necessary to implement this study and the NBMT intervention include a computer, access to nature, access to academic journal databases, access to an Institutional Review Board, data collection software (i.e., Qualtrics), communication platform (i.e., email), data organization software (i.e., Excel), data storage capabilities (i.e., secure cloud server), software to develop recruitment materials and NBMT journal (i.e., Canva), printed journals, and camp chairs. The researcher had access to most of the resources needed for the study and intervention implementation with their connection to a university. Camp chairs were

donated by a reputable company (Crazy Creek, 2022) with the total budget for study management and intervention implementation under \$40 (i.e., cost of printed journals approximately \$1 per journal). Universities have access to the software used to design, implement, and manage the study as well as access to natural environments (Rakow & Eells, 2019). The ability to use technological resources and software appropriately was important for the ability to successfully manage this study. Both the study and intervention are accessible with little financial cost, important considerations for implementing nature-based interventions (Bloomfield, 2017; Shanahan et al., 2019).

The major factor to consider is the time, expertise, and skills required to manage and implement the study and NBMT intervention. The researcher became proficient in using the software identified above to manage the intervention, a necessary requirement for any research team hoping to replicate this study. While the fidelity or quality of the implementation of an intervention is difficult to measure (Linnan & Steckler, 2002), NBMT was designed and implemented by the author to be delivered in 90-minute outdoors in nature and delivered as planned. NBMT is unique as a brief nature-based mindfulness intervention that incorporates social interaction among group members (Vitagliano et al., 2023). As a licensed professional counselor, the researcher possessed the group counseling skills and competencies (Corey et al., 2018) to manage the social interaction among group members innovate component of NBMT.

Preliminary Evaluation of Participant Responses to the Intervention

The preliminary evaluation of responses to the intervention, specifically for the research questions outlined in this study on impact of NBMT on college student anxiety and mindfulness, can be found in the previous chapter. As discussed earlier in this chapter, while the results for anxiety were not statistically significant, evidence suggests promising results for the impact of

NBMT on college student anxiety for with small effect sizes indicating practical significance as well as clinical significance from percent improvement index analyses. Regarding feasibility, the primary focus is whether the intervention produces promising preliminary outcomes with the intended population (Orsmond & Cohn, 2015), with preliminary results regarding self-efficacy described above. For nature-based interventions focused on mental health, recent evidence suggests challenges in determining whether outcomes are attributed to time spent in nature or the intervention itself (Harper et al., 2021; Lewis et al., 2022). The researcher included two slider scale questions (see Appendix N) to explore the impact of spending time in nature and interaction with peers during NBMT on their ability to understand mindfulness and anxiety. Participants indicated an equal impact of time spent in nature and interaction with peers in the group to better understand mindfulness (*Mean* = 49.49; *Median* = 50). However, participants indicated time spent in nature to have a larger impact than interaction with peers in the group regarding anxiety (*Mean* = 40.62; *Median* = 36). Likert scale questions were used to further explore the impact of nature and peer interaction on understanding of mindfulness and ability to reduce anxiety (see Table 12). While participants agreed both nature and peer interaction helped to better understand mindfulness, nature (*M* = 4.70) appeared to be more impactful than peer interaction (*M* = 4.41) to better understand mindfulness. Similarly, participants agreed that nature (*M* = 4.43) helped to reduce anxiety more so than peer interaction (*M* = 3.92), congruent with results from the slider scale questions. Future studies may benefit from collecting additional data to triangulate findings and continue to parcel out the impact of nature versus the intervention on intended outcomes. While this study was not specifically designed to address intervention feasibility, the author has demonstrated that NBMT and this research study are feasible. NBMT shows promise for reducing anxiety and improving mindfulness in college students.

Limitations

As with any research study, there are several limitations in this study. As indicated throughout this chapter, this study may be subject to several threats to internal validity to include history, social interaction, and pretesting bias. First, while the literature indicated a moderate effect size would be appropriate for the statistical analysis, many of the analyses were not statistically significant with a small effect size, likely related to the small sample size ($n = 39$). The small sample size likely contributed to low observed power with nonsignificant results subject to Type II error. Future studies would benefit from more expansive inclusion criteria and a larger sample size to rigorously analyze the data.

While a larger sample size may lead to statistically significant results, an important limitation to consider is the timing and sequencing of the intervention components of NBMT (see Appendix O). The first intervention component that included an experiential activity (i.e., Anxiety) occurred 10 minutes into the NBMT intervention. This intervention component targets *Attention* (Shapiro et al., 2006) with results indicating a large effect for *Observing* subscale scores and a moderate effect for *Describing* subscale scores. While the author intentionally designed NBMT to invoke involuntary attention prior to introducing the experiential intervention component targeting *Intention* (i.e., Why NBMT?) approximately 20 minutes into NBMT, there was no effect on *Acting with Awareness* subscale scores. Additionally, the intervention component targeting *Attitude* (i.e., How to Practice NBMT?) was not introduced until about 55 minutes into the NBMT intervention, again with no effect for *Nonjudging of Inner Experience* subscale scores. With how one observes their experience (Desrosiers et al., 2013), as well as one's ability to act with awareness (Carpenter et al., 2019) integral in managing symptoms of anxiety, the introduction of intervention components targeting these facets of mindfulness earlier

in NBMT may have altered the study findings. Future studies may consider including conditions that introduces skills and experiential activities of the intervention component targeting *Nonjudging of Inner Experience* (i.e., How to Practice NBMT?) and *Acting with Awareness* (i.e., Why NBMT?) earlier in the intervention to determine their impact of mindfulness and anxiety scores.

Another limitation is related to the study design (i.e., quantitative two-group treatment removal design). For the intervention group ($n = 20$), only one baseline measure for anxiety and mindfulness scores was collected (TP1) prior to participating in the intervention and for the delayed intervention group ($n = 17$) only two post-intervention measures were collected (TP4, TP5). As anxiety can fluctuate among college students, especially during the COVID-19 pandemic (Gao et al., 2022), additional baseline measures may have provided a more accurate trend in average anxiety scores prior to receiving NBMT. Future studies may benefit from considering a quasi-experimental time series design (Harris et al., 2006) or a single case research design (SCRD; Lenz, 2015) to capture additional baseline and post-intervention measures to strengthen results. SCRD would allow for participants to serve as their own control condition, with the additional baseline and post-test measures allowing for inspection of potential cause and effect relationships between NBMT and anxiety symptoms (Lenz, 2015). In addition to limiting factors of the study design, limitations regarding data collection must be considered.

