Forest Bathing Increases Adolescent Mental Well-being And Connection To Nature.

A Transformative Mixed Methods Study

A Dissertation

Presented to the Faculty of

Antioch University New England

In partial fulfillment for the degree of

DOCTOR OF PHILOSOPHY

by

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June 22, 2023

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This dissertation, by Jennifer Keller, has

been approved by the committee members signed below

who recommend that it be accepted by the faculty of

Antioch University New England

in partial fulfillment of requirements for the degree of

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Abstract

Previous research has demonstrated that practicing forest bathing has significant positive effects on well-being. However, few studies have investigated whether forest bathing increases adolescent well-being despite the growing adolescent mental health crisis in the United States. Similarly, few studies have explored forest bathing's impacts on connectedness to nature. Considering the ongoing environmental crisis, determining if forest bathing increases connectedness to nature is a critical expansion of forest bathing research, as connectedness to nature is linked to environmental care and concern. This study investigated the possibility that forest bathing, a nature-based mindfulness practice, could increase adolescent mental well-being and connectedness to nature and sought to determine participants' experiences of practicing forest bathing. This study used a convergent parallel mixed-methods design that was partially co-created with 24 participants aged 16-18 as part of a youth participatory action research (YPAR) project where participants practiced forest bathing three times over three weeks. After practicing forest bathing, participants' mental well-being increased significantly, as measured by the Warwick Edinburgh Mental Well Being Scale. Connectedness to nature also increased significantly as measured by the Connectedness to Nature Scale. Participants described reduced stress and increased feelings of relaxation, peace, and happiness as well as increased connection to nature, gratitude for nature, concern for nature, and desire to care for nature. Although this is one of the first studies to examine forest bathing impacts on participants' connectedness to nature, these findings correlate with other studies showing that spending time outside in nature increases connectedness to nature and care and concern for the environment. People working with adolescents could consider forest bathing as a practice that increases connectedness to

nature while also increasing mental well-being. This dissertation is available in open access at AURA, http://aura.antioch.edu/ and OhioLINK ETD Center, https://etd.ohiolink.edu/etd.

Keywords: forest bathing, forest therapy, adolescent well-being, ecoanxiety, ypar, mixed methods, photovoice, nature connection, nature connectedness, connection to nature.

Dedication

I dedicate this dissertation to my children, Magdalena Schneiderman and Ruben Schneiderman. You have given and taught me more than you could ever know, including unconditional love, hope for the future, the courage to pursue my dreams, and how to keep an open heart and mind even in the face of fear and uncertainty.

Acknowledgements

As with any large endeavor there is a large support team behind the researcher and author. So many people have helped me while researching and writing this doctoral dissertation. I will start with my family, especially my children, Magdalena and Ruben Schneiderman. My parents, Nancy Alex, Bob and Barbara Keller, my sister Stephanie Keller have also provided support and encouragement not only throughout this adventure, but also my entire life. I truly have good fortune that you all always had my back.

I can't imagine writing a dissertation related to nature connection without also thanking the more than human world, particularly the lands and waters near my home. The inspiration you provide, the love and care I feel whenever in your presence has sustained me for decades. I'm always in a better mood, rejuvenated and inspired after spending time with you. Thank you for all your gifts.

My Advanced Placement (AP) Environmental Science students 2021-2022, who were also my co-researchers. Your enthusiasm and willingness to explore forest bathing with me fills my heart with gratitude. I could not have done this research without your support. Thank you, Lauren Halsey, Cara Caulfield, John Caulfield, Cadie Hancock, Cecilia Ginsburg, Juliette Archer, KileyAnne Maloney, Logan O'Neil, Luke Mobius, Luz Matamoros, Mollie Radice, Saide Radice, Raven Reddick, Brian Emmons, Cameron Wiley, Emma Cervone, Hailey Cameron, Jasmine Head, Juliette Kearns, Tessa Arnzen, Andrew Vessinia, and Sophia Oliveria.

There are also the dear friends and colleagues I must express gratitude to. My friends, who have helped lift my spirits, provided respite, play, attentive listening and sometimes a shoulder to cry on, over the course of this PhD program. I am so grateful for our friendship and loving connections. My colleagues, who helped at school and when I had no out of school time

to spare, thank you for your collegial support not only during my PhD program, which happened during COVID, but also all the time.

There are others who have helped in their own ways. The Academic Writing Space community who helped create supportive writing space with accountability. Rhona Schneberger and Carolynne Crawley, my Nature and Forest Therapy Guide Trainers, and all the members of Cohort 43: you helped me bring consciousness to my relationships with the more than human world. Also, thank you to: Joel Kaye, Harper ShawverHowell, Melissa Schwartz, Melinda Valentine, Kathryn Peterson and Alison Miller. There is also my Antioch Cohort: Manaseh Mintah, Jennifer Smith, Alana Soucy-Carveth, Sharon Bowen, Nicole Conklin and Rachel Brice. Although we have moved in different directions and at different paces, knowing we were all doing good work with the foundation we created together helped keep me moving along. Thank you to all of you.

My committee has also helped me. Jason Rhoades was my advisor on the YPAR pilot project that led to this doctoral research. Your feedback and suggestions while I created, carried out and completed that pilot, and later, my doctoral research, are immensely appreciated. Louise Chawla, when you accepted my invitation to be my external committee member I was thrilled. Your worlds of encouragement, feedback on my work and support have meant so much to me. I am so thankful you both agreed to be on my committee.

And, most importantly, my brilliant advisor and committee chair, Jean Kayira. You have been my midwife through these past two and a half years, from the conception of this research project all the way through till I was ready to give birth to this doctoral dissertation. Like any excellent midwife, you trusted my own abilities while providing essential support and encouragement when I needed it. Your constant “You got this” kept me going more than once

when I was bogged down. You challenged my assumptions, pushed me to consider new viewpoints and helped me become a more critical and thoughtful scholar. I am so grateful that you said yes to being my advisor.

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Chapter 1 Introduction

Introduction

The continuing global environmental crisis, which includes climate change, biodiversity loss, and biogeochemical cycle disruption (Steffen et al., 2015), is making researchers and teachers wonder how to engage young people with these critical issues without causing anxiety or stress (Ojala, 2012, 2018; Pihkala, 2020). As the UN sustainable development goals state, young people are "critical agents of change" and have "infinite capacities for activism into the creation of a better world" (UNSDR, 2015, para 51). Increasing environmental education is one long-lasting suggestion to help counteract these dramatic global environmental changes (Ardoin et al., 2020; Hungerford et al., 1980; Stapp, 1969). Environmental education was codified in the UN Tbilisi Declaration in 1977 as a "learning process that increases people's knowledge and awareness about the environment and its associated challenges" (p. 14) to counteract the human-caused environmental devastation spreading around the globe. Recognizing that awareness is not enough, the Declaration also recognized that young people must also learn the skills and develop the capacity to address these critical environmental issues (UNESCO, 1977).

This capacity has been termed constructive hope, which is the ability to see environmental challenges and uncertainties while still having the ability to take action to address these serious threats (Ojala, 2017). Generating constructive hope is both critical and challenging, as many global environmental issues, like mass extinction, are so heartbreaking for young people, or so global, like climate change, that many young people suffer from ecogrief or ecoanxiety (Berman, 2021; Ojala, 2018; Pihkala, 2020; Watts et al., 2021), in addition to their already high rates of anxiety and depression (Centers for Disease Control (CDC), 2021; Geiger

& Davis, 2019; McCarthy, 2019). Ecoanxiety symptoms include low mood, disturbed sleep, and feelings of anger, guilt, or helplessness (Watts et al., 2021). Ecoanxiety can also include panic attacks, obsessive thinking (Wu et al., 2020), and hopelessness about humanity's future (Hickman et al., 2021). Place-based education that includes time outside in nature can be a way for students to relieve their ecogrief or ecoanxiety by learning to care for their local place (Chawla, 2014, 2015, 2020; Ojala, 2018; Pihkala, 2020) and perhaps generate constructive hope.

Place-based education is a strategy within the broad environmental education field that can increase the effectiveness of environmental education. This is because place-based education explicitly incorporates not just learning about the environment and its challenges but also creates a "heightened commitment to serving as active, contributing citizens" (Sobel, 2004, p. 26). Place-based education proposes that schools often focus on national or global issues too early in a child's education, which causes students to lose their sense of place (Gruenewald & Smith, 2014; Sobel, 2004, 2020). It also proposes that students must be grounded in their community's natural history, geology, local culture, history, social/political issues, before moving on to broader subjects (Anderson, 2017; Bartholomaeus, 2006; Sobel, 2004; Tso & Hill, 2006). Place-based education rightfully recognizes that everything is interconnected, as solutions to environmental and social problems require an interdisciplinary approach that looks at all aspects of environmental issues. In Chapter 2, I further describe and provide critiques of place-based education.

Place-based education also often involves students spending time outside in nature. Time outside in nature has been shown to increase connection to nature. Connection to nature is the sense of connection to or belonging to the natural world as part of a larger community of nature (Capaldi et al., 2015; Lumber et al., 2017; Mayer et al., 2009). Cultivating connection to nature

is essential as people with more connection to nature show more proenvironmental and pronature behavior (Balundė et al., 2019; Barrera-Hernández et al., 2020; Chawla, 2014, 2020; Hughes et al., 2019; Mackay & Schmitt, 2019; Marschall, 2021; Richardson et al., 2019; Tam, 2013; Whitburn et al., 2018). These behaviors include working with conservation groups, recycling, joining a nature club, volunteering with environmental organizations, and any behavior that helps the environment (Balundė et al., 2019; Hughes et al., 2019; Richardson et al., 2019).

Coupled with the worry and overwhelm of caring for a planet that is suffering, being a teenager is, in general, stressful (Long, 2021). This is important because, as mentioned, the rates of anxiety and depression in teenagers have increased dramatically in the US since 2007 (CDC, 2021; Geiger & Davis, 2019; McCarthy, 2019). These increases are linked to academic and social pressures (Geiger & Davis, 2019), increased social media and technology, and decreased interpersonal interactions (Shensa et al., 2018). More recently, teenage life during the COVID pandemic was even more stressful than usual (CDC, 2021; Czeisler et al., 2020; Styck et al., 2021; Catty, 2021; Singh et al., 2021).

There were many suggestions for reducing this stress and anxiety to improve adolescent mental well-being. These suggestions included an increased emphasis on social-emotional learning (SEL) in schools (Katzman & Stanton, 2020; Tan et al., 2021; Singh et al., 2021). As SEL funding was increased in 2020 by the U.S. federal government-in the COVID-relief Coronavirus Aid Relief and Economic Security Act— many schools are adopting or expanding SEL programs to help their students. In their efforts to support students many SEL programs also incorporate contemplative practices like mindfulness and yoga. However, only some-if any- SEL programs incorporate increasing student time outside in nature, or practicing a nature based contemplative practice such as forest bathing, as a way to increase mental well-being.

This is despite the well-documented benefits of both time outside in nature and practicing forest bathing for increasing human well-being (Hansen et al., 2017; Kuo, 2015; Chawla, 2021).

Forest bathing, often called forest therapy in North America, refers to the practice of spending time in forested areas to invite healing interactions (Clifford, 2018). This nature-based contemplative practice evolved from the Japanese practice of shinrin-yoku. The Japanese Ministry of Agriculture, Forestry, and Fisheries coined the term shinrin-yoku in 1982 (Park et al., 2010). It is described as making contact with and taking in the atmosphere of the forest (Park et al., 2010), similar to natural aromatherapy (Li, 2010). North American forest bathing is a structured walk that invites participants to become embodied and "experience a deeper sense of relationship with the world" (Page, 2019, p. 28).

Gaps In Previous Research

Forest bathing is a nature-based contemplative practice that I will describe in more detail in the literature reviews of manuscripts in Chapters 2-4 of this dissertation. Although research studies agree on the statistically significant positive effects of forest bathing on human well-being, the data mainly come from research involving young adult males in Asia (Li et al., 2011, Lee et al., 2014; Park et al., 2009, 2010). However, there are a few studies with more balanced gender ratios and more broad age ranges, and these studies also show similar patterns (Hansen et al., 2017; Hohashi & Kobayashi, 2013; McEwan et al., 2022). For my dissertation, I explored this gap in the research for the effectiveness of forest bathing in improving mental well-being in adolescents in the U.S. This was important because if the health benefits of forest bathing for adolescents are similar to those for adults, forest bathing is a technique that could be used to support adolescent well-being.

Other gaps in forest bathing research that I explored in my dissertation research include documenting participants' lived experiences of forest bathing and determining if there are changes in participants' connection to nature. Although there has been abundant research into the physiological and psychological effects of both time outside in nature in general and forest bathing in particular, I have not found any literature on correlations between forest bathing and connection to nature except McEwan et al. (2022). Therefore, I included exploring changes in connection to nature while forest bathing in my dissertation research. Determining if forest bathing increases connection to nature is important because, as mentioned above, connection to nature increases conservation values and engagement in pro-environmental behavior (Balundė et al., 2019; Barrera-Hernández et al., 2020; Chawla, 2014, 2020; Hughes et al., 2019; Mackay & Schmitt, 2019; Marschall, 2021; Richardson et al., 2019; Tam, 2013; Whitburn et al., 2018) and could support justifying forest bathing's inclusion in place-based education.

Schools need pedagogical techniques to increase student mental well-being-traditionally through SEL and contemplative practices- and to foster environmental care and concern-often through place-based education. While place-based education is a research-backed method of increasing student engagement and achievement, and SEL is a research-backed method of decreasing student anxiety and increasing student mental well-being, in Chapter 2 I propose forest bathing as a technique for combining place-based education and SEL. In my dissertation research, I also explored the potential of forest bathing as a pedagogical technique to bridge place-based education and SEL to increase student mental well-being and connection to nature. Further below I will briefly describe the chapters of my dissertation research, which answered the following:

Research Questions

1. How does practicing forest bathing impact adolescents' mental well-being and connection to nature?
2. What are adolescents' experiences of practicing forest bathing?
3. How can forest bathing bridge SEL and place-based education programs?

Locating Myself In This Study

Spending time outside in nature has always been essential to me. I can credit all my grandparents with long days on the water fishing or in the garden, nurturing the Earth that gave us delicious food and beautiful flowers. I can also highlight my parents for incorporating a sense of adventure by adding sailing and skiing to my time outside in nature, often accompanied by my beloved sister. The contrast of these early outdoor experiences, the calm patience and attentiveness of fishing and gardening with the thrill of developing competence in sailing and skiing, while surrounded by the love, attention, and care of my family, created a strong foundation of love and care for the Earth. I built upon this foundation when I pursued a Bachelor of Science in Marine Biology. Throughout college, I felt a tension between my growing awareness of the ongoing environmental crisis of species extinction, air and water pollution, increasing amounts of waste, and climate change, and the intact flourishing ecosystems I experienced regularly.