While attempting to not overburden participants with the amount of data collected, key information that could have been collected include the specific CED class participants were enrolled in and whether participants continued to practice skills learned in NBMT after receiving the intervention. Two of the largest CED courses where participants were recruited from was the Stress Management class, where students learn skills and strategies to reduce stress.

Additionally, collecting information on the frequency of practicing the skills learned during NBMT after the intervention may have aided to interpreting the results. Although the information was collected on engagement during the intervention, the key innovation to NBMT is the social interaction among group members. Future studies may consider developing and including more robust evaluation tools to capture social interaction or include an observer in the study design.

All findings are subject to self-report bias (Bauhoff, 2014), with social desirability particularly common among college students self-reported improvements (Bowman & Hill, 2011). Participants were aware the author assumed multiple roles in this study to include recruiter, researcher, group facilitator, and administrator (i.e., providing participants letters of study completion for course credit) which may have influenced participants to over or underreport their responses to assessments. Additionally, while in some respects the author serving as both the researcher and group facilitator may be a strength (i.e., attentive to group participants with anecdotal evidence helping to support findings), there is the potential for bias in interpreting results. While the author utilized co-chairs from his dissertation committee to mitigate potential biases throughout this study, the author is passionate about nature-based mindfulness and created NBMT. This passion may have influenced participants to sign up for the intervention during recruitment procedures.

Lastly, there are great limitations to generalizability of the findings from this study. The limited sampling procedures recruiting from undergraduate CED classes and students on the waiting list from the Nicholas A. Vacc Counseling and Consulting Clinic limits generalizability to the larger campus community. The sample consisted of more male than female students, while the 67% of students at the researcher's institution identify as female (UNCG at a Glance, 2022).

Less than half of the sample identified as White (38.5%), which is inconsistent with the general undergraduate population with 51% of college students identifying as White (National Center for Education Statistics, 2022). Additionally, students in this sample were recruited from a large public university in the Southeast, which may limit generalizability to colleges and universities of different sizes and geographic locations. Further research is needed to examine the impact of NBMT with a more diverse sample, including a variety of universities regarding funding (i.e., public versus private), size of student body, demographics of the student population, and geographic location.

Implications

There are several important implications from this study for universities of higher education, practitioners employing nature-based interventions, educational professionals, researchers, and college students. With COVID-19 still prevalent and students returning to campus, some may not want to gather indoors in group settings. One solution to refraining from indoor social gatherings is to connect outdoors, in nature. College students use campus greenspaces regularly and consider them essential to the campus environment (Speake et al., 2013), to alleviate stress (Seitz et al., 2014) and improve perceptions of quality of life (McFarland et al., 2008). Continued preservation of natural environments on college campus is a priority. Institutions of higher education must maximize their campus resources and identify creative strategies to combat the mental health crisis on college campuses. With college counseling centers facing an influx of students experiencing anxiety (Lipson et al., 2019), NBMT offers an innovative and creative strategy to meet college student mental health needs utilizing natural environments on campus to reach more students in the group setting (Vitagliano et al., 2023). Several course instructors from the CED courses indicated their students who participated

in NBMT for course credit inquired about the possibility for NBMT to be included as a future alternative assignment in CED courses. While this evidence is anecdotal, universities can improve mental health for their students by integrating attractive and engaging interventions, such as NBMT, into their curriculum (Bamber & Schneider, 2022).

Nature-based mindfulness interventions with college students lack the articulation of integrating nature and mindfulness and nature-related theories in the nature-based mindfulness intervention design. As suggested by researchers designing therapeutic nature-based interventions (Harper et al., 2021; Mygind et al., 2019), I intentionally integrated theoretical components of nature and mindfulness to develop NBMT, an innovative psychoeducational group intervention. Many of the brief nature-based mindfulness interventions explored among college students are offered in isolation, without social interaction (Ibes & Forestell, 2022; Ibes et al., 2018; Nisbet et al., 2019; Owens & Bunce, 2022a). While nature appears to be slightly more beneficial to better understand mindfulness and reduce anxiety compared to social interaction in this study, participants agreed social interaction among group members aided to better understand mindfulness and reduce anxiety. The findings from this study add to the literature in support of incorporating a group component to nature-based mindfulness interventions. Social prescribing is correlated with improvements in social connectedness, physical health, and mental well-being (Leavell et al., 2019). It is recommended researchers critically think through conceptual models, proposed causal pathways, and anticipated outcomes when developing, designing, and implementing group nature-based mindfulness interventions to reach more students with effective group interventions than individual services.

With 89% of students ($n = 33$) in agreement that participating in NBMT improved their self-efficacy to manage anxiety related symptoms, institutions of higher education may benefit

from offering NBMT to their campus community to increase the reach and number of students served on their campus community. While the findings from this study did not produce a significant decrease in anxiety scores (i.e., distal outcome) for students in the intervention group, participating in NBMT contributed to a significant increase in total mindfulness and *Observing* subscale scores (i.e., proximal outcome). However, students in the intervention group did experience a clinically significant decrease in anxiety scores over a longer period (i.e., five weeks). Universities seeking to implement NBMT with students on their campus may benefit from increased data collection procedures post-NBMT intervention while offering NBMT booster sessions to participants who may benefit from a refresher or continued practice of NBMT skills to sustain increases in mindfulness and decreases in anxiety over time. As mental health concerns are on the rise not only for college students, but for people of all ages, increase access to funding for innovative nature-based mindfulness interventions to improve population health should be a top priority.