I still feel this tension more than two decades and two children later. I experience it as a person, a being of this planet. I experience it as a Mother, thinking about how my children engage with their communities and the environment. I also experience this tension as a high school science teacher. I've taught Biology, Chemistry, Earth Science, Marine Biology, Indigenous Science, and Environmental Science. I love science and teenagers, so teaching high

school science seems like a great career choice. And yet, most of the science I am required to teach is prescribed and limited by standardized tests required for high school graduation or Advanced Placement (AP) credit. I teach on the eastern end of Long Island, New York, on Shinnecock land, now called Southampton. It is a bioregion with multiple aquatic and terrestrial ecosystems with relationships with human people that extends from time immemorial.

The constraint of standardized tests while living and teaching in a place with so many opportunities for interdisciplinary learning can often feel oppressive and even harmful. I wanted to teach with this place, and fortunately, my district supports me in integrating place into my Environmental Science classes. Until 2022 this Environmental Science class was also constrained by an AP exam. My learning, and, perhaps most importantly, unlearning, over the past decade empowered me to successfully advocate for the Environmental Science class to be de-coupled from the AP curriculum and to ground the course in our community's history, ecology, sociology, economics, and politics. It is now an interdisciplinary place-conscious course that still earns credit, but now through SUNY Stony Brook, without a high-stakes AP exam.

As I watched the epidemic of adolescent anxiety and depression unfold right in front of my eyes, the other side of my research called to me. I witnessed so much suffering in my students that included self-harm and suicide. I observed smartphones becoming part of my students' lives, and saw their growing obsession with social media and how they were not as connected to each other in ways I had observed in the past. After taking several mindfulness courses for my own well-being, I also saw that at least part of their struggles was that they were not connected to themselves. Ten years ago, I completed a year-long mindfulness teacher training and introduced a mindfulness curriculum in my classes that I continue to this day.

Wanting to connect my mindfulness practice with my love of the Earth, I trained as a Nature and Forest Therapy Guide in 2019-2020. This training, which started in the northern Canadian Rocky Mountains on Ktunaxa land in what is now called Golden, British Colombia, was transformative in not only my personal practice but also my consciousness around human relationships with the more than human world, and concepts of reciprocity and Indigeneity. I was excited to bring this practice back to my community and school. I saw and felt how forest bathing increased my well-being and awareness of the interconnection of all beings. I read the research that showed my experience was typical for forest bathing practitioners.

A few months after my training as a Nature and Forest Therapy Guide began, I also entered the Ph.D. program in Environmental Studies at Antioch University, New England to nurture a long-dormant scholar inside of me and complete this interdisciplinary research study with the support of other scholars. In the first year of the Ph.D. program, the COVID pandemic shut down my high school and much of the world. During this time, adolescent anxiety and depression further increased from their already high levels. I was curious to see if forest bathing would also increase my teenage students' well-being, as it had for me and other adults, while also motivating them to care for the environment. I decided researching how forest bathing impacts adolescent mental well-being and connection to nature would be the most meaningful way for me to train as a scholar while at Antioch.

Ethical Considerations

Ethics were considered throughout this study, which received approval from Antioch University, New England's Institutional Review Board. Before data collection, I met with school administrators to ensure this research could occur with my students in and outside my classroom. I also explained the research study to students and parents. I assured them all

participant data would be deidentified and kept in a password-protected file. Students, who were also my co-researchers, or their parents could elect to have their data removed from the study without academic or other penalties. I gathered student assent in class and parent consent through email. During the school year I endeavored to create a welcoming, non-judgmental, liberating environment where students could be their authentic selves. This helped when, to ensure reliable data was gathered, I emphasized that I valued their honest responses to surveys, journals, and photovoice. I reassured participants that my earning a Ph.D. did not depend on me "proving" anything and that the most important thing is that our data reflects our actual experiences.

Dissertation Outline And Overview Of Manuscripts

As this is a manuscript format dissertation, each paper contains its own abstract, literature review, methods, results, discussion, conclusion, recommendations/implications and works cited. I plan to submit each of these papers to peer-reviewed journals. I will expand on the recommendations/implications of each paper in Chapter 5, Recommendations and Implications.

Methods Overview

I used Creswell and Plano Clark's (2018) mixed methods participatory social justice design to investigate my research questions. Mixed methods participatory social justice, sometimes called transformative mixed methods (Mertens, 2003, 2010; Ponterotto, 2010; Tashakkori & Teddie, 2010), includes participants voices to identify and describe issues while generating evidence that is useful and persuasive to individuals and stakeholders (Creswell & Creswell, 2018; Creswell & Plano Clark, 2018). The collaborative intent of participatory research provided a framework for conducting aspects of mixed methods research in my classroom. The quantitative instruments, qualitative prompts, and details about the sites and

participants – who were also my co-researchers- are described in the manuscripts in Chapters 3 and 4.

Chapter 2: Forest Bathing as Pedagogy: Critical Contemplative Place-Based Education, a Proposed Theoretical Framework

This paper answers my third research question: How can forest bathing bridge SEL and place-based education programs? It describes a framework I propose, critical contemplative place-based education (CCPBE). This framework combines place-based education, contemplative practices, and critical theory. CCPBE fosters the healing of the environment and people. It incorporates aspects of both place-based education and SEL; namely, it is grounded in place and increases student well-being. In addition to place-based and SEL pedagogies, CCPBE includes critical components. It achieves this by opposing the harmful Western narrative of a dualistic human-nature relationship and the detrimental power dynamics in schools and many U.S. communities. In this paper, I outline additional components of CCPBE and explain how forest bathing could satisfy its requirements.

Chapter 3: Forest Bathing Increases Adolescent Mental Well-being

This paper answers the mental well-being part of my first research question: How does practicing forest bathing impact adolescents' mental well-being? It also answers my second research question: What are adolescents' experiences of practicing forest bathing? The paper describes how forest bathing improves adolescent mental well-being and documents participants' experiences of forest bathing related to mental well-being. As measured by the Warwick Edinburgh Mental Well-Being Survey, mean participant mental well-being increased significantly after forest bathing, with moderate to large effect sizes. Participants described reduced stress and increased feelings of relaxation, peace, and happiness. These findings

described in this paper correlate with previous forest bathing research with adult participants. In this paper, I recommend that people working with adolescents consider forest bathing a simple, low-cost way to improve adolescent mental well-being.

Chapter 4: Forest Bathing Increases Adolescent Connection to Nature

This paper answers connection to nature part of my first research question: How does practicing forest bathing impact adolescents' connection to nature? Additionally, it answers the second research question: What are adolescents' experiences of practicing forest bathing? The manuscript describes how forest bathing increases adolescent connectedness to nature and documents participants' experiences of practicing forest bathing related to nature connection. After practicing forest bathing, participants' connectedness to nature increased significantly as measured by the Connectedness to Nature Scale. Participants described increased connection to nature, gratitude for nature, concern for nature, and desire to care for nature. This was one of the first studies to examine forest bathing's impacts on participants' connectedness to nature. These findings correlate with other studies showing that spending time outside in nature increases connectedness to nature and care and concern for the environment. In this paper, I recommend that people working with adolescents consider forest bathing as a practice that increases connectedness to nature while also increasing mental well-being.

Chapter 5: Implications and Recommendations

This chapter concludes my dissertation by briefly synthesizing the results of my research. Here, I also address limitations, highlight implications and make recommendations for research, practice and policy.

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Chapter 2 Forest Bathing as Pedagogy in Critical Contemplative Placed-Based Education a Proposed Theoretical Framework

Introduction

The continuing global environmental crisis, which includes climate change, biodiversity loss, and biogeochemical cycle disruption (Steffen et al., 2015), is making researchers and teachers wonder how to engage young people with these critical issues without causing counterproductive anxiety or overwhelming stress (Ojala, 2012, 2018; Pihkala, 2020). As the United Nations sustainable development goals state, young people are "critical agents of change" and have "infinite capacities for activism into the creation of a better world" (United Nations Department of Economic and Social Affairs, 2015, para 51). Increasing environmental education is one long-lasting suggestion to help counteract these dramatic global environmental changes (Ardoin et al., 2020; Hungerford et al., 1980; Stapp, 1969). Environmental education was codified in the United Nations' Tbilisi Declaration in 1977 as a "learning process that increases people's knowledge and awareness about the environment and its associated challenges" (p. 14) to counteract the human-caused environmental devastation spreading around the globe. However, awareness is not enough. Students must also learn the skills and develop the capacity to address these critical environmental issues (United Nations Educational, Scientific and Cultural Organization, 1977).

This capacity to address environmental issues has been termed constructive hope, which is the ability to see environmental challenges and uncertainties while still having the ability to take action to address these serious threats (Ojala, 2017). Generating constructive hope is both critical and challenging, as many global environmental issues, like mass extinction, are so heartbreaking for young people, or so global, like climate change, that many young people suffer

from ecogrief or ecoanxiety (Berman, 2021; Ojala, 2018; Pihkala, 2020), in addition to their already high rates of anxiety and depression (Centers for Disease Control and Prevention [CDC], 2021; Geiger & Davis, 2019; McCarthy, 2019). Watts et al. (2021) described ecoanxiety symptoms as including low mood, disturbed sleep, and feelings of anger, guilt, or helplessness. Ecoanxiety can also include panic attacks, obsessive thinking (Wu et al., 2020), and hopelessness about humanity's future (Hickman et al., 2021). Place-based education that includes time outside in nature can be a way for students to relieve their ecogrief or ecoanxiety by learning to care for their local place (Chawla, 2014; 2015, 2020; Ojala, 2018; Pihkala, 2020) and perhaps generate constructive hope.

Schools need pedagogical techniques to increase student mental well-being, traditionally accomplished through social emotional learning (SEL) and contemplative practices, which are research-backed methods of decreasing student anxiety and increasing student mental well-being (Bailey et al., 2019; Greenberg et al., 2003; Lantieri & Nambiar, 2012; Niemi, 2020; Yoder et al., 2020a, 2020b). Schools must also foster environmental care and concern, which can be accomplished through place-based education (Anderson, 2017; Balundė et al., 2019; Gruenewald & Smith, 2014; Sobel, 2004; Smith & Sobel, 2010). I propose forest bathing, a nature-based contemplative practice, as a pedagogical technique to bridge place-based education and SEL to increase students' mental well-being, connection to nature and environmental care and concern.

To do this, I first describe and explain the benefits of place-based education and SEL, while also including critiques of both. I then describe forest bathing and its research-backed benefits. Then, I show how forest bathing could address critiques of place-based education and SEL. Lastly, I explain how forest bathing can facilitate place-based education and SEL coming together in a proposed critical contemplative place-based education (CCPBE) framework.

Place-Based Education

Place-based education is a strategy within the broad environmental education field that can increase the effectiveness of environmental education. This is because place-based education not only explicitly incorporates learning about the environment and its challenges but also creates a "heightened commitment to serving as active, contributing citizens" (Sobel, 2004, p. 26). Place-based education has the goal of placing students' education in "local heritage, cultures, landscapes, opportunities, and experiences, and uses these as a foundation" (Place-Based Education Evaluation Collaborative (PEEC), 2010, p. 8) for the interdisciplinary study of subjects across the curriculum (Lloyd et al., 2018; PEEC, 2010). It also aims to cultivate a sense of responsibility for the environment and community, in addition to promoting critical thinking skills by addressing real-world environmental and social challenges within the context of a specific place (Anderson, 2017; Ark et al., 2020). Place-based education immerses students in authentic local experiences and fosters a holistic learning environment that integrates academics with practical skills to fulfill its goals of nurturing ecologically conscious and community-oriented individuals (Ark et al., 2020).

Place-based education also often involves students spending time outside in nature. But what is nature? The concept of nature is culturally defined, and a single definition can be elusive. For this paper, and much of the connection to nature research, "nature" includes everything that grows and changes on its own, independently of humans (Chawla, 2022). I also use David Abram's (1997, 2008) phrase, *the more-than-human world*, for nature, which Abram (2008) defined as the "commonwealth of earthly life, a realm that manifestly includes humankind and its culture, but which also necessarily exceeds human culture," (para 5) as this is the term used in forest bathing and reflects its underlying philosophy of the interconnection and agency of all

beings. The term the more-than-human world is also used in deep ecology, which is an environmental movement and philosophy that regards human life as just one of many equal components of a global ecosystem (Madsen, 2016).

Time outside in nature has been shown to increase connection to nature (Barrable & Booth, 2020; Cheng & Monroe, 2012; Elliot et al., 2014; Larson et al., 2019; Sheldrake et al., 2019; Soga et al., 2018). Connection to nature is the sense of connection or belonging to the natural world as part of a larger community of nature (Capaldi et al., 2015; Lumber et al., 2017; Mayer et al., 2009). This is important because research shows that connection to nature increases environmental care, concern, and positive behavior toward the environment, wildlife, and habitats (Balundė et al., 2019; Barrera-Hernández et al., 2020; Chawla, 2014, 2020; Hughes et al., 2019; Mackay & Schmidt, 2019; Richardson et al., 2019; Tam, 2013; Whitburn et al., 2018, 2020).

Place-based education, which can often include time outside in nature, enhances students' appreciation for the natural world and, as mentioned previously, creates a commitment to active community engagement (Sobel, 2004). Place-based education also proposes that schools often focus on national or global issues too early in a child's education, which causes students to lose their sense of place (Gruenewald & Smith, 2014; Sobel, 2004, 2020). It also proposes that students must be grounded in their community's ecology, culture, and history before moving on to broader subjects (Bartholomaeus, 2006). Place-based education focuses on all aspects of the local environment by including natural history, geology, local culture, history, social/political issues, and the built environment (Anderson, 2017; Sobel, 2004; Tso & Hill, 2006).

The first part of Sobel's (2004) statement above—that place-based education increases academic achievement as measured by standardized test scores—has been strongly supported by

research for over 3 decades (Bartosh et al., 2009; Danforth et al., 2008; Heaton, 2020; Lieberman & Hoody, 1998; Lloyd et al., 2018). This link has been used to justify place-based education in the current educational environment, which has been mainly focused on high-stakes testing since the 2001 No Child Left Behind Act (Nichols et al., 2005). This may be partly explained because many students participating in place-based education will spend time outside in nature, which has many positive benefits, including improvements in attention, creativity, and focus (Faber Taylor et al., 2001; Faber Taylor & Kuo, 2009; Kuo, 2015; Kuo & Faber-Taylor, 2004; Markevych et al., 2014; van den Bosch & Bird, 2018). The improvement of these benefits after students spend time outside in nature is so significant that, in 2008, Richard Louv coined the term *nature deficit disorder* to describe how decreasing time outside in nature led to a decreasing ability to concentrate and well-being in U.S. children. Other positive benefits of time in nature include a deeper connection to nature, motivation for conservation, and prosocial behaviors, all essential traits for our world's future (Chawla, 2014, 2020, 2022; Ojala, 2018).