Regarding practitioners offering group nature-based therapeutic services, it is essential group facilitators believe that natural environments can heal, promote mental health and wellness, and influence the therapeutic process (Vitagliano et al., 2023). With group nature-based mindfulness interventions requiring peer interaction, facilitators must be creative in their strategies to engage group participants while creating a safe environment. Several participants indicated social anxiety as a contributing factor to neutral responses on peer interaction leading to better understanding mindfulness ($n = 5$) and the lowest mean score from an individual item on the SE scale was Activity During NBMT (8.38). Evidence from qualitative feedback responses and anecdotal evidence suggests authenticity of the group facilitator is vital, with appropriate self-disclosure from facilitators offering hope to participants by sharing their process

of managing anxiety through nature-based mindfulness practices to create a safe environment for participants. Group facilitators must be attuned to the individual group participants and group dynamics and be flexible to effectively manage group dynamics. While group interventions may consist of a structured guide or format, group facilitators are encouraged to be flexible when using group counseling skills to focus, facilitate, and enhance group discussion to foster a safe and trusting environment and allow group members to learn from each other. Group facilitators may benefit from seeking both verbal feedback and written deidentified feedback from participants to continue to develop and enhance their approach and skills to effectively implement NBMT. Not only are there implications for practitioners offering nature-based interventions to college students, but also for elementary and high school educational professionals.

College students are not the only group susceptible to increased anxiety symptoms, as recent reports indicate increased prevalence of anxiety among children and adolescents with recommendations to start screening for anxiety as early as 8 years old (U.S. Preventive Services Task Force, 2022). Academic achievement in elementary education has superseded social and emotional development, with schools often reducing the time recess and physical education for children. With outdoor education interventions have demonstrated promise to improve mental health of elementary school children (Gustafsson et al., 2012), it is recommended to develop and implement programs and initiatives in our elementary and high schools to increase access and time for youth to spend time outdoors, in hopes to reduce the prevalence of mental health concerns when reaching college age.

There are several implications for college students as a result of this study. First and foremost, spend more time in nature as the evidence suggests a myriad of physical and mental

health benefits from brief time periods spent in nature (Barton & Pretty, 2010; Meredith et al., 2019). With the rapid acceleration of technology and social media use among college students, it is recommended to put the phone down, step away from the computer away, and get outside. As several participants indicated social anxiety, be intentional with who you decide to spend time with and connect with peers your feel safe with and trust when you are outdoors. Two participants in this study indicated nature as anxiety inducing, specifically due to unexpected noise and sounds and fear of critters (e.g., bugs and spiders). For students who may be afraid of nature, it is recommended to increase your access to nature by listening to nature sounds and viewing natural images. EcoWellness, defined as “a sense of appreciation, respect for, and awe of nature that results in feelings of connectedness with the natural environment and the enhancement of holistic wellness” (Reese & Myers, 2012, p. 400), suggests sensory access can supplement when physical access to nature is unavailable (Reese et al., 2015). Collectively, institutions of higher education, college counseling centers, researchers, and practitioners must work together to maximize mental health benefits for students by developing and implementing brief nature-based mindfulness interventions to improve mental health of college students.

Areas for Future Research

This study was a necessary first step in testing the efficacy of the NBMT intervention for college students with anxiety, with several areas for future research to be considered. With feasibility established, the Multiphase Optimization Strategy (MOST) can be utilized (Collins, 2018; Collins et al., 2007). MOST is a methodology intended to build, optimize, and evaluate behavioral interventions which are comprised of a set of intervention components. As indicated previously, NBMT may benefit from additional intervention components targeting *Intention* and *Attitude* components of Mindfulness (Shapiro et al., 2006) to improve the *Acting with Awareness*

and *Nonjudging of Inner Experience* facets of mindfulness (Baer et al., 2008). The author plans to develop these additional components to be added to the program model and develop a train the trainer model to prepare future group facilitators to offer NBMT in a variety of settings (*Training and Professional Development*, 2019).

The author hopes to employ MOST in the future to iteratively examine the impact of each intervention component on the desired outcomes and to strengthen each component against an a priori performance standard to create an optimized version of NBMT (Collins, 2018). This next step would benefit from a larger and more diverse sample, to increase generalizability and statistical power to further examine changes to mindfulness and anxiety with the small effect sizes found in this study. Additional baseline data collection points would allow for a more accurate trend in average anxiety scores prior to receiving NBMT and longitudinal follow-up would provide insights on whether the impacts of NBMT are retained over time. The optimized version of NBMT can then be evaluated in a fully powered 2-arm randomized control trial. NBMT is designed to be simple and flexible, as these are top predictors for program adoption (Dusenbury & Hansen, 2004), with the ability to be adapted to each university, school, organization, and agency based on their clinical and environmental resources. While the interaction of group members is integral in NBMT, the flexibility promotes various potential applications of the intervention components.

In a world increasingly run by technology, researchers can adapt and utilize technology as a resource to improve mental health and wellness through e-health interventions. With evidence for nature-based guided imagery (Nguyen & Brymer, 2018), natural sounds (Jo et al., 2019), and virtual reality psychotherapy (Pisalski et al., 2020) reducing anxiety, technological adaptations must be considered for NBMT. As NBMT is comprised of a set of intervention

components, a NBMT mobile application may present participants with a booster after the group intervention to maintain treatment outcomes over time. Additionally, a mobile application can be implemented as a standalone e-health intervention by increasing the reach of the NBMT curriculum to improve health and well-being. As the mobile application for NBMT would be an e-health intervention, the MOST methodology can be used to enhance and optimize the intervention (Collins et al., 2007).

While the focus of this research has been with college students experiencing anxiety, anxiety is not the only mental health diagnosis of concern among college students. Although NBMT is designed to reduce anxiety, the intervention can be adapted specifically for other mental health concerns (i.e., depression) and other populations (i.e., high school students; high-stress professionals) experiencing mental health concerns. Future studies with the optimized version of NBMT intervention components can be conducted to examine efficacy of NBMT for various mental health concerns and populations. With NBMT a creative and innovative solution to serve college students seeking mental health support, it may also fuel research and development of nature-based mindfulness interventions to support students and high-risk populations experiencing a variety of mental health concerns.

Lessons Learned

As I am interested in conducting applied intervention research in the future, with intentions to further develop and investigate the impacts of NBMT for a variety of populations, there are several valuable lessons I learned throughout this study. Most importantly, I recognize the value of conducting applied intervention research with a team. I underestimated the amount of time that would be required to conduct an applied intervention study. While the guidance I received from my members of my doctoral committee has been instrumental, and this study

would not have been possible without their support, working more closely with researchers and practitioners can improve the NBMT intervention, the study design, recruitment capabilities, data collection procedures, and strengthen data analysis. In hindsight, there are several changes I would have made to the timing, study design, recruitment strategies, data collection measures, and procedures.

First, I would have started recruitment at the start of the academic semester and conducted the intervention groups prior to fall break, and the delayed intervention groups after fall break, as history appeared to be a threat to internal validity. Second, I would have collected more data timepoints at baseline and conclusion of the intervention. I would have collected more data, specifically demographic information (e.g., specific CED class participant was enrolled in), standardized measures to include the State Mindfulness Scale, the Perceived Stress Scale, Quality of College Life Scale, and additional intervention feedback questions around the frequency of practicing skills learned from NBMT post-intervention. While I wanted to balance the time required for participant involvement in the study, this information would be valuable in future studies investigating NBMT.

I experienced a steep learning curve during recruitment. My emotions resembled a roller coaster, ups and downs, excitement, and despair. After sending out the electronic marketing recruitment flyer and not having one participant sign up for approximately a week, I felt uncertain for the ability to conduct this study. But this is normal. I was assured by my committee and colleagues that recruitment takes time. I also learned the value of connecting with participants in person during recruitment presentations, to be able to put a face to the marketing flyer and answer questions from prospective participants.

I designed NBMT to increase accessibility to nature-based interventions in terms of the location and time required. Although random assignment may strengthen the generalizability of the study, participants may be less likely to attend a future NBMT intervention if the randomized time determine does not fit with their schedule. Regarding incentives, course credit appeared to be an appropriate incentive to recruit and retain participants, however by increasing the amount of data being collected, additional incentives (e.g., gift cards) may be appropriate to compensate participants for their time commitment.

Another lesson learned is that applied intervention research does not always go according to plan. I am fortunate I am able to be adaptable, flexible, and can think quickly, as these personal characteristics were necessary in the thick of facilitating the NBMT groups. As my journey in my doctoral studies comes to a close with the completion of this study, I truly enjoyed the dissertation process and I have learned that balance, self-awareness, and passion are keys to success. Balance meaning focusing my time and efforts to both research and evaluation as well as continued clinical practice. Self-awareness and reflexivity are invaluable, without reflecting on what is truly important and what I value, passion would not exist. I am passionate about getting people to spend more time outdoors to ultimately improve their physical and mental health.

Conclusion

This study began only seven months prior to the writing of this final section. It was born out of my own reflexivity on my values and passions. After a series of invaluable personal insights, I shifted my research agenda to focusing on nature and the outdoors, specifically Wilderness Therapy. Through continued exposure and reflection, I again shifted my focus to nature-based interventions that are more accessible, leading to the development of NBMT. The

process of developing NBMT and designing this study were complex and challenging in a mere seven months, yet I have found my passion and founded Seek Your Summit LLC, where we integrate mental health and wellness services into the outdoors.

The results from this study are just a first step to providing accessible nature-based interventions to college students and others seeking relief from stress, anxiety, depression, and a host of mental health concerns rampant in our society. The small decreases in anxiety and increases in mindfulness provide hope that NBMT can help improve mental health. It is my hope that this study can start to expand access to nature-based health interventions and ultimately lead to the preservation of natural environments to protect this beautiful world we are all a part of, and responsible for.

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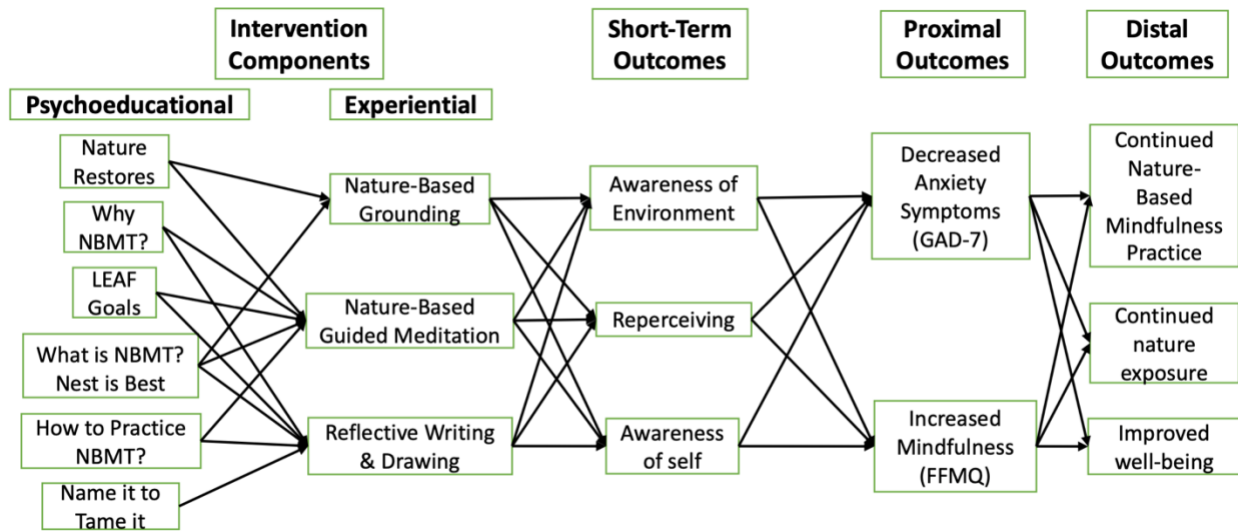
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APPENDIX A: NATURE-BASED MINDFULNESS TRAINING INTERVENTION
COMPONENTS



APPENDIX B: NBMT CURRICULUM & JOURNAL

The NBMT curriculum and journal is Copyrighted by the author, Luke Vitagliano, 2022. Please reach out to author for details.

APPENDIX C: GAD-7

Instructions: Over the last week, how often you been bothered by the following problems?