Although rightfully celebrated for its many benefits, place-based education has also been criticized. The four main critiques of place-based education are as follows. Place-based education often neglects Indigenous and non-Western stories of place and can perpetuate harmful colonial narratives of places (Bowers, 2008; Fletcher, 2017; Greenwood, 2010; Griffin, 2017; Gruenewald, 2003; Gruenewald & Smith, 2007; Kayira et al., 2022; McInerney et al., 2011). Place-based education is focused on younger (PK–8) children and excluded from many secondary schools (Anderson, 2017; Ark et al., 2020; Duffin et al., 2005; Krasnow et al., 2020). Third, using standardized tests as a justification for place-based education is problematic because standardized tests are themselves problematic (Mooney, 2018; Perry et al., 2003; Royal, 2012; Truss, 2019), as they can be considered oppressive (Torres, 2019) and they also serve a

neoliberal agenda (Gruenewald & Smith, 2007). A fourth, more recent, criticism is that place-based education can be too intellectual, and nature is studied as an external entity (Britto dos Santos & Gould, 2018; Chawla, 2022; Clarke & Mcphie, 2020a, 2020b; Dickinson, 2013; Fletcher, 2017; Himes & Muraca, 2018; Humphreys & Blenkinsop, 2018; Owen-Smith, 2017; Somerville, 2010). In other words, nature is framed as separate from humans, which may perpetuate the issues place-based education attempts to solve (Clarke & Mcphie, 2020a, 2020b; Dickinson, 2013; Fletcher, 2017). Although forest bathing could address all four place-based education critiques, I will limit the scope of this paper to the fourth, as forest bathing has the intention of creating connections between people and nature (Clifford, 2018; Page, 2019, 2021).

To be less intellectual and reduce externalizing nature, place-based education should be more relational (Britto dos Santos & Gould, 2018; Chawla, 2022; Himes & Muraca, 2018; Humphreys & Blenkinsop, 2018) embodied, sensual (Abram, 1997; Gruenewald, 2003; Somerville, 2010), and internal (Owen-Smith, 2017). Some also propose that place-based education should incorporate contemplative opportunities for students to explore their internal experience of place, particularly outside in nature (Owen-Smith, 2017; Rushmere, 2020; Somerville, 2010). These suggestions are rooted in Abram's (1997) argument that language, particularly written language, is a way humans can distance themselves from nature.

If language creates distance in place-based education, what could support connection and relationality? Although Rushmere (2020), Somerville (2010), and Owen-Smith (2017) described ways place-based education must evolve to include contemplative opportunities, only Owen-Smith proposed a specific pedagogical technique, allowing time for silence, which they proposed could help in creating a "contemplative imagination of place" (p. 28–29). Batavia et al. (2021) linked and expanded the critiques of Owen-Smith, Rushmere (2020), and Somerville (2010) to

include also the need for "an emotional experience of shared vulnerability" (p. 1384) removed from the "dualistic, hierarchical logic used to maintain power in the dominant class" (p. 1380), which they identified as White, cis-male, heterosexual, able-bodied, upper class, and human. Batavia et al. further posited that emotional connection and compassion are "core virtues" (p. 1384) of conservation, as they strengthen conservationists' perceptions of a "duty to protect" (p. 1380) the biodiversity of ecosystems. These emotional connections are best created through direct experience and the "reciprocal oral transfer of knowledge" (Pilgrim et al., 2007). Therefore, there must be a more explicit relational component in place-based education by shifting pedagogies to include interconnected ways of being (Welden et al., 2021).

Having strategies for educators to use to cultivate an embodied and relational experience in a place is a critical expansion of place-based education. The need for more specific pedagogical practices to create contemplative place-based education is a gap that could be filled with forest bathing, a nature-based mindfulness practice. Forest bathing creates opportunities for embodiment, sensuality, and relationship (Clifford, 2018; Page, 2019). Thus, it could be a technique to fulfill the need for students to explore their embodied internal experience of place. In addition, incorporating contemplative practices, such as forest bathing, into place-based education links place-based education to SEL. In the next section, I describe SEL, including how contemplative practices enhance and deepen SEL, then explain how forest bathing could bridge SEL and place-based education in a new proposed framework.

Social Emotional Learning and Contemplative Practices

The Collaborative for Academic, Social, and Emotional Learning (CASEL; 2020) defined the goals of Social Emotional Learning (SEL) as follows:

> [For] young people and adults acquire and apply the knowledge, skills, and attitudes to develop healthy identities, manage emotions, achieve personal and collective goals, feel and show empathy for others, establish and maintain supportive relationships and make responsible and caring decisions (para. 1).

I chose the CASEL description because not only did CASEL introduce the term in 1994 (Niemi, 2020), their framework has also been used in many research studies (Bailey et al., 2019; Greenberg et al., 2003; Jones et al., 2021; Jones & Doolittle, 2017; Niemi, 2020; Starr, 2019; Yoder et al., 2020a, 2020b), some of which also include increasing human well-being as an SEL goal (Bailey et al., 2019; CASEL, 2020; Jones & Doolittle, 2017; Niemi, 2020), and for many U.S. federal and state policies. These policies include the No Child Left Behind Act of 2001, its replacement, the Every Student Succeeds Act of 2015, and the American Rescue Plan Act of 2021, part of the United States' response to the COVID-19 pandemic. SEL is included in these policies because SEL is an integral part of human development (Niemi, 2020) and, therefore, an integral part of education. However, not all agree that SEL is a critical part of education, and in 2022, Florida banned several textbooks for including SEL content (Goldstein & Saul, 2022; Gross, 2022).

SEL has been referred to as "the missing piece" (Lantieri & Nambiar, 2012, p. 1) in education because it embodies a part of education that is critical for students' success. Although school is one of the primary places where students learn SEL skills (Durlak et al., 2011), SEL traditionally has not been explicitly acknowledged or prioritized in U.S. public education (Lantieri & Nambiar, 2012; Lawlor, 2016), despite being codified in the U.S. federal policies mentioned above. However, the COVID-19 pandemic, coupled with the racial awakening experienced by many public school educators in 2020 (Skogsbergh, 2020), has accelerated the

adoption of SEL programs in schools (Katzman & Stanton, 2020; Yang, 2021) and expanded their adaptation to high schools (Rosanbalm, 2021; Sawchuk, 2021).

Although adolescence has long been characterized as a time of stressful personal development (Long, 2021; Romeo, 2013), the rates of anxiety and depression in teenagers increased dramatically in the United States between 2007 and 2021 (CDC, 2021; Geiger & Davis, 2019; McCarthy, 2019), including the rates of hospital admissions for suicidal teens in the United States during the same time period (CDC, 2021; Denizet-Lewis, 2017; Geiger & Davis, 2019). These increases are linked to academic and social pressures (Geiger & Davis, 2019), increased social media and technology, decreased interpersonal interactions (Shensa et al., 2018), and the worry and overwhelm of caring for a suffering planet (Berman, 2021; Hickman et al., 2021; Ojala, 2018; Pihkala, 2020; Watts et al., 2021; Wu et al., 2020). More recently, teenage life during the COVID pandemic has been even more stressful than usual (Catty, 2021; CDC, 2021; Czeisler et al., 2020; Singh et al., 2020; Styck et al., 2021).

There are many suggestions for reducing this stress and anxiety to improve adolescent mental well-being. These suggestions include an increased emphasis on SEL in schools (Katzman & Stanton, 2020; Singh et al., 2020; Tan et al., 2021). As SEL funding was increased in 2021 by the U.S. federal government in the Coronavirus Aid, Relief, and Economic Security Act, many schools are adopting or expanding SEL programs to help their students.

In addition, there is a growing call for practices that influence students' mindsets, sometimes called contemplative practices, which are taught through contemplative pedagogies, to be added to SEL programs (Brensilver, 2016; Brensilver et al., 2020; Dorais et al., 2022; Lantieri & Nambiar, 2012; Lantieri & Zakrzewski, 2015; Lawlor, 2016; Thornton Hardy, 2018). Edwards et al. (2007) described contemplative practices as activities that have the intention of

“quieting the mind and cultivating deep concentration, calm, and awareness of the present moment" (p. 11). Roeser and Peck (2009) expanded on this definition and described contemplative practices as approaches that focus on the whole person's development that encourage "mindful and intentional forms of living and learning" (p. 127). Contemplative practices most frequently mentioned in public education are yoga and mindfulness meditation (Brensilver, 2016; Wong, 2018). Incorporating contemplative practices into SEL is important because contemplative practices can take SEL skills to a deeper level (Lantieri & Nambiar, 2012; Lawlor, 2016).

When explicitly combined, SEL and contemplative practices support each other in motivating students to transform themselves, their communities and beyond, to the larger society. This is because, when combined, they cultivate compassionate dispositions and ethical ways of living and the skills to make that transformation happen (Roeser & Peck, 2009). Therefore, I will link the two terms as SEL/CP to make this connection more explicit.

In addition to improving student well-being, SEL/CP is also justified in schools as implementing SEL/CP programs correlates with improved standardized test scores and decreased discipline referrals (Greenberg et al., 2003; Jones et al., 2021). However, like place-based education, SEL/CP has been criticized for this justification through increased student standardized test scores. As with place-based education, in public education's current high-stakes testing environment, it is understandable that proponents would emphasize this connection. It is easier to justify taking time away from math and English language arts (ELA) instruction for an activity or program that will improve math and ELA test scores. However, justifying SEL/CP adoption through increases in standardized test scores is problematic, as described in the place-based education section, as standardized testing is harmful to students,

teachers, and school curricula (Perry et al., 2003; Kamenetz, 2016; Royal, 2012; Mooney, 2018; Truss, 2019) and serves a problematic neoliberal agenda (Connell, 2013; DeSaxe, 2015; Gabbard & Ross, 2004; Hursh, 2007).

In addition, some wonder if SEL, particularly contemplative practices such as mindfulness and yoga, could merely be facilitating student adaption to and tolerance for a broken system (Forbes, 2012; Ramirez et al., 2021; Torres, 2019; Tate, 2020). Many students are not struggling in school because they do not practice mindfulness; they are struggling because their communities have been oppressed for generations (Torres, 2019), and school is still an unequal system. "Mindfulness is a tool for emotional regulation, not a solution to systematic inequalities" (Torres, 2019, p. 1). A more critical justification might be how SEL/CP could facilitate the whole child's development in an interconnected caring community of humans and beings in the more-than-human-world.

Lastly, SEL/CP often do not incorporate nature-based practices. This is an essential critique for several reasons. One is that, as described previously, spending time outside in nature also increases human well-being, one of the goals of SEL/CP (Bailey et al., 2019; CASEL, 2020; Jones & Doolittle, 2017; Niemi, 2020). Another is that time in nature increases connection to nature which is linked to pro-environmental behavior. Pro-environmental behavior, one of the goals of place-based education, includes actions such as working with conservation groups, recycling, joining a nature club, volunteering with environmental organizations, and any behavior that helps the well-being environment (Balundė et al., 2019; Gkargkavouzi et al., 2019; Gruenwald, 2003; Hughes et al., 2019; Hungerford et al., 1980; Richardson et al., 2019). These behaviors are essential for the future well-being of our communities and planet. Thus activities that cultivate their development are essential to incorporate in school. However, only some, if

any, SEL programs incorporate increasing student time outside in nature as a way to increase mental well-being. This is despite the well-documented benefits of time outside in nature for increasing human well-being (Barrera-Hernández et al., 2020; Capaldi et al., 2015; Chawla, 2022; Harvey et al., 2020; Kuo, 2015; Kuo et al., 2019; Larson et al., 2019; Leong et al., 2014; Mayer et al., 2009; McEwan et al., 2022; Piccininni et al., 2018; Pritchard et al., 2020; Richardson et al., 2019; Sheldrake et al., 2019; van den Bosch & Bird, 2018; Whitten et al., 2018).

Spending time outside in nature is also a potential conduit for mindfulness (Deringer, 2016, 2017; Lawlor, 2016). Lawlor (2016) stated that "Moment to moment awareness when in nature, focusing attention on sights, sounds, and smells, may encourage inner stillness, contemplation, and gratitude" (p. 70). Deringer (2017) linked mindfulness to place-based education through the lens of outdoor adventure education. They suggested outdoor education should emphasize connection to place through mindfulness instead of only emphasizing experiences. However, these authors provided suggestions for incorporating contemplative practices while outside in nature without offering any specifics on the types of effective practices for students or pedagogies for teachers. This gap invites the following question: Does merely spending time outside in nature support the goals of SEL/CP, or is incorporating a specific contemplative practice necessary?

A few studies have mixed formal contemplative practices, such as walking meditation (Nisbet et al., 2019) and meditating (Unsworth et al., 2016), with time outside. Nisbet et al.'s (2019) results suggest combining walking mindfulness meditation with time outdoors increased mindfulness, attention, and nature-relatedness. Unsworth et al. (2016) reported a statistically significant increase in connection to nature in participants who meditated outside in nature than

those who were just outside in nature. Although Unworth et al.'s study did not investigate participant well-being, the increase in connection to nature is important as connection to nature is a place-based education goal (Gruenewald, 2003; Sobel, 2004, 2013, 2020). These studies suggest that combining SEL/CP and place-based education could create a synergistic effect that enhances both.

However, what is missing is a specific pedagogical technique that could combine SEL/CP and place-based education in a way that teachers could use with their students to increase the well-being of students, their community, and the more-than-human world. Forest bathing could be such a technique. There is abundant research to document its profound effects on human well-being beyond practicing mindfulness alone or solely spending time outside in nature (Hansen et al., 2017; Kuo, 2015). In a later section, I describe forest bathing before proposing how forest bathing could combine SEL/CP and place-based education in a way that is beneficial for students and nature.

Critical Pedagogies

Critical pedagogies are educational approaches and theories that challenge and transform existing power structures, social inequalities, and oppressive systems through education (Gay, 2018; Giroux & McLaren, 1989; Freire, 1994, 2000; Monchinski, 2008). They emphasize critical thinking, social justice, and democratic participation in learning spaces to encourage students to critically analyze and question the dominant ideologies, structures, and practices in societies (Bartolomé, 2004; Gay, 2018; Giroux & McLaren, 1989; Freire, 1994, 2000; Monchinski, 2008; Weil, 1998). Critical pedagogies were developed by Paulo Freire, who describes them as a process of unveiling, where students become conscious of the reality of

oppression, followed by praxis, which is transforming that reality through reflection and action (Freire, 1994, 2000).

Challenging and transforming existing power structures in education is important because the US education system, like US society, has persistent issues related to systematic inequalities (Gay, 2018; Darling-Hammond, 2001; Leonardo & Grubb, 2019; Ray & Mahmoundi, 2022; Sarche & Spicer, 2008). Critical pedagogies provide a framework for addressing social justice issues such as racism, sexism, discrimination, poverty, and privilege (Gay, 2018; Hobbell & Chapman, 2022; Valenzuela, 2016). They do this by promoting critical thinking skills that enable students to analyze, evaluate and question information, the narratives presented to them in school and the media, and the dominant ideologies that permeate US society (DeSaxe, 2015; Lodge, 2021; Skogsbergh, 2020). These ideologies are from the perspective of the dominant class, which, as stated earlier, in the US is White, cis-male, heterosexual, able-bodied, upper-class, and human (Batavia et al., 2021).

Critical pedagogies inform culturally relevant pedagogies, which place a specific emphasis on the cultural backgrounds, experiences, and identities of all students, not just those in the dominant class (Gay, 2018; Ladson-Billings,1994). Culturally relevant pedagogies also seek to make learning meaningful and relevant to students' lives by connecting curriculum to their cultural contexts (Ladson-Billings, 1994, 1995; Brown-Jeffy & Cooper, 2011; Paris, 2017). Both critical and culturally relevant pedagogies share a commitment to equity, justice, and empowerment of all students and recognize the importance of addressing issues of race, ethnicity, language, and culture in the educational setting while also allowing opportunities to challenge Eurocentric and neoliberal perspectives (Connell, 2013; DeSaxe, 2015; Freire, 1994, 2000; Gay, 2018; Brown-Jeffy & Cooper, 2011; Sarche & Spicer, 2008).

Further expanding on these pedagogies is a critical pedagogy of place, first described by David Gruenewald (2003). Gruenewald integrated ecological place-based education and critical pedagogy by emphasizing studying places "as political praxis for social transformation." (Gruenewald, 2003, p. 7). Gruenewald proposed two goals for a critical pedagogy of place. First is reinhabitation, which Gruenewald described as "learning to live well socially and ecologically in places" (p. 9). Second is decolonization, described as "learning to recognize disruption and injury and to address their causes." (p. 9). Reinhabitation and decolonization begin with acknowledging Indigenous claims to land as well as the historical injustice experienced by African, Latinx, Asian, Arab and Native American (ALAANA) communities (Gruenewald, 2003; Greenwood & Smith, 2008; Jorgenson et al., 2022; O'Connor, 2009; Schindel Dimick, 2016; Trinidad, 2012). A critical pedagogy of place focuses on the local context and encourages students to explore and critically engage with their immediate environment (Gruenewald, 2003, 2010; Jorgenson et al., 2022; McInerney et al, 2011; Schindel Dimick, 2016). It links critical pedagogies and place-based education by promoting social and environmental activism while aiming to develop a sense of place identity and ecological consciousness (Greenwood, 2010). In the next section, I describe forest bathing before proposing how forest bathing could combine critical pedagogies, SEL/CP and place-based education in a way that is beneficial for students, society, and nature.

Forest Bathing

Forest bathing, often called forest therapy in North America, refers to the practice of spending time in forested areas to invite healing interactions (Clifford, 2018). This nature-based contemplative practice evolved from the Japanese practice of shinrin-yoku, which, according to Li (2010), is a "short, leisurely visit to a forest; it is regarded as being similar to natural

aromatherapy" (p. 1). North American forest bathing is a structured walk that invites participants to become embodied and "experience a deeper sense of relationship with the world" (Page, 2019, p. 28).

A forest bathing walk is a 1.5–3 hour ritualized walk with three stages. These stages are called *connection*, *liminal space/time*, and *incorporation*, each designed to create opportunities for embodiment, sensuality, and relationship (Clifford, 2018; Page, 2019). The connection stage uses sensory connection to shift participants' awareness from a thinking experience to their senses, the present moment, and the present place. This stage is composed of two parts. The first part is where the guide invites participants to focus on each sense and notice what they are experiencing. The second part of connection, called *what's in motion*, invites participants to slow down and notice what is moving in the forest (Page, 2019, 2021).

Once participants connect with the present moment, they enter the second stage, called *liminal space/time*. Here, a guide offers participants several partnership invitations that emerge from a guide's partnership with the land and the beings that live there (Clifford, 2018; Page, 2019, 2021). Partnership invitations can be thoughtful, creative, playful, or introspective, are open-ended, and allow participants to interpret their experiences in their own way. After each invitation, the participants circle up, and everyone has a chance to respond to the prompt, "What are you noticing?" Participants share with the whole circle while the rest of the group listens or partakes in a pair-share. Everyone has a turn to share their stories and have their stories witnessed by others multiple times in a walk, which is also an opportunity to establish or maintain relationships with other participants, as well as the non-human beings in the environment. The last partnership invitation is always a sit spot, where participants find a place alone to meditate quietly. Meditation has been shown to help practitioners which manage

emotions (Brensilver, 2016; Brensilver et al., 2020; Brewer et al., 2011; Greenberg & Harris, 2012; Sauer-Zavala et al., 2013).

The third part of a forest bathing walk, *incorporation*, leads participants out of liminality and back to their thinking minds. Incorporation is marked by a ritual-like tea ceremony prepared by the guide. Here, the group gathers one last time to share tea and stories and express gratitude in a tea ceremony, which is another opportunity to cultivate and nurture relationships with other participants and the-more-than-human-world. Completing the tea ceremony marks the departure from liminal space and reentry into regular life.

In forest bathing, participants spend time in natural areas to enhance their health, wellness, and happiness (Page, 2019). The practice of forest bathing also involves reciprocity that, in addition to healing people, includes healing for the more-than-human world (Clifford, 2018). This can be the forest, a river, a desert, or whatever environment a practitioner is visiting (Page, 2019, p. 10–11).

Forest bathing has many research-backed benefits for its practitioners. Most studies of forest bathing's impacts on human physiology have been completed in Japan and South Korea, where shinrin-yoku is considered a part of preventive medicine (Hansen et al., 2017). Much of the research on the physiological effects of forest bathing has focused on improvements in cardiovascular indicators (Hansen et al., 2017; Lee et al., 2014; Li et al. 2011) and lowered salivary cortisol, indicating reduced stress levels (Hansen et al., 2017; Kuo, 2015; Li et al., 2011; Sung et al., 2012). Decreased stress has positive health outcomes, including improved sleep, immune function, and reduced inflammation (Hansen et al., 2017; Kuo, 2015). The third avenue of research has been how forest bathing impacts the human immune response, documenting increased levels of anticancer immune cells (Hansen et al., 2017; Li et al., 2011). This happens

because forest bathing allows participants to breathe in volatile organic compounds emitted by trees, which trigger this human immune response (Li et al., 2011; Shanahan et al., 2019). Kuo (2015) proposed the human immune system as the central pathway leading to the myriad health benefits of spending time outside in nature and doing activities like forest bathing.

In addition to the innate restorative potential of time outside in nature, the enhanced efficacy of forest bathing is likely, at least partly, related to a participant's intent before forest bathing—for example, to relax, receive healing, and connect. This is because the person's intent significantly affects the outcome of nature visits (Pasanen et al., 2018). Forest bathing practitioners engage in forest bathing with the intent of supporting their wellness and health.

In addition to physiological well-being, forest bathing and other activities where participants spend time outside in nature support human psychological well-being. Although there is a link between physical and mental health (Osborn, 2001), the psychological benefits of forest bathing, such as decreased stress, would be most important in advocating for the inclusion of forest bathing as part of an SEL program.

Although research studies agree on the statistically significant positive effects of forest bathing on human well-being, the data mainly come from research involving young adult males in Asia (Lee et al., 2012, 2014; Li, 2010, 2018; Li et al., 2011). However, there are a few studies with more balanced gender ratios and broader age ranges, and these studies also show similar patterns (Hansen et al., 2017; Hohashi & Kobayashi, 2013). Likewise, recent studies have shown that forest bathing also increases adolescent mental well-being and connection to nature (Keller et al., 2023; McEwan et al., 2022), another reason for it to be included in place-based education and SEL.

Critical Contemplative Place-based Education: A New Proposed Framework

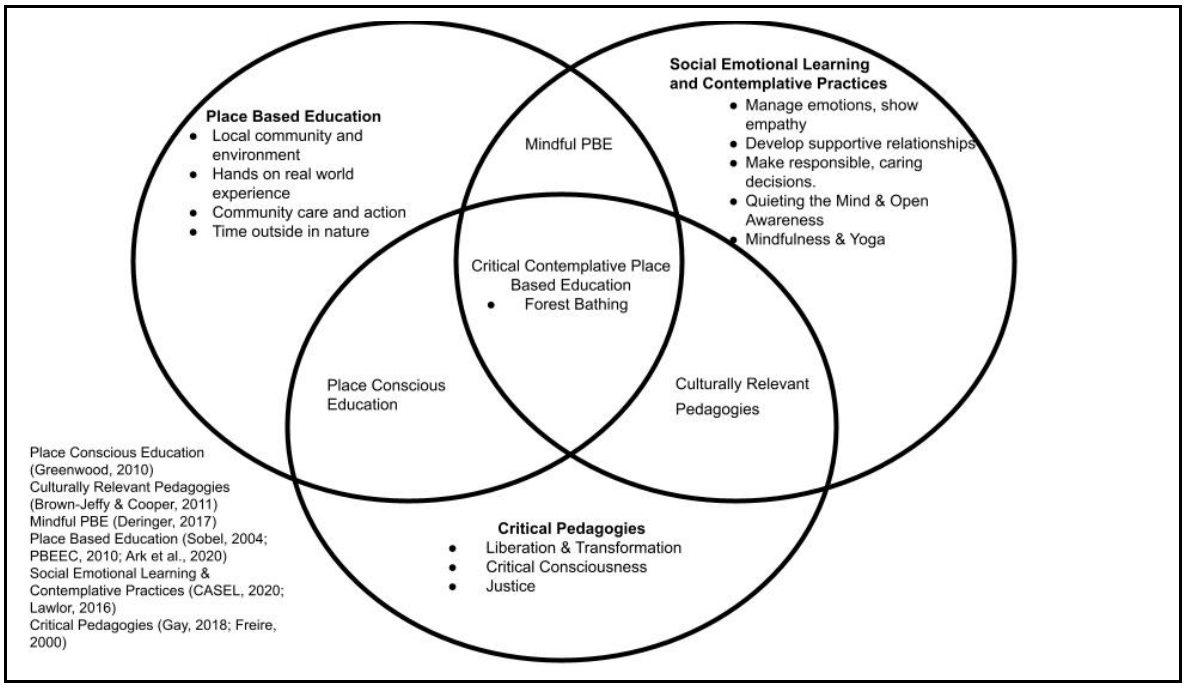
When combined, place-based education and SEL are synergistic pedagogies that will enhance each other. Because students and our world need both place-based education and SEL, I propose combining them into a Critical Contemplative Place Based Education (CCPBE). A CCPBE would foster healing the environment and people. Therefore, it must first incorporate aspects of both place-based education and SEL/CP; namely, it must be grounded in place and increase student well-being. In addition to place-based and SEL pedagogies, CCPBE must also include critical components. Critical components include opposing the harmful Western narrative of a dualistic human-nature relationship (Anderson, 2017; Bowers, 2008; Fletcher, 2017; Greenwood, 2010; Griffin, 2017; Gruenewald, 2003; Gruenewald & Smith, 2007; Kayira et al., 2022; McInerney et al., 2011), as well as the detrimental power dynamics in schools and many U.S. communities (Jimenez-Castellanos et al., 2010; Forbes, 2012; Jorgenson et al., 2022; Scott et al., 2015, Torres, 2019). For the relationship between humans and nature to be reframed in a nondualistic way, CCPBE would also need to be contemplative. Therefore, non-Western relationships and place-based narratives (Cajete, 1999; Hanh, 1995; McCoy et al., 2017; Nguyen & Hanh, 2019; Oskineegish 2014; Pierotti & Wildcat, 2000; Tuck et al., 2014) must also be included in CCPBE. In this way, CCPBE could be culturally relevant and support the reinhabitation of a place for all a community's members, including the nonhuman beings. In this section, I outline these additional liberatory components of CCPBE and explain how forest bathing could satisfy CCPBE's requirements.

What types of pedagogical techniques could support a CCPBE? Pedagogies to support CCPBE must include these three components described above, and many current place-based education and SEL/CP programs do incorporate some of these components. However, none I

have found seem to address all three. I propose forest bathing as a practice that could be incorporated into classrooms or other settings that will satisfy the requirements of a CCPBE (see Figure 2.1).

Figure 2.1

Proposed Framework: CCPBE



Increasing student well-being is a goal of SEL/CP (Bailey et al., 2019; CASEL, 2020; Greenberg et al., 2003; Jones et al., 2021; Jones & Doolittle, 2017; Niemi, 2020; Starr, 2019; Yoder et al., 2020a, 2020b) and thus a goal of CCPBE. As described in Clifford (2018) and Page (2019, 2021), the standard sequence of North American forest bathing incorporates several elements that promote outcomes aligned with SEL/CP. These elements include extended time outside in nature, mindfulness practices such as a body scan and mindfulness meditation, sharing stories and connecting with nature and people in a nonjudgmental environment, as well as a rite-of-passage-like structure to the sequence.

Forest bathing also has extensive research, described previously, to demonstrate its efficacy in increasing human physiological well-being. In addition to physiological well-being, forest bathing and other activities where participants spend time outside in nature support human psychological well-being. The psychological benefits of forest bathing, such as decreased stress (Hansen et al., 2017; Kuo, 2015), would be most important in advocating for the inclusion of forest bathing in an SEL program.

Providing skills to students to alleviate anxiety and depression is one of the goals of the America Cares Act (2021), which provides funding for school SEL/CP programs. As mentioned in the introduction, rates of anxiety and depression in adolescents are at an all-time high. Bratman et al. (2019) outlined extensive research in their literature review that shows experiences outside in nature can alleviate the symptoms of anxiety and depression. The studies cited and tabulated in Hansen et al. (2017) and Capaldi et al. (2015) show a statistically significant reduction in depression and anxiety symptoms in adult participants after time outside in nature, particularly after forest bathing, which was the focus of Hansen et al.'s review. However, more recent research shows that forest bathing has similar effects when practiced by adolescents (Keller et al., 2023; McEwan et al., 2022).