	Not at all	Several days	More than half the days	Nearly every day
Feeling nervous, anxious, or on edge	0	1	2	3
Not being able to stop or control worrying	0	1	2	3
Worrying too much about different things	0	1	2	3
Trouble Relaxing	0	1	2	3
Being so restless that it is hard to sit still	0	1	2	3
Becoming easily annoyed or irritable	0	1	2	3
Feeling afraid, as if something awful might happen	0	1	2	3

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

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

APPENDIX D: FFMQ-15

FFMQ-15: 15-item Five-Facet Mindfulness Questionnaire

Instructions

Please use the 1 (never or very rarely true) to 5 (very often or always true) scale provided to indicate how true the below statements are of you. Circle the number in the box to the right of each statement which represents your own opinion of what is generally true for you. For example, if you think that a statement is often true of you, circle '4' and if you think a statement is sometimes true of you, circle '3'.

	Never or very rarely true	Rarely true	Some-times true	Often true	Very often or always true
1. When I take a shower or a bath, I stay alert to the sensations of water on my body.	1	2	3	4	5
2. I'm good at finding words to describe my feelings.	1	2	3	4	5
3. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.	1	2	3	4	5
4. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.	1	2	3	4	5
5. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.	1	2	3	4	5
6. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.	1	2	3	4	5
7. I have trouble thinking of the right words to express how I feel about things.	1	2	3	4	5
8. I do jobs or tasks automatically without being aware of what I'm doing.	1	2	3	4	5
9. I think some of my emotions are bad or inappropriate and I shouldn't feel them.	1	2	3	4	5
10. When I have distressing thoughts or images I am able just to notice them without reacting.	1	2	3	4	5
11. I pay attention to sensations, such as the wind in my hair or sun on my face.	1	2	3	4	5
12. Even when I'm feeling terribly upset I can find a way to put it into words.	1	2	3	4	5
13. I find myself doing things without paying attention.	1	2	3	4	5
14. I tell myself I shouldn't be feeling the way I'm feeling.	1	2	3	4	5
15. When I have distressing thoughts or images I just notice them and let them go.	1	2	3	4	5

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APPENDIX E: STUDENT ENGAGEMENT SCALE

1. Did your group leader pay attention to you when you spoke in group? (Group Leader Enthusiasm 1)
 - a. No (0)
 - b. Yes, a little (5)
 - c. Yes, a lot (10)
2. Did your group leader do a good job teaching Nature-Based Mindfulness Training? (Group Leader Enthusiasm 2)
 - a. Definitely yes (10)
 - b. Mostly yes (6.67)
 - c. Mostly no (3.33)
 - d. Definitely no (0)
3. Did you enjoy Nature-Based Mindfulness Training? (Enjoyment)
 - a. No (0)
 - b. Yes, a little (5)
 - c. Yes, a lot (10)
4. How often did you share your experience during Nature-Based Mindfulness Training? (Activity during NBMT)
 - a. Never (0)
 - b. Rarely (3.33)
 - c. Occasionally (6.67)
 - d. Often (10)
5. How often did you pay attention during Nature-Based Mindfulness Training? (Attentiveness)
 - a. Never (0)
 - b. Rarely (3.33)
 - c. Occasionally (6.67)
 - d. Often (10)
6. Did Nature-Based Mindfulness Training help you think about what was important to you to manage your mental health? (Program Value)
 - a. No (0)
 - b. Yes, a little (5)
 - c. Yes, a lot (10)

To note, the numbers in parentheses indicate the weighted values for scoring of the Student Engagement scale.

APPENDIX F: DEMOGRAPHICS

1. Please identify your year in school:
 - a. Freshman
 - b. Sophomore
 - c. Junior
 - d. Senior
 - e. Another grade level not listed above (fill in the blank)
2. Please identify your age:
 - a. 18
 - b. 19
 - c. 20
 - d. 21
 - e. 22
 - f. Another age not listed above (Fill in the blank)
3. How would you describe your gender identity? (please select all that apply)
 - a. Woman
 - b. Man
 - c. Transgender
 - d. Agender
 - e. Gender queer
 - f. Two Spirit
 - g. Questioning
 - h. Another gender identity not identified above (fill in the blank)
 - i. Prefer not to say
4. What is your racial and/or ethnic identity? (please select all that apply)
 - a. Asian or Asian American
 - b. Black or African American
 - c. Latina/o/x or Hispanic
 - d. Middle Eastern or Middle Eastern American
 - e. Native American, North or South American Indian, or Alaskan Native
 - f. Native Hawaiian or Pacific Islander
 - g. White
 - h. Biracial or Multiracial
 - i. Another race/ethnicity not identified above (fill in the blank)
 - j. Prefer not to say
5. How often do you practice mindfulness for at least 10 minutes per day?
 - a. Frequently (6 to 7 days per week)
 - b. Occasionally (3 to 5 days per week)
 - c. Infrequently (0 to 2 days per week)
6. How often to you intentionally get outside in nature for at least 5-10 minutes per day?
 - a. Frequently (6 to 7 days per week)
 - b. Occasionally (3 to 5 days per week)
 - c. Infrequently (0 to 2 days per week)

Nature-Based Mindfulness Training



CALL FOR RESEARCH PARTICIPANTS

This study seeks to explore the impact of a Nature-Based Mindfulness Training (NBMT) intervention in reducing anxiety and increasing mindfulness for undergraduate college students

You are eligible to participate if you meet the following criteria:

- You are 18 years of age or older
- You are enrolled as an undergraduate student at UNCG in a CED class OR you are currently on the waitlist at the Vacc Clinic
- You self identify to experience anxiety

Participation will include:

- Engaging in one 90-minute NBMT group in Peabody Prairie followed by one 5-minute Qualtrics Survey (95 minutes). Possible group dates and times include:
 - [Insert date & times here]
 - [Insert date & times here]
 - [Insert date & times here]
 - [Insert date & times here]
- Completing 5 Qualtrics surveys one time per week for 5 weeks, approximately 5 minutes per week (25 minutes)



Receive course credit for your CED class!!