In addition to alleviating student anxiety and depression, schools are concerned about students' abilities to focus and achieve academically. Over the past 2 decades, there has been much research into nature as a treatment for attention-deficit/hyperactivity disorder (e.g., Faber Taylor & Kuo, 2009; Kuo & Faber Taylor, 2004; Markevych et al., 2014; van den Berg & van den Berg, 2011), literature reviews of this research (e.g., Gill, 2014; Tillman et al., 2018), and books on this topic (e.g., Louv, 2008). Nature provides variability in stimuli and opportunities for child autonomy that are essential for healthy development (Besthorn, 2005; Chawla, 2022;

Nussbaum, 2011; Ryan & Deci, 2017). These factors are often absent in the built environments and institutions where children spend most of their time. The absence of both of these elements may prevent appropriate development in many children, which could manifest as attention-deficit/hyperactivity disorder symptoms (Besthorn, 2005).

Forest bathing also has liberatory aspects. For example, the part of forest bathing called *partnership invitations* explicitly establishes forest bathing in a critical framework, relating to the more-than-human world, as a partner with an agency of its own, not as an other. This is similar to many Indigenous (Cajete, 1999; McCoy et al., 2017; Pierotti & Wildcat, 2000; Tuck et al., 2014; Vea, 2020; Wooltorton et al., 2020) or Buddhist (Hanh, 1995; Nguyen & Hanh, 2019) worldviews. Forest bathing invites participants to relate to the nonhuman beings in the forest as equals. This perspective contrasts with the Western, scientific, capitalistic, and exploitive ways of relating to nature or a place; for example, framing nature as an agglomeration of ecosystem services, resources to extract, or phenomena to explore. Forest bathing explicitly seeks to partner with the beings in the more-than-human world for mutual healing and transformation (Clifford, 2018; Li, 2018; Page, 2019, 2021). In this way, forest bathing is grounded in ideas of mutual liberation proposed by Paulo Freire (2000, 2014) and embodies the reframing of human-nature relationships toward "regenerative relationships between humans and nature" (Welden et al., 2021, p. 966).

Forest bathing is also considered a contemplative practice and thus could be a part of the SEL/CP part of CCPCE. Page (2021) explicitly called forest bathing a “contemplative practice” (p. 34), as they explained that one of the meanings of forest bathing is "bathing in the present moment" (p. 35). Page (2021) also contrasted an intellectual nature experience—such as a nature walk—with the sensual forest bathing experience. In forest bathing practice, a sensual experience

is facilitated by the *threshold of connection*, the first part of a forest bathing walk which encourages embodiment and present-moment awareness (Clifford, 2018; Page, 2019, 2021), both essential components of contemplative practices (Coburn et al., 2011; Fisher, 2017), and thus CCPBE. As mentioned previously, forest bathing invites participants to become embodied and "experience a deeper sense of relationship with the world" (Page, 2019, p. 28). Forest bathing could be a nature-based contemplative pedagogical technique that facilitates opportunities for students to explore their internal experience of place in a way that is embodied, sensual, relational, and less intellectual. Classroom teachers and place-based educators could be trained in forest bathing techniques to create these experiences for their students.

Adolescents are suffering psychologically, and our planet is suffering from human exploitation. Our schools and teachers need pedagogical techniques at their disposal that can address the challenges of both. Forest bathing is one such technique that could bridge place-based education and SEL to increase students' mental well-being and connection to nature. Incorporating forest bathing into educational and other settings could be a way to alleviate both adolescent and planetary suffering, cultivate crucial connections to nature, and foster the generation of constructive hope that is needed in so many young people.

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Chapter 3 Forest Bathing Improves Adolescent Mental Well-being

Abstract

Previous research has demonstrated that practicing forest bathing has significant positive effects on adult psychological well-being. Considering the ongoing adolescent mental health crisis of increasing anxiety and depression, determining if forest bathing has similar effects on adolescents is an important expansion of forest bathing research. This study investigated the possibility that forest bathing could improve adolescent mental well-being and sought to determine participants' experiences of forest bathing. It used a convergent parallel mixed methods design that was partially cocreated with 24 participants aged 16–18 as part of a youth participatory action research (YPAR) project where participants practiced forest bathing three times over three weeks. As measured by the Warwick Edinburgh Mental Well-Being Survey, mean participant mental well-being increased significantly after forest bathing, with moderate to large effect sizes. Participants described reduced stress and increased feelings of relaxation, peace, and happiness. These findings correlate with previous forest bathing research with adult participants. It is recommended that educators and others who work with adolescents consider forest bathing as a simple, low-cost way to improve adolescent mental well-being.

Introduction

"I firmly believe that nature brings solace in all troubles." – Anne Frank

Forest Bathing and Well-being

Anne Frank's words remind us that spending time in nature has long been a source of rejuvenation and healing. Empirical evidence supports this observation, and many studies show a link between spending time in green spaces, such as forests, nature preserves, and parks, or blue spaces, such as outdoor water environments, and improved mental and physical well-being (Adams & Beauchamp, 2020; Kuo, 2015; White et al., 2019; Beyer et al., 2014; Faber Taylor, & Kuo, 2011; Chawla, 2014; Britton et al., 2020). More recently, research has also supported the benefits of practicing forest bathing, a nature-based mindfulness practice (Hansen et al., 2017). Forest bathing, often called nature and forest therapy in North America, involves spending time in forested areas to invite healing interactions (Clifford, 2018). Forest bathing evolved from the Japanese practice of shinrin-yoku and is described as making contact with and taking in the atmosphere of the forest (Park et al., 2010).

Practicing forest bathing has many research-backed benefits for its practitioners. Most studies of the impacts of practicing forest bathing on human physiology have been completed in Japan and South Korea, where shinrin-yoku is considered a part of preventive medicine (Hansen et al., 2017). Much of the research on the physiological effects of forest bathing has focused on improved cardiovascular indicators and stress hormones. Multiple studies have shown that forest bathing lowers blood pressure (Bikomeye et al., 2022; Dogaru, 2020; Hansen et al., 2017; Lee et al., 2012; Li et al., 2011). Forest bathing also lowers salivary cortisol, indicating reduced stress levels (Hansen et al., 2017; Kuo, 2015; Li et al., 2011; Sung et al., 2012). Decreased stress has

positive health outcomes, including improved sleep, immune function, and reduced inflammation (Hansen et al., 2017; Kuo, 2015).

Another avenue of research has explored how forest bathing impacts the human immune response. Multiple studies have linked forest bathing to increased levels of anticancer immune cells, sometimes called "Natural Killer" or NK cells (Hansen et al., 2017; Li et al., 2011). Forest bathing allows participants to breathe in phytoncides, a type of volatile organic compound emitted by trees, which trigger this human immune response (Li et al., 2011; Shanahan et al., 2019). Kuo (2015) proposed the human immune system as the central pathway that leads to the myriad observed health benefits of spending time in nature and doing activities like forest bathing.

Perhaps this strong link between human well-being, and the presence of the central pathway described by Kuo (2015), is because when humans spend time in nature, we are returning to a part of ourselves that is more difficult to access in the modern built world. Some propose that this link is because humans have an innate and adaptive tendency to respond positively to natural environments, as suggested by the Biophilia hypothesis (Kellert & Wilson, 2013; Wilson, 1984). According to the Biophilia hypothesis, this tendency is because nature is the environment in which humans evolved (Kellert & Wilson, 2013; Scopelliti et al., 2018; Wilson, 1984). Although frequently cited as the root of the connection between time in nature and human well-being, Wilson's hypothesis is critiqued for being grounded in genetic determinism and leaving out the influences of learning, culture, and individual experiences (Djernis et al., 2019; Joye & De Block, 2011; Kahn, 1999), or the presence of biophobia (Zhang et al., 2014; Orr, 2004,1993; Kahn, 1999).

Building off the Biophilia Hypothesis are the Attention Restoration Theory (Kaplan & Kaplan, 1995) and Stress Reduction Theory (Ulrich, 1983). Attention Restoration Theory, which states that natural environments improve mental well-being because they restore people's ability to pay attention (Kaplan & Kaplan, 1995), is frequently cited as a framework for the efficacy of nature-based practices like forest bathing (Berto, 2014; Bowler et al., 2010; Djernis et al., 2019; Frumkin et al., 2017; Kuo, 2015; Page, 2019; Payne & Delphinus, 2018). Stress Recovery Theory, also cited as a reason for the health benefits of time in nature (Page, 2019, 2021a; Whitburn et al., 2018), predicts that if individuals are stressed, time in a natural environment will reduce stress (Ulrich, 1983; Ulrich et al., 1991). However, many of the literature reviews summarizing the studies supporting Attention Restoration Theory or Stress Recovery Theory provide additional evidence that these theories are likely incomplete explanations of the mechanism for how nature promotes human well-being (Djernis et al, 2019; Ohly et al., 2016; Kuo, 2015; Berto, 2014).

Another explanation for nature's health benefits is that feelings of awe or mystery may mediate positive health outcomes (Djernis et al., 2019; Anderson et al., 2018; Beyer et al., 2014). Much of the research related to nature, awe and well-being is related to improving the well-being of people suffering from posttraumatic stress disorder (PTSD). For example, research by Anderson et al. (2018), Poulsen et al. (2016). and Westlund (2015) point to time spent in the outdoors, and in nature in particular, as a potential treatment for PTSD. Participants in these studies, who were adults, reported improved PTSD symptoms after forest bathing (Poulsen et al., 2016) or general nature experiences (Anderson et al., 2018; Westlund, 2015).

In addition to the innate restorative potential of time in nature, the enhanced efficacy of forest bathing is likely, at least partly, related to a participant's intent before forest bathing (for

example, to relax, receive healing, and connect). This is because the person's intent significantly affects the outcome of nature visits (Pasanen et al., 2018). Forest bathing practitioners engage in forest bathing with the intent to support their wellness and health.

Although research studies agree on the statistically significant positive effects of forest bathing on human well-being, the data mainly come from research involving young adult males in Asia (Hansen et al., 2017; Lee et al., 2012, 2014; Li, 2010). The few studies with more than one gender and more broad age ranges show similar patterns (Hohashi & Kobayashi, 2013; Tsao et al., 2022; Zhou et al., 2019). However, there have been very few studies on adolescents practicing forest bathing. Understanding the potential of forest bathing to positively impact adolescent mental well-being is important because if the health benefits of forest bathing for adolescents are similar to those for adults, then forest bathing is a technique that could be used in schools or other settings to support adolescent mental well-being. Therefore, I explored this gap in the research on the effectiveness of forest bathing for improving mental well-being in adolescents in the United States.

Adolescent Mental Well-being

Supporting adolescent well-being is necessary because, although adolescence has long been characterized as a time of stressful personal development (Romeo, 2013), the rates of anxiety and depression in teenagers have increased in the United States by 59% between 2007 and 2017 (Geiger & Davis, 2019; McCarthy, 2019), while the rates of hospital admissions for suicidal teens in the United States also increased 50% during the same time period (Denizet-Lewis, 2017; Geiger & Davis, 2019). These increases are linked to academic and social pressures (Geiger & Davis, 2019), increased social media and technology, and decreased interpersonal

interactions (Shensa et al., 2018). More recently, teenage life during the COVID pandemic was even more stressful than usual (Catty, 2021; Czeisler et al., 2020; Singh et al., 2020; Styck et al., 2021).

There are many suggestions for reducing adolescent stress and anxiety to improve adolescent mental well-being. These suggestions include an increased emphasis on social-emotional learning (SEL) in schools (Katzman & Stanton, 2020; Singh et al., 2020; Tan et al., 2021). As the U.S. federal government increased SEL funding in 2020 (in the COVID-relief CARES Act), many schools are adopting or expanding SEL programs to help their students. Many SEL programs also incorporate contemplative practices like mindfulness and yoga in their efforts to support students (Brensilver et al., 2017). However, few, if any, SEL programs incorporate increasing student time in nature to increase mental well-being. This is despite the well-documented benefits of time in nature for increasing human well-being (White et al., 2019).

Although Nisbet et al. (2019) conducted a study with young adults to attempt to determine if practicing walking meditation while spending time in nature had more positive effects than either alone, they did not find a significant difference between the three groups. However, the results suggested that combining mindful walking with outdoor time increases mindfulness and attention. Djernis et al.'s (2019) review included similar studies that explored practicing mindfulness in nature or alongside nature-based therapeutic interventions. I was curious to see if a nature-based mindfulness practice, such as forest bathing, had more impact on well-being than practicing a non-nature-based meditation, such as mindfulness or walking meditation, in nature, as investigated by Nisbet et al. (2019) and others included in Djernis et al.'s (2019) review. In this study, I examined the potential for practicing forest bathing to

increase adolescent mental well-being, traditionally supported through SEL programs and contemplative practices.

The Practice of Forest Bathing

Forest bathing, often called forest therapy in North America, refers to the practice of spending time in forested areas to invite healing interactions (Clifford, 2018). This nature-based contemplative practice evolved from the Japanese practice of shinrin-yoku. The Japanese Ministry of Agriculture, Forestry, and Fisheries coined the term shinrin-yoku in 1982. It is described as making contact with and taking in the atmosphere of the forest (Park et al., 2010), similar to natural aromatherapy (Li, 2010). North American forest bathing is a structured walk that invites participants to become embodied and "experience a deeper sense of relationship with the world" (Page, 2019, p. 28).

A North American forest bathing walk is a 1.5–3-hour ritualized walk composed of three stages: connection, liminal space/time, and incorporation. Each stage is designed to create opportunities for embodiment, sensuality, and relationship (Clifford, 2018; Page, 2019). In his book, *Your Guide to Forest Bathing*, Amos Clifford (2018) first described the standard sequence of North American forest bathing. Ben Page took the work of Amos Clifford and wrote the *Training Manual for Nature and Forest Therapy Guides* (2019). The standard sequence of North American forest bathing has many components that support practitioners in having a healing connection with whatever natural environment they choose.

The connection stage uses sensory connection to shift participants' awareness from the everyday thinking experience to their senses, the present moment, and the present place. The connection stage is composed of two parts. The first part, called pleasures of presence, is where the guide invites participants to focus on each sense and notice what they are experiencing. The

second part of connection, called what's in motion, invites participants to slow down and notice what is moving in the forest (Page, 2019, 2021a).

Once participants connect with the present moment, they enter the second stage, called liminal space/time. To facilitate this shift into liminal space and time, a guide offers participants several “partnership invitations” that can be thoughtful, creative, playful, or introspective. They are called partnership invitations because they emerge from a guide's partnership with the land and beings that live there (Clifford, 2018; Page 2019, 2021a). These invitations are open-ended and allow participants to interpret their experiences in their own way. After each invitation, the participants circle up and everyone has a chance to respond to the prompt, "what are you noticing?" Participants share with the whole circle while the rest of the group listens or in a pair-share. Everyone has a turn to share their stories and have their stories witnessed by others multiple times in a walk. The last partnership invitation is always a sit spot, where participants find a place to meditate alone quietly.