Scan the QR Code to complete the Qualtrics Survey

If you have any questions please contact Luke Vitaglano at lavitagl@uncg.edu or 720-770-0340

Version Date: July 29, 2022

APPENDIX H: RECRUITMENT POWERPOINT PRESENTATION



Naturally Mindful: Nature-Based Mindfulness Training for College Students with Anxiety

Presented by Luke Vitagliano

#NBMT

Version Date: July 29, 2022



Luke Vitagliano, MS, LPC, LAC

Doctoral Student at UNCG
Department of Counseling & Educational Development
Avid lover of the outdoors



Version Date: July 29, 2022



Nature-Based Mindfulness Training

This study seeks to explore the impact of a Nature-Based Mindfulness Training (NBMT) intervention in reducing anxiety and increasing mindfulness for undergraduate college students.

NBMT is a psychoeducational group lasting 90-minutes with 8-12 participants per group and to be delivered outdoors in nature.



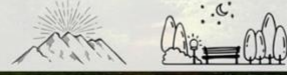
Version Date: July 29, 2022



Eligibility

You are eligible to participate if you meet the following criteria:

- You are 18 years of age or older
- You are enrolled as an undergraduate student at UNCG in a CED class OR you are currently on the waitlist at the Vacc Clinic
- You self identify to experience anxiety



Version Date: July 29, 2022



Requirements for Participating

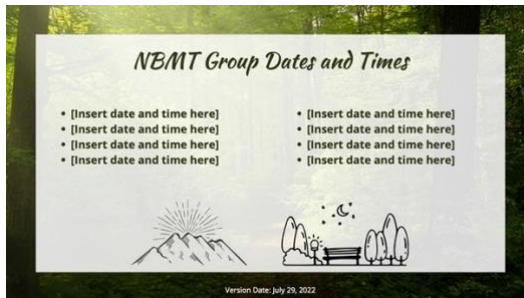
Participation will include:

- Engaging in one 90-minute NBMT group in Peabody Prairie followed by one 5-minute Qualtrics Survey (95 minutes)
- Completing 5 Qualtrics Surveys (5 minutes per week; 1 times per week over 5 weeks between 12:00am Saturday and 12:00am Monday (25 minutes)

1 - 90 minute group
1 - 5-minute post-group Qualtrics survey
5 - 5-minute weekly Qualtrics surveys
Total time - 2 Hours




Version Date: July 29, 2022



NBMT Group Dates and Times

- [Insert date and time here]
- [Insert date and time here]
- [Insert date and time here]
- [Insert date and time here]



Version Date: July 29, 2022



Potential Benefits

Learn skills to improve mindfulness and reduce anxiety

Receive course credit for your CED class

- In order for your participation in this study to count as course credit, you will need to 1) participate in a 90-minute NBMT intervention and 2) complete ALL 6 Qualtrics surveys
- Receive a brief report at the end of the study demonstrating your levels of anxiety and mindfulness throughout the study



Version Date: July 29, 2022



Questions??



Version Date: July 29, 2022



Thank You!!!

If you are eligible and interested in participating, please scan the QR Code to complete the Qualtrics Survey

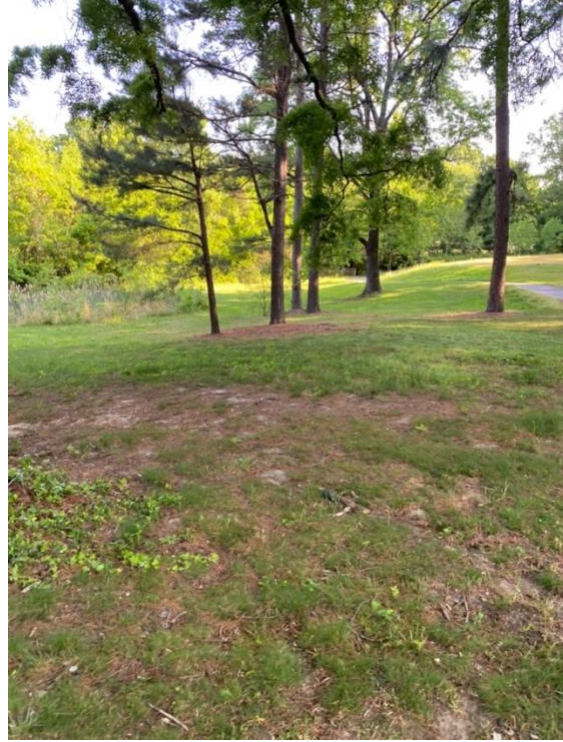


If you have any questions please contact Luke Vitagliano at lavitagl@uncg.edu or 720-770-0340



Version Date: July 29, 2022

APPENDIX I: NBMT INTERVENTION SETTING



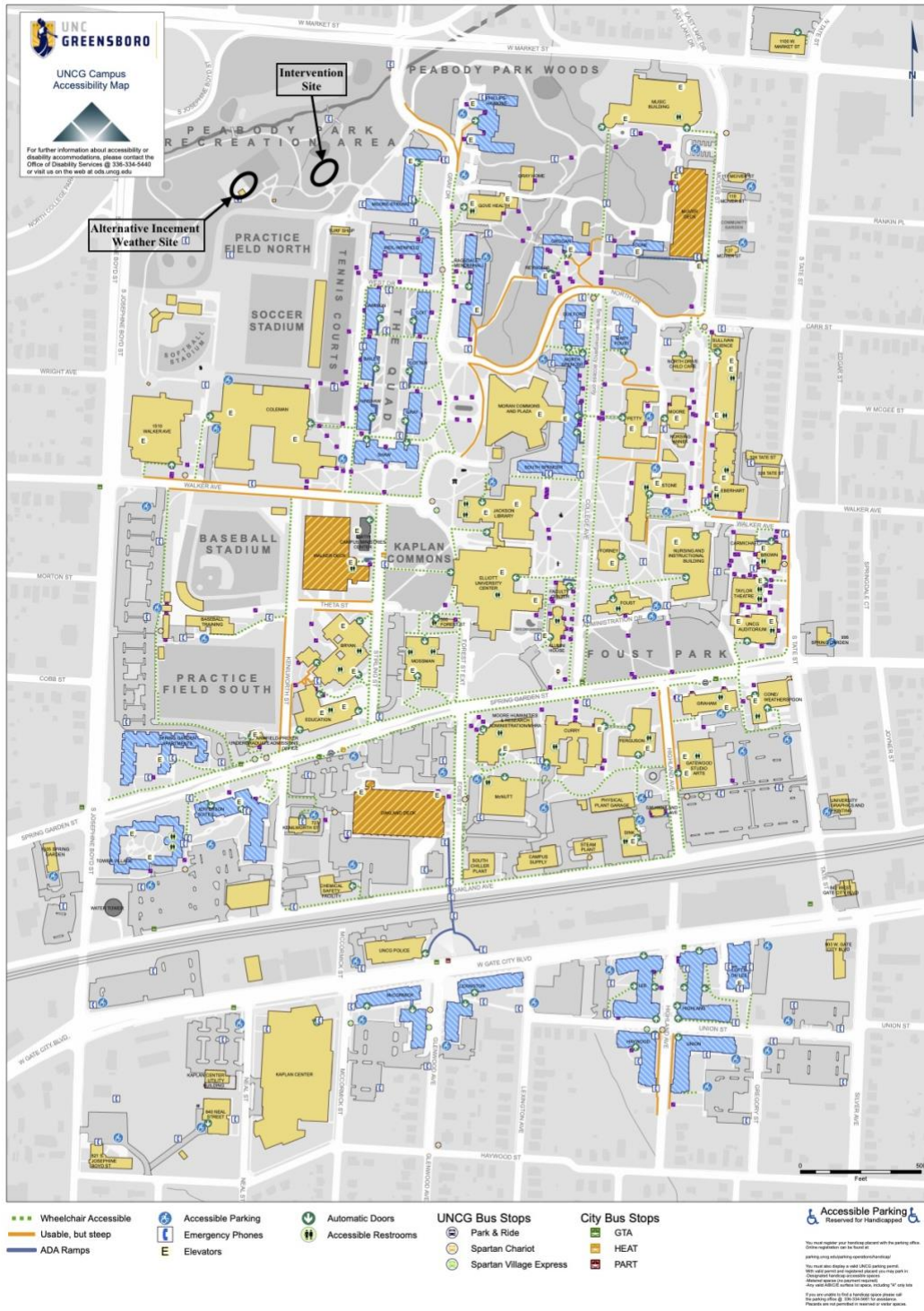


*Alternative location



*Alternative location

APPENDIX J: CAMPUS MAP – INTERVENTION LOCATION



APPENDIX K: PILOT STUDY FEEDBACK QUESTIONS ON NBMT INTERVENTION

1. The content of Nature-Based Mindfulness Training was appropriate for the 90-minute time frame (1 = strongly disagree, 5 = strongly agree)
2. The content presented in Nature-Based Mindfulness Training was presented in a way that was clear and easy to understand (1 = strongly disagree, 5 = strongly agree)
3. Do you self-identify to experience anxiety? (Yes, No)
4. Participating in Nature-Based Mindfulness Training helped me identify ways to reduce my anxiety (1 = strongly disagree, 5 = strongly agree)
5. What ways, if any, did Nature-Based Mindfulness Training help you identify ways to reduce your anxiety?
6. Participating in Nature-Based Mindfulness Training helped me better understand mindfulness (1 = strongly disagree, 5 = strongly agree)
7. What ways, if any, did Nature-Based Mindfulness Training help you better understand mindfulness?
8. What, if any, parts of the training were unclear or confusing?
9. What improvements would you suggest for Nature-Based Mindfulness Training?

APPENDIX L: PILOT STUDY INTERVENTION COMPONENT FEEDBACK QUESTIONS

1. The time devoted and information provided during the Group Introductions section was appropriate (1 = strongly disagree, 5 = strongly agree)
2. Please provide details for why you selected your answer for the Group Introduction section
3. The time devoted and information provided during the Nature Restores section was appropriate (1 = strongly disagree, 5 = strongly agree)
4. Please provide details for why you selected your answer for the Nature Restores section
5. The time devoted and information provided during the Anxiety section was appropriate (1 = strongly disagree, 5 = strongly agree)
6. Please provide details for why you selected your answer for the Anxiety section
7. The time devoted and information provided during the Why NBMT? section was appropriate (1 = strongly disagree, 5 = strongly agree)
8. Please provide details for why you selected your answer for the Why NBMT? section
9. The time devoted and information provided during the LEAF Goals section was appropriate (1 = strongly disagree, 5 = strongly agree)
10. Please provide details for why you selected your answer for the LEAF Goals section
11. The time devoted and information provided during the What is NBMT?: NEST section was appropriate (1 = strongly disagree, 5 = strongly agree)
12. Please provide details for why you selected your answer for the What is NBMT? NEST section
13. The time devoted and information provided during the BEST: Nature-Based Grounding section was appropriate (1 = strongly disagree, 5 = strongly agree)

14. Please provide details for why you selected your answer for the BEST: Nature-Based Grounding section
15. The time devoted and information provided during the How to Practice NBMT? section was appropriate (1 = strongly disagree, 5 = strongly agree)
16. Please provide details for why you selected your answer for the How to Practice NBMT? section
17. The time devoted and information provided during the Nature-Based Guided Meditation section was appropriate (1 = strongly disagree, 5 = strongly agree)
18. Please provide details for why you selected your answer for Nature-Based Guided Meditation section
19. The time devoted and information provided during the Reflective Journaling section was appropriate (1 = strongly disagree, 5 = strongly agree)
20. Please provide details for why you selected your answer for the Reflective Journaling section

APPENDIX M: PILOT STUDY STUDENT ENGAGEMENT SCALE

Student Engagement Scale Word Changes

Original Item	Changed Item
Did your teacher pay attention to you when you spoke in class?	Did your group leader pay attention to you when you spoke in group?
Did your teacher do a good job teaching All Stars?	Did your group leader do a good job teaching Nature-Based Mindfulness Training?
How often did you share your opinion during All Stars?	How often did you share your experience during Nature-Based Mindfulness Training?
Did All Stars help you think about what was important to you as you grow older?	Did Nature-Based Mindfulness Training help you think about what was important to you to manage your mental health?