The third part of a forest bathing walk, incorporation, leads participants out of liminality and back to their thinking minds. Incorporation is marked by a tea ceremony prepared by the guide. Here, the group gathers one last time to share tea, food, and stories and express gratitude. Completing the tea ceremony marks the departure from liminal space and time and reentry into regular life.

In forest bathing, participants spend time in natural areas to enhance well-being, health, and happiness (Page, 2019). Forest bathing involves immersion in nature with all a person’s senses, creating a mindful connection with the environment (Clifford, 2018) to receive the calming and rejuvenating energies of the natural world, which could be the forest, river, desert, ocean, or whatever environment a practitioner is visiting (Page, 2019, 2021a). This practice

fosters a reciprocal relationship with nature, where individuals not only benefit from the healing qualities of nature but also develop a deeper understanding of and respect for the natural world (Clifford, 2018; Page, 2019). This happens when individuals acknowledge that they are a part of the larger ecosystem and recognize their responsibility to care for and protect it (Page, 2019, 2021a). In other words, forest bathing helps foster a harmonious relationship where individuals receive healing and inspiration from nature while also recognizing their role in nurturing and preserving the natural world.

Current Study

The purpose of this study was to determine the impact of practicing forest bathing, as described above, on adolescent mental well-being. Additionally, I wanted to explore adolescent experiences of forest bathing, as most of the forest bathing research studied quantitative measures of mental and physical well-being. The participants in this study, who were high school students in my Advanced Placement (AP) Environmental Science class, partially cocreated the convergent parallel mixed-methods study as part of a Youth Participatory Action Research (YPAR) project on improving mental well-being to answer the following research questions:

1. Does practicing forest bathing impact adolescent mental well-being?
2. What are adolescents' experiences of practicing forest bathing?

During this study, I measured mental well-being before and again after practicing forest bathing one and three times with the Warwick-Edinburgh Mental Well Being Scale (WEMWBS). I also documented participants' lived experiences through journaling, responses to open ended prompts added to the WEMWBS, and photovoice after forest bathing.

Methods

Participants and Site

Participants

This research took place Spring, 2022 at Southampton High School, located on the ancestral lands of the Shinnecock Nation, in what is now Southampton, New York, USA. Southampton High School is the high school for a small suburban school district where over 50% of students are eligible for free or reduced lunch because of low family income (US Dept. of Education, 2018). Participants were twenty-four 11th and 12th-grade students in my Advanced Placement (AP) Environmental Science classes. Each year after the AP exam in May, students complete a student- or class-chosen action research project to conclude their year of study. In the spring of 2022, students completed an in-class YPAR project on student mental well-being, particularly how spending time in nature might alleviate student stress and anxiety. We chose to focus on mental well-being as Spring 2022 was the second year of the COVID pandemic, and students reported increased stress and anxiety levels. Students were intrigued by a 2021 pilot study previous AP Environmental Science students completed and wanted to continue the work.

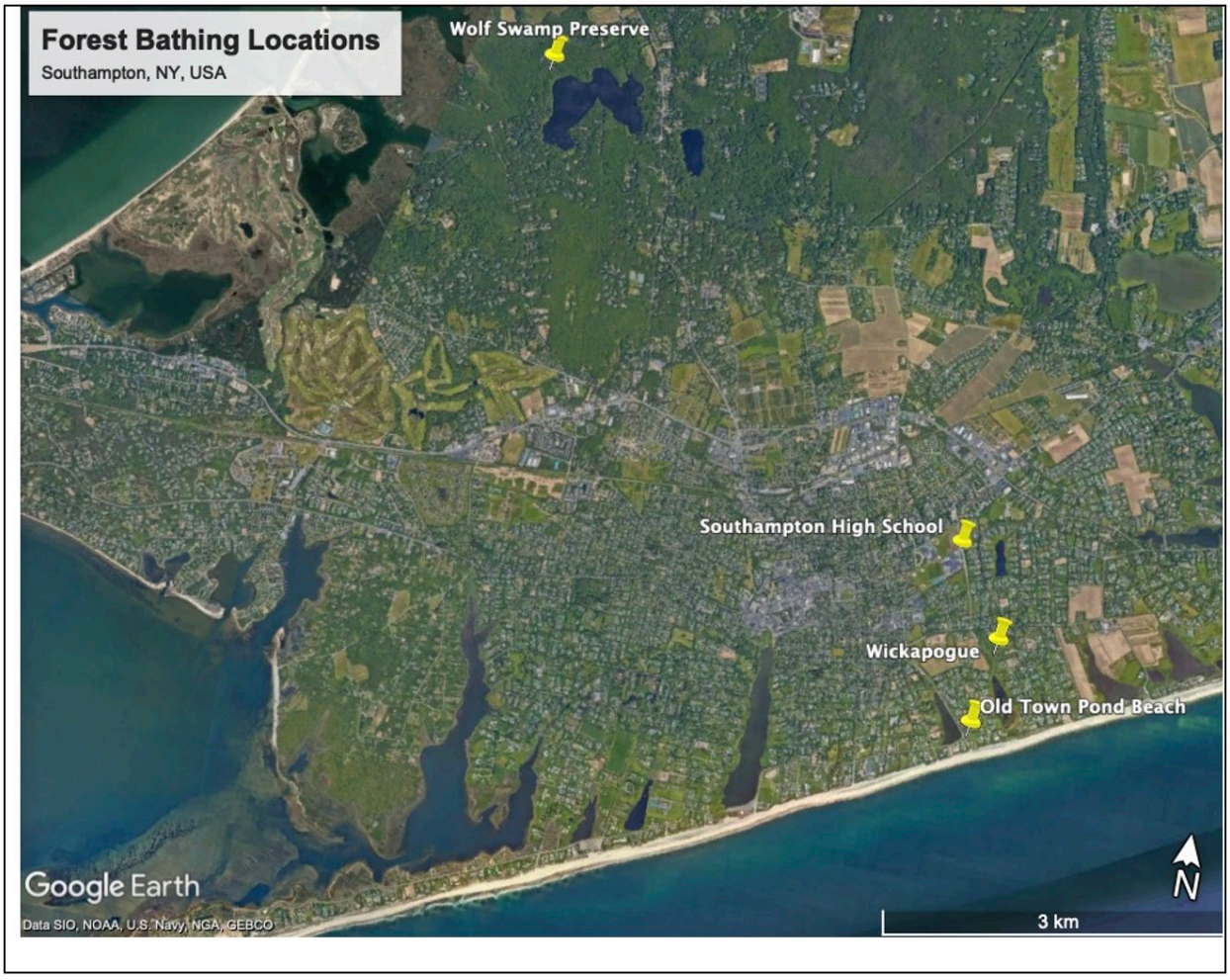
All 24 participants completed the first two weeks of the forest bathing series and forest bathed twice. Sixteen participants completed all three weeks of the series and practiced forest bathing a total of three times. This research underwent Institutional Review Board review and was approved by Antioch University, New England's Institutional Review Board committee and Southampton High School administration. Participants or their parents/guardians could choose to have their data excluded from this study with no academic or other penalties.

Sites

This study took place in our classroom and three nearby nature preserves (see Figure 3.1). One nature preserve is in an area called Wickapogue, which in Algonquian means “end of the water” or “end of the land” (Tooker, 1911). In 1986, Wickapogue was renamed the Richard Fowler Nature Preserve by Southampton Village (Bottini, 2003) to honor Richard Fowler, a former Southampton Village trustee. I chose this site because it is very close to Southampton High School and would maximize forest bathing time. This location also provided a mix of closed and open canopy forest and a small pond shoreline, which meant a variety of spaces for partnership invitations.

Figure 3.1

Forest Bathing Locations in Southampton, NY



Source: Google, 2022

Another nature preserve in which we practiced forest bathing is the Wolf Swamp Preserve near a lake now called Big Fresh Pond. This lake is called Missapogue in Algonquian, which means “large lake” or “large water” (Citizens Statewide Lake Assessment Program, 2018; Tooker, 1911). I could not determine when the lake’s name officially changed. The New York State Department of Environmental Conservation and a local homeowner’s association still use Missapogue to refer to the lake (Citizens Statewide Lake Assessment Program, 2018; New York

State Federation of Lake Associations, 2011, 2018). The Wolf Swamp preserve is on the northwest side of Big Fresh Pond. Elizabeth Morton Tilton donated this 20-acre preserve to the Nature Conservancy in 1957 (Bottini, 2003). Despite its name, there are no wolves in Wolf Swamp Preserve, as wolves were hunted to extinction on Long Island due to a bounty system established by settlers in the 1600s and 1700s (Elswick, 2005; McCully, 2018). Like the Richard Fowler Preserve, this site also provides a mix of closed and open canopy forest as well as the lake's shoreline. There were loud home construction noises at Richard Fowler on our first visit. Hence, participants and I decided our second time practicing forest bathing should be in an area away from development. We chose Wolf Swamp Preserve as it is more isolated than the Richard Fowler Preserve, yet close enough to Southampton High School that we would have enough time for forest bathing.

The third location is part of Southampton Village's Old Town Pond Park and Beach. The area is called Old Town because it was the location of the first English settlement in Southampton. It is an ocean beach with a grassy and shrubby open foredune environment. Although our original intent was to return to the forest in the Wolf Swamp Preserve, several participants found ticks on themselves after forest bathing in Wolf Swamp Preserve. I decided that choosing a location with a low probability of tick activity was essential to have one last time practicing forest bathing before school ended for the summer. This was to minimize the potential for tick-borne diseases and decrease potential participant drop-out because of the fear of ticks.

Mixed Methods

I used Creswell and Plano Clark's (2018) mixed methods participatory social justice design to investigate my research question: How does practicing forest bathing impact adolescent mental well-being? This design adds mixed-methods research to a participatory or social justice

perspective to involve participants in the research and foster changes in individuals, institutions, or communities (Creswell & Plano Clark, 2018). Mixed methods participatory social justice, sometimes called transformative mixed methods (Mertens, 2003, 2010; Ponterotto et al., 2010; Tashakkori & Teddie, 2010), is useful for identifying and describing issues and including the voice of participants while also generating evidence that is useful and persuasive to individuals and stakeholders (Creswell & Creswell, 2018; Creswell & Plano Clark, 2018). The collaborative intent of participatory research provided a framework for conducting aspects of mixed-methods research in my classroom. In the case of this study, I embedded a convergent parallel mixed-methods design into a YPAR methodological framework. YPAR is a democratic approach to research in which participants work collaboratively with a researcher in the collaborative creation of new knowledge to address a specific issue or problem (Jacobs, 2016). YPAR provides a space for young people to be researchers into their own experiences (Radina & Schwartz, 2019). In addition, using YPAR allowed me to gain more authentic and nuanced insight into my research questions than if I were conducting the research in a more hierarchical and traditional approach. The YPAR project was designed and conducted with my students to investigate their experiences of practicing forest bathing and if forest bathing impacted their mental well-being.

I chose a convergent parallel design because the design allowed me and my participants to obtain "different but complementary data on the same topic" (Morse, 1991, p. 122), in this case, the impact of forest bathing on adolescent well-being. In a convergent design, the qualitative and quantitative data collection and analysis are considered separate (Creswell & Creswell, 2018). This is based on the assumption that qualitative and quantitative data provide

different types of information. The qualitative data provided depth of participants' experiences and the quantitative data provided breadth.

Quantitative Methods and Instruments

I used the WEMWBS to determine participant well-being. This tool is composed only of positively worded items relating to different aspects of mental health (Tennant et al., 2007). It was developed, in part, to support the evaluation of mental well-being programs (Stewart-Brown et al, 2009). The WEMWBS is responsive in relatively small samples (Maheswaran et al., 2012), which was necessary for this study with 24 participants.

The WEMWBS has been extensively validated to be responsive in those ages 13 and older in multiple cultures (Clarke et al., 2011; Stewart-Brown et al., 2011; Taggart et al., 2013; Waqas et al., 2015) and translated into 28 languages (Taggart et al., 2013; Waqas et al., 2015). It was important to connect this study with other research, whether it be other forest bathing research that used the WEMWBS (Jeon et al., 2021) or other research on interventions to improve adolescent mental well-being.

The WEMWBS is quick and easy to complete, with only 14 items scored on a 1–5 Likert scale. This was essential, as our time for forest bathing and post evaluation was limited to 90 minutes by the school's schedule. The WEMWBS has been shown to provide a credible picture of mental well-being and is sensitive to changes that can occur in mental well-being in populations, small groups, or individuals (Maheswaran et al., 2012; Waqas et al. 2015) and is considered suitable for measuring change due to interventions or programs (Putz et al., 2012; Taggart et al., 2013).

The WEMWBS Is scored by summing the response to each item. The minimum score is 14, indicating lower levels of mental well-being, and the maximum is 70, indicating higher levels

of mental well-being. The range in change in WEBMWBS scores considered meaningful varies from 3 to 8 (Maheswaran et al., 2012; Putz et al., 2012). However, Maheswaran et al.'s (2012) review found that a score change of 3 or more in an individual's WEMWBS score could be interpreted as important. The WEMWBS has also been shown to be helpful as a screening tool for depression, with cutoff total well-being scores of <42 indicating probable clinical depression and total well-being scores of 41–45 indicating possible or mild depression (Maheswaran et al., 2012; Stewart-Brown et al., 2009; Taggart et al., 2013).

Qualitative Methods

Participants determined the qualitative methods during their in-class YPAR project. These methods included open-ended survey responses, journal entries, and photovoice. Open-ended survey responses and journaling helped participants document and reflect on their work as researchers and their experiences with forest bathing. In addition, during the research design we discussed participant response and researcher bias. Although an important discussion for any research project, this discussion was particularly relevant in this study as the participants were my students and they knew I would be using the data in my PhD dissertation. I told students that I would write my dissertation and earn my PhD no matter what the data showed or how they responded to survey or written responses, and that they should be truthful and authentic in their responses so any trends or patterns in the data would be real. In addition to discussing participant bias, every time data were generated, I reminded participants that the data would be deidentified, pseudonyms used, and that they should respond truthfully about their experiences.

Participants wanted to add a place for free-response writing at the end of the WEMWBS to gather information the survey might miss about participants' experiences. Participants also wanted to provide a more extended journaling opportunity. Journaling is a reflective practice

where practitioners can describe and reflect on their feelings and lived experience of an event or occurrence (Blake, 2005; Kolb, 2015). Journaling is often used in an experiential learning cycle (Hubbs & Brand, 2005; Kolb, 2015) and in action research (Stringer & Ortiz-Aragon, 2021). We also chose journaling as it is a time-efficient and effective method of gathering participants' personal experiences (Arndt & Rose, 2022; Hyers, 2018; Sullivan et al., 2012). Although journaling can be free form, we created prompts for the open-ended survey question and journal entries to help guide participants' reflections on their experiences of practicing forest bathing.

Participants collaboratively created the open-ended survey response and journal prompts with each other and me. At the end of the pre-forest bathing survey, participants responded to the prompt, "Describe what you imagine your forest bathing experience will be like." At the end of the post-forest bathing surveys, participants responded to the prompt, "Describe what your forest bathing experience was like, including any impacts on your well-being or connection to nature you may have experienced." The prompts for after-forest bathing journaling were "Describe your experience of forest bathing and compare your experience to what you thought the experience would be like."

The last type of qualitative data participants generated was photovoice. Photovoice is a qualitative method where participants use photographs to document their experiences (Coghlan & Brydon-Miller, 2014; Sutton-Brown, 2014; Wang & Burris, 1997). Participants can use their photos to identify, highlight, and represent issues of importance to them. They can write about or discuss their photographs, which can be shared with others if desired. Photovoice enables researchers to understand the issue under study (Barraza, 2020; Breny & McMorrow, 2021; Nykiforuk et al., 2011). Participants used their phones to take photos in Wolf Swamp Preserve, after the second time practicing forest bathing. Their prompt was "What would you want to share

about your forest bathing experience?" Participants took photos of themselves, each other and the nature preserve. They were also invited to complete another photovoice after practicing forest bathing for the third and last time at Old Town Park Beach. Back in the classroom, participants selected one photo that best showed their forest bathing experience. They wrote captions about their photographs describing their experiences of forest bathing and responded to the following prompt: "What are you showing the viewer about the forest bathing experience?" Seeing participants' photos and reading their captions gave me a more authentic and nuanced insight into their experiences than I would have from only the survey results and observations during practicing forest bathing.

Procedure

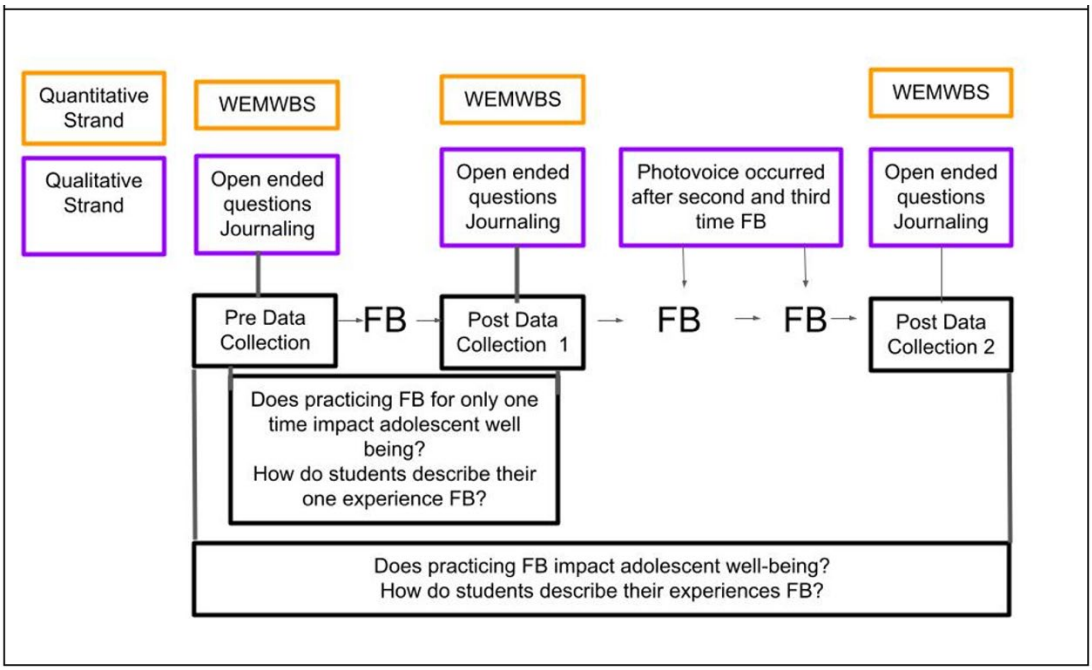
Figure 3.2 presents the flow of the data collection and the procedure. Data were collected before forest bathing, after forest bathing once, and at the end of the entire three-week forest bathing series. I gathered data after one forest bathing experience as some members of the Forest Therapy Guide community were curious about the impact of a single forest bathing walk (Page, 2021b). I wanted to determine how changes in mental well-being after one walk compared to any changes that occurred after completing a series of walks over three weeks.

To determine participant well-being before forest bathing, participants completed the WEMWBS survey with a free-response prompt (found in Appendix A) in Google Forms during the class the day before. The next day, I guided participants students through a 90-minute shortened version of the North American forest therapy sequence of forest bathing, adapted from Clifford (2018) and Page (2019) and described above at Wickapogue. This shortened version included a reduced 5-minute what's-in-motion invitation instead of the typical 15–20 minutes. It

also included one to three partnership invitations, instead of the typical two to five partnership invitations, and a 5-minute sit spot, instead of a 10–20-minute sit spot.

Figure 3.2

Procedure for Convergent Parallel Mixed Methods



We started the first walk inside the Richard Fowler Preserve and finished with the sit spot and tea ceremony at Wickapogue Pond. After completing the final tea ceremony of forest bathing, all 24 participants immediately completed post-WEMWBS surveys in Google Forms on their phones. They also responded to the prompt we added to the end of the WEMWB survey: "Describe what your forest bathing experience was like, including any impacts on your well-being or connection to nature you may have experienced." Participants also had an opportunity to journal about their experience in response to the prompt, "Describe your experience of forest bathing and compare your experience to what you thought the experience would be like."

Participants who could not access the Google form on their phones were given a paper copy of the survey to complete. Completing the survey, responding to the prompt and journaling took participants approximately ten minutes. Before completing the WEMWBS and questions, I reminded participants that the data would be deidentified, and that they should respond truthfully about their experiences.

Six days later, the 24 participants and I went to the Wolf Swamp Preserve to practice forest bathing for the second time. We decided to change locations because of construction noise near the Richard Fowler Preserve. Wolf Swamp Preserve is more remote, and we thought it would have less human-created noise. I led participants in practicing forest bathing by following the same sequence as the first. After completing the final tea ceremony, participants had 10 additional minutes in the nature preserve to use their phones as cameras to document their most meaningful experiences forest bathing through photovoice. Before taking pictures for their photovoices, I reminded participants that their names would be removed from the photovoice and that they should document whatever was most meaningful to them. Participants chose to take pictures of themselves, the nature preserve, and each other in the nature preserve. The next day, participants each selected one photo, gave voice to the photo by writing a caption describing the selected photo, then uploaded the photo and caption to a Google doc. Participants also added their photovoice to a shared Google Slides presentation for sharing with the whole class, the school, or on social media.

Because of concern for ticks in the woods, we again relocated our practice. The third time forest bathing took place 5 days after the second, on the ocean beach of the Old Town Park, which we also thought would have less human-created noise than the Richard Fowler Preserve. I again led participants in practicing forest bathing by following the same sequence as the first and

second times. After completing the final tea ceremony of forest bathing, the 18 participants immediately completed post-WEMWBS surveys in Google Forms. They also responded to the prompt we added to the end of the WEMWB survey: “Describe what your forest bathing experience was like, including any impacts on your well-being or connection to nature you may have experienced.” Participants who could not access the Google form on their phones were given a paper copy of the survey to complete. Before completing the WEMWBS and questions, I reminded participants that the data would be deidentified, and that they should respond truthfully about their experiences. After completing the surveys, participants were also invited to complete another photovoice using their phones as cameras. Participants were also given an opportunity to journal about their forest bathing experiences. If participants chose, the next day they could select and upload a photo with a caption giving voice to the photo to a Google Doc. They could also add the photovoice to the shared Google Slide presentation for sharing with the whole class, the school, or on social media.

Quantitative Analysis & Results

Quantitative Analysis

I used the Microsoft Excel descriptive statistics function to determine that the data were normally distributed, with low skewness and kurtosis, to select the appropriate types of analyses. As the data were normally distributed, I performed a one-factor ANOVA analysis to determine if there were significant differences among all three groups. I also used a Tukey-Kramer post hoc test to examine pairwise differences between groups because the number of participants dropped

from 24 to 18 between the second and third time forest bathing, so I had different sample sizes. An alpha level of 0.05 was used for statistical significance.

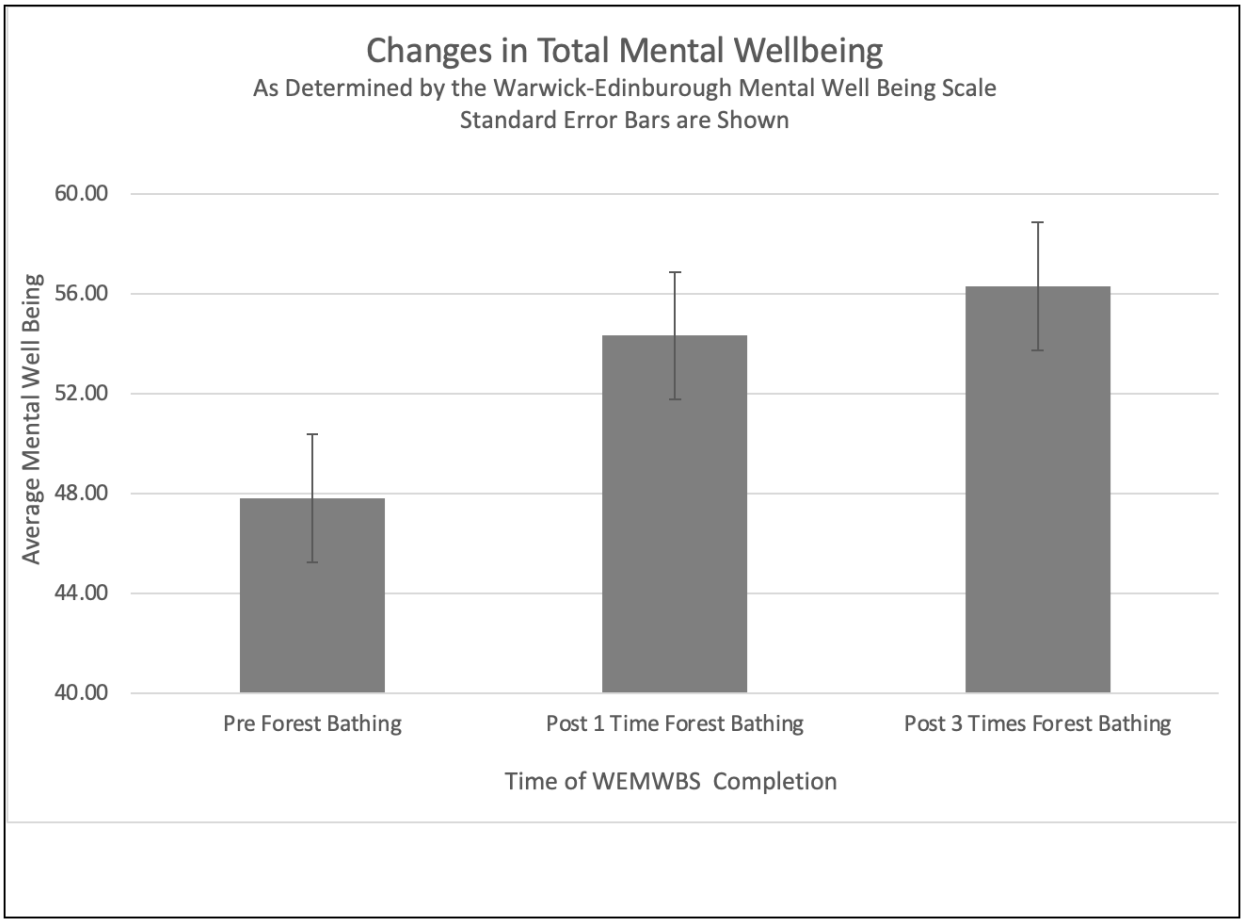
I then used Hedges-*g* to determine the effect size of practicing forest bathing. Hedges-*g* is considered appropriate when evaluating responsiveness in single group pre-post studies, particularly when comparing samples of different sizes (Lakens, 2013) or small sample sizes (Grissom & Kim, 2005). I also chose Hedges-*d* as it is an effect size statistic commonly used to determine the effect of medical and psychological interventions (Lakens, 2013; Luiz & Almeida, 2012; Norman et al., 2007) and I wanted the results of this study to be comparable with other studies on adolescent mental well-being.

Quantitative Results

As measured by the WEMWBS, mean total well-being significantly increased after participants practiced forest bathing (see Figure 3.3). A single factor ANOVA analysis of all three groups showed the difference among all three was significant ($p<0.01$). After one time of practicing forest bathing, mean mental well-being increased from 47.8 ± 3.2 to 54.3 ± 4.0 ($p<0.01$). This 6.5-point increase shows a moderate effect size (Hedges $g = 0.7$) and is considered a meaningful improvement using the WEMWBS (Maheswaran et al., 2012; Putz et al., 2012). Practicing forest bathing three times increased the mean mental well-being to 56.3 ± 4.0. This is a large effect size (Hedges $g = 1.0$) and is significant compared to the baseline pretest score ($p<0.01$). Although there was no significant difference in the mean mental well-being between one and three times forest bathing ($p >0.5$), the small increase in mental well-being between the first and third time forest bathing is still considered a meaningful improvement on the WEMWBS (Maheswaran et al., 2012; Putz et al., 2012).

Figure 3.3

Changes in Mental Well-Being Graph



In addition, the pre-forest bathing mental well-being mean of 47.8 was above the thresholds for possible/mild depression (41–45) or probable clinical depression (<41). However, based on the pre-forest bathing survey, three participants did meet the threshold for possible/mild depression and six for probable depression. After practicing forest bathing once, no participants met the threshold for possible/mild depression and the number of participants meeting the threshold for probable depression decreased to three. Because eight participants did not complete the third forest bathing practice, I was not able to determine if practicing forest bathing three

times would further decrease the number of participants meeting the threshold for probable depression.

Qualitative Analysis And Findings

Qualitative Analysis

To analyze the qualitative data, I first printed out participants' journal entries and their responses to the end of the survey prompts. I then read through the text. To analyze participants' expectations of their forest bathing experiences, I used participant responses to the end of the pre-survey prompt. To analyze participants' descriptions of their experiences forest bathing, I used participants' post-one-time forest bathing and post-three-times forest bathing journal entries and responses to the end of the survey prompt. The second time I read through the text, I highlighted specific words and phrases, made notes, and formed initial codes. To analyze the photovoice data, I coded participants' captions and descriptions while viewing each photovoice in Google Docs.

Next, I created three documents. I took all the participants' responses to the end of the pre-survey prompt and placed them in one document. Then, I did the same for all the post-one-time forest bathing and post-three-times forest bathing journal entries and participants' responses to the end of the survey prompt. I uploaded all documents separately into NVivo software and did a second round of coding in NVivo. During coding on paper and in NVivo, I was looking for similar patterns and themes. Three themes emerged: relaxation and peace, mindful qualities, and being away.