Feedback Questions for Student Engagement Scale Word Changes

1. Is the question “Did your group leader pay attention to you when you spoke in group?” clear and easy to understand (1 = strongly disagree, 5 = strongly agree)
2. Is the question “Did your group leader do a good job teaching Nature-Based Mindfulness Training?” clear and easy to understand (1 = strongly disagree, 5 = strongly agree)
3. Is the question “How often did you share your experience during Nature-Based Mindfulness Training?” clear and easy to understand (1 = strongly disagree, 5 = strongly agree)
4. Is the question “Did Nature-Based Mindfulness Training help you think about what was important to you to manage your mental health?” clear and easy to understand (1 = strongly disagree, 5 = strongly agree)

APPENDIX N: INTERVENTION FEEDBACK QUESTIONS

Slider Scale Questions

Please slide the marker on the scale to show how much spending time in nature vs. interaction with peers in the group impacted to your understanding of mindfulness and impacted your anxiety.

- Middle = Spending time in Nature and Interaction with peers in the group impacted my understanding of mindfulness / anxiety equally
- Farther left = Spending time in Nature impacted my understanding of mindfulness / anxiety more than interaction with peers in the group
- Farther right = Interaction with peers in the group impacted my understanding of mindfulness / anxiety more than Spending time in Nature

Mindfulness

Spending Time in Nature-----Interaction with Peers in the Group

Anxiety

Spending Time in Nature-----Interaction with Peers in the Group

Peer Interaction

1. *Please select the level in which you agree or disagree to the following statement:*
Interacting with peers in the group helped me to better understand mindfulness (1 = strongly disagree, 5 = strongly agree)
2. Expanding on your response to the previous question, please provide examples of how interacting with peers in the group impacted your understanding of mindfulness (*positively, negatively, or neutrally*). *Please provide a minimum of 1-3 examples in your response*

3. *Please select the level in which you agree or disagree to the following statement:*
Interacting with group members helped to reduce my anxiety (1 = strongly disagree, 5 = strongly agree)
4. Expanding on your response to the previous question, please provide examples of how interacting with peers in the group impacted your anxiety (*positively, negatively, or neutrally*). *Please provide a minimum of 1-3 examples in your response*

Nature

1. *Please select the level in which you agree or disagree to the following statement:*
Spending time in nature during NBMT helped me to better understand mindfulness (1 = strongly disagree, 5 = strongly agree)
2. Expanding on your response to the previous question, please provide examples of how spending time in nature impacted your understanding of mindfulness (*positively, negatively, or neutrally*). *Please provide a minimum of 1-3 examples in your response*
3. *Please select the level in which you agree or disagree to the following statement:*
Spending time in nature during NBMT helped to reduce my anxiety (1 = strongly disagree, 5 = strongly agree)
4. Expanding on your response to the previous question, please provide examples of how spending time in nature impacted your anxiety (*positively, negatively, or neutrally*).
Please provide a minimum of 1-3 examples in your response

Self-Efficacy

Self-efficacy *Self-efficacy is one's beliefs in their capacity to act in ways necessary to reach specific goals (i.e., reduce anxiety)*

1. *Please select the level in which you agree or disagree to the following statement:*
Participating in NBMT helped to improve my self-efficacy to better manage anxiety (1 = strongly disagree, 5 = strongly agree)
2. Expanding on your response to the previous question, please provide examples of how participating in NBMT impacted your self-efficacy (*positively, negatively, or neutrally*) to manage anxiety? *Please provide a minimum of 1-3 examples in your response.*
3. Please provide examples of how interacting with peers in the group impacted your self-efficacy to manage anxiety. *Please provide a minimum of 1-3 examples in your response.*
4. Please provide examples of how spending time in nature impacted your self-efficacy to manage anxiety. *Please provide a minimum of 1-3 examples in your response.*

APPENDIX O: NBMT INTERVENTION COMPONENTS

Time and Description

Intervention Component	ART & Mindfulness Components	Time	Description
Group Introduction	<i>Being Away</i> <i>Intention</i>	0:00-0:05	Facilitator and participants share their name, pronouns (optional), major, and reason for participating in NBMT.
Nature Restores	<i>Being Away</i> <i>Intention</i>	0:05-0:10	Facilitator draws attention to natural environment and guide discussion with participants on their experiences with nature.
Anxiety	<i>Compatibility</i> <i>Attention</i>	0:10-0:20	Facilitator directs participants to reflect on their anxiety and to write or draw how anxiety impacts their lives.
Why NBMT ©?	<i>Compatibility</i> <i>Intention</i>	0:20-0:25	Participants identify their purpose for participating in and practicing NBMT and to write their purpose.
LEAF Goals	<i>Compatibility</i> <i>Intention</i>	0:25-0:35	Participants reflect on their larger life goals, drawing or writing this goal and sharing with group members.
What is NBMT ©?: NEST	<i>Soft</i> <i>Fascination</i> <i>Attention</i>	0:35-0:45	Participants focus on their internal experience (i.e., thoughts, emotions, and sensations) and to write what they notice in the moment.
BEST: Nature-Based Grounding	<i>Extent</i> <i>Soft</i> <i>Fascination</i> <i>Attention</i>	0:45-0:55	Participants focus on their external experience (i.e., surroundings, natural environment) and facilitator guides participants in Nature-Based Grounding exercise.
How to Practice NBMT ©?	<i>Being Away</i> <i>Compatibility</i> <i>Attitude</i>	0:55-1:05	Facilitator guides discussion among participants to practice NBMT without judgment, honestly, and focusing on one thing at a time.
Nature-Based Guided Meditation	<i>Being Away</i> <i>Extent</i> <i>Soft</i> <i>Fascination</i> <i>Compatibility</i> <i>Reperceiving</i>	1:05-1:20	Facilitator will prepare participants for the guided meditation and will guide a 10-minute Nature-Based Guided Meditation specific to the natural environment of the group.
Reflective Journaling	<i>Extent</i> <i>Soft</i> <i>Fascination</i> <i>Reperceiving</i>	1:20-1:25	Participants will reflect on three prompts focused on <i>Attention</i> , <i>Attitude</i> , and <i>Intention</i> and write their responses.
Group Conclusion	<i>Compatibility</i> <i>Reperceiving</i>	1:25-1:30	Participants will write their top three takeaways from NBMT and share one with the group.

* *Reperceiving* includes *Attention*, *Intention*, and *Attitude*