Qualitative Findings

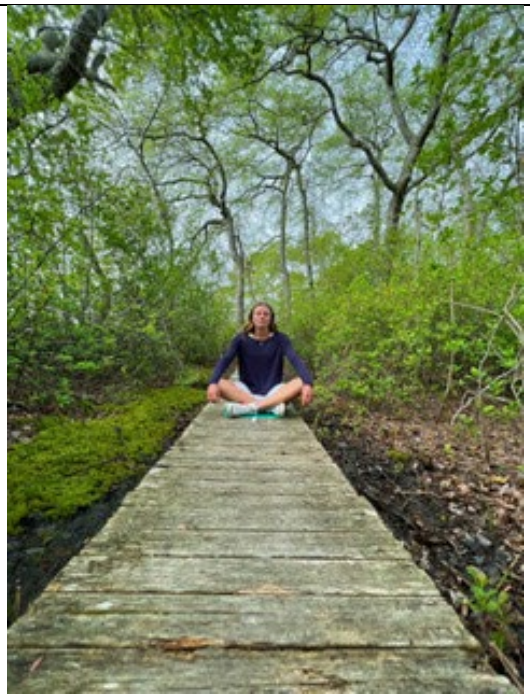
Relaxation and Peace

The most common coding of the participants' journals and open-ended question responses related to relaxation and peaceful feelings. After one time practicing forest bathing, 22% of the text was coded to the theme "relaxation and peace," which increased to 30% after forest bathing three times. Many, like José, explicitly described their experiences practicing forest bathing as relaxing: "My experience of forest bathing was relaxing," or, like Annie, calming: "I felt great about the experience. It really calmed me down." Relaxation can be related to stress reduction, as Luz wrote, "It benefited my peace of mind and any anxieties and stresses I had were gone."

Some, like Julie, linked their feelings of relaxation to the sit spot invitation (Figure 3.4). The feeling of relaxation some participants experienced was also linked to a desire to continue the practice. For example, Gloria wrote, "Forest bathing is definitely something that I plan on continuing because it was just so relaxing."

Figure 3.4

Julie's Photovoice

	I am showing the viewer where my sit spot was and how relaxed I was while sitting. During this picture, I was enjoying the sunlight and birds chirping.

In addition to relaxation, many participants described their forest-bathing experience as helping them feel peaceful. For example, Alexandra wrote that she "felt way more calm and peaceful," and John wrote that he "felt as though l was completely at peace." Some participants, like Sara, linked their feelings of peace to a connection to nature, as evidenced when she wrote, "I felt a greater connection to not only nature but all the peace within myself." For others, this peaceful feeling was linked to experiencing forest bathing as spiritual. Olive expressed this when she wrote, "Forest bathing was very positive in calming my mind and soul." Likewise, John wrote, "I didn't feel stressed nor quick to temper. It's like I had changed inside. It was relaxing, fun, and even spiritual." All these post forest bathing descriptions reflect how participants responded to the open-ended prompt in the presurvey. For example, pre-forest bathing Jay and

Luna wrote, “I think my forest bathing experience will be very relaxing,” and “I think I will feel happier and calmer,” indicating their anticipation of feeling relaxed and calm after forest bathing.

Mindful Qualities

Mindful qualities, which, for this study, included expressions of gratitude, present moment awareness, and slowing down, increased from 14% after practicing forest bathing one time to 23% after the third time practicing forest bathing. Participants described slowing down and being more aware in both their written responses and photovoice captions of their photos, often including specific forest bathing invitations when describing their experiences. For example, Kathy described her photovoice (Figure 3.5) as follows:

> What’s in Motion…helps us slow down and change our pace so you can notice more of what’s right in front of you. This is beneficial because depending on what you see or what you find it can help you calm down and connect with nature.

In Kathy’s case, slowing down was also linked to calm and the ability to connect with nature. This is similar to Bri’s description:

> I was able to fully connect with myself with nature and become very aware of the surroundings. I was able to notice things such as the ways the plants swayed in the wind and the different creatures living within the forest.

Or June when she “sat on a nice bridge as well as picked a tree to get to know.” Likewise, Sara also wrote about being more aware of her surroundings while slowing down: “I’ve surprised myself with how much I've overlooked, noticing all the details that have always been there have helped me slow down and enjoy moments like these.” Ernesto also connected slowing down with feeling calmer “If you just take your time and slow down your life for a moment you feel a sense of relief.”

Figure 3.5

Kathy's Photovoice

I found this short trail during What's in motion. During forest bathing this helps us slow down and change our pace so you can notice more of what's right in front of you. This is beneficial because depending on what you see or what you find it can help you calm down and connect with nature

Participant descriptions related to mindful qualities also included perceptions of oneness with nature and awe. Mel wrote, "I felt extremely relaxed and truly one with nature. I felt as though l was completely at peace with my existence and one with the world." and Jace "I realized how much I truly care about the things in nature and now feel like I am connected to the web of life." Participants also wrote about their gratitude and concern for nature, such as Brian,

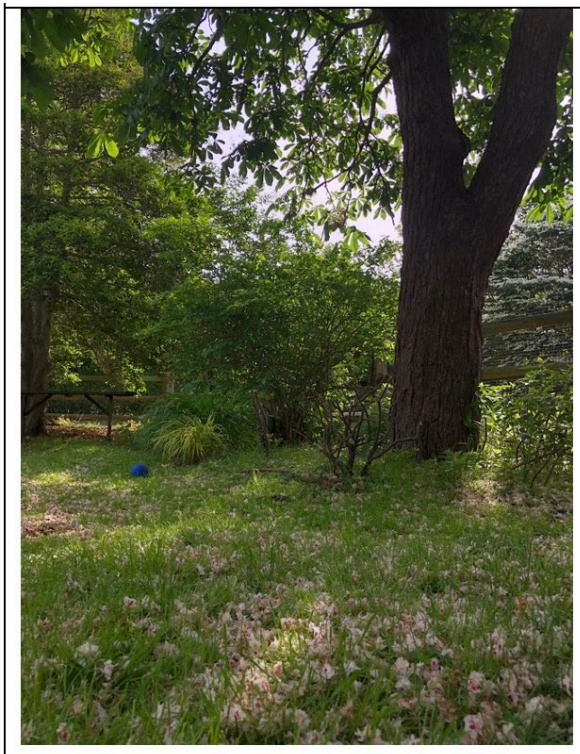
who wrote, “After three experiences of forest bathing, I feel way more appreciative of nature.” And Kelly “All forms of nature are important in their own ways. It is important to know that all ecosystems deserve to be protected.” More gratitude, this time for practicing forest bathing, came from Valeria: “I am very thankful to have gotten the chance to further connect with nature.”

Being Away

Descriptions and photovoice reflecting the being away theme included statements describing forest bathing as a break from school or life, developing a clearer mind or thinking while forest bathing, and feelings of enjoyment, fun, or play. The percent of participant responses related to being away stayed steady at 21% even after practicing forest bathing three times. Being away was evident in Larry’s photovoice (Figure 3.6) both in his photo and description where he wrote about forest bathing “being able to be somewhere that has not been rearranged by society.” Some participants described how their experience practicing forest bathing felt like a break from their stressful lives, such as Jessie, who wrote they were “feeling tired and emotionally done with school. Afterward, I felt a sense of relief and relaxation that remained with me for the rest of the day.” Several participants expressed similar feelings; for example, Laurey wrote that “school can be very stressful, and forest bathing provides an escape into nature where one can relax,” and Carla “was happier, less tired, and less stressed afterward. It was a nice break in my day to relax.” There were many overlaps between the being away theme and relaxation and peace theme.

Figure 3.6

Larry's Photovoice

	Caption: the most natural and peaceful thing is being able to be somewhere that has not been rearranged by society. In motion: the breeze going through the leaves on each tree.

This feeling of being away and having a break helped some participants clear their minds, as Mariana and June, respectively, wrote, "I was able to clear my mind and think and focus." "I talked to a rock which sounds silly but it helped organize my thoughts." And some, like Eduardo, mentioned disconnecting from technology as an important part of their experience: "It was very relaxing to disconnect from the online world and clear my mind." Others, such as Luke, wrote about how forest bathing helped them get back to themselves: "I feel like my energetic frequency is higher, my mind is more awake," and Trinity wrote, "I honestly think being in nature reflects my true emotions."

For several participants, like Jay and Linda, the feeling of a break was described as enjoyment: “I enjoyed the nature around me and felt that spending time outside improved my mood,” and “I enjoyed being able to not have to worry about anything.” This enjoyment for some participants, like Amalia, was linked to nature awareness: “I enjoyed listening and feeling the nature around me,” and Kaily wrote, “It was fun connecting with nature. I liked meeting a tree.” For others, like Andy, it was linked to practicing forest bathing with others: “Also, it was nice to have friends around you as well to make the experience more happy.”

Discussion

My goal was to understand the impact of practicing forest bathing on adolescent mental well-being and to explore adolescents’ experiences of forest bathing. The 6.5 point increase in the mean mental well-being, from 47.8 ± 3.2 to 54.3 ± 4.0 as measured by the WEMWBS survey, suggests that practicing forest bathing, even just once, significantly increases adolescent mental well-being ($p<0.01$) with a moderate effect size (Hedges $g=0.7$). Practicing forest bathing three times had a large effect size (Hedges $g = 1.0$) and further increased participant mean mental well-being by two points to 56.3± 4.0. In addition, participants’ descriptions of their experiences practicing forest bathing indicated they found the experience relaxing, that forest bathing increased their mindful awareness, and that they felt like they got away from their everyday experiences. All three of these traits have been linked in previous research to improved mental well-being (Carmody, 2015; Korpela & Hartig, 1996; Lawlor, 2016; Taren et al., 2015; Wood et al., 2018). Three primary factors could contribute to the mental health benefits of forest bathing. factors include the structure of the forest bathing walk; setting an intention for the forest bathing walk; and that forest bathing takes place outside, in nature.

The Components and Structure of the Forest Bathing Walk Support Improve Mental Well-Being

First, the structure of a forest bathing walk creates more opportunities for open awareness than merely spending time in nature. This is important because open awareness is a state shown to improve mental well-being (Brown & Ryan, 2003; Stawarczyk et al., 2012). Forest bathing creates these opportunities through a sequence that contains many elements known to improve mental well-being.

As mentioned in the introduction, a forest bathing walk is structured in three stages: connection, liminal space/time, and incorporation (Page, 2019). The connection stage uses sensory connection to shift participants' awareness from their thinking minds to their senses, the present moment, and the present place. This is accomplished in three ways. First, participants check in with their bodies, which is shown to increase mental well-being (Dreeben et al., 2013; Sauer-Zavala et al., 2013). Next, participants are guided through their senses and invited to notice what they are experiencing to encourage open awareness, another technique that has been shown to increase mental well-being (Brown & Ryan, 2003; Stawarczyk et al., 2012). In the last part of the connection phase, during “what's in motion," participants are invited to slow down and notice what is moving in the forest. Again, slowing down and increasing open awareness increases mental well-being (Shapiro et al., 2008; Wood, 2002). Participants journaled how slowing down made them more aware of the nature preserve, with Kathy describing how forest bathing “helps us slow down and change our pace so you can notice more of what’s right in front of you,” while Sara wrote how she was “noticing all the details that have always been there have helped me slow down and enjoy moments like these.”

Other vital elements of forest bathing support participants' improved well-being. For example, in the second part of the forest bathing walk, which is considered a type of liminal space/time (Clifford, 2018; Page, 2019, 2021a), the guide offers participants several open-ended partnership invitations. These invitations support improved mental well-being, perhaps by generating happy feelings (Etkin & Mogilner, 2016; Kashdan & Silvia, 2009; Williams, 2018) through the curiosity, play, and creativity that can arise from participants exploring these invitations. Partnership invitations are open-ended and allow participants autonomy to interpret their experiences in their own way. Feeling autonomous is also linked to mental well-being (Fotiadis et al., 2019; Nelson et al., 2015; Parto & Besharat, 2011). Descriptions of the various partnership invitations filled many participants' journal entries, such as “I talked to a rock which sounds silly but it helped organize my thoughts,” and “I sat on a nice bridge as well as picked a tree to get to know.”

After each invitation, the participants circle up, and everyone has a chance to respond to the prompt, "What are you noticing?" Participants share with the whole circle while the rest of the group listens, or they share in a pair-share. Everyone has a turn to share their stories and have their stories witnessed by others multiple times in a walk. The sharing circle allows each participant to share and listen, observing the simultaneous commonality and uniqueness of everyone’s experiences. The power of having our stories heard and hearing others' experiences (Corominas et al., 2020; Jordan, 2017; Siegel, 2013) is also an aspect of forest bathing that supports improved mental well-being. In addition, the sharing circle also provides opportunities for positive social interactions, which is also shown to support adolescent mental well-being (Chue & Yeo, 2022; Traylor et al., 2016; Williams & Anthony, 2015; Oberle et al., 2010)

The last partnership invitation is a sit spot, where participants find a place alone to meditate quietly. Meditation is a mindfulness practice long shown to improve the mental well-being of its practitioners (Brewer et al., 2011; Greenberg & Harris, 2012; Sauer-Zavala et al., 2013). Meditation in the sit spot provides opportunities for participants to begin to integrate their forest bathing experience. Integrating transformative experiences, whether using psychedelic medications or rites of passage, improves the effectiveness of these experiences (Janusz & Walkiewicz, 2018; Lertzman, 2002; Morgan, 2020; Payne et al., 2021; Wagstaff, 2011). The photovoice shows that participants valued the sit-spot part of forest bathing. They not only chose to capture the moment with a picture but also chose to write, as their caption, "I am showing the viewer where my sit spot was and how relaxed I was while sitting. During this picture, I was enjoying the sunlight and birds chirping."

Integration is further facilitated in incorporation, the last part of a forest bathing walk. Here, the guide leads participants out of liminality and back to their thinking minds. Incorporation is marked by a tea ceremony ritual prepared by the guide. Here, participants gather one last time to share tea, food, and stories and express gratitude. Expressing gratitude, as occurs in the tea ceremony, has been shown to increase happiness and motivate self-improvement and positive change (Armenta et al., 2017; Davis et al., 2016; Komase et al., 2021; Wood et al., 2010), including in adolescents (Bono et al., 2020; Froh et al., 2008). Many participants in this study expressed gratitude for the nature preserves in which they practiced. For example, "This experience gave me a deeper appreciation for nature," and "I am very thankful to have gotten the chance to further connect with nature." In addition, participants like Kay also wrote about gratitude for the forest bathing practice "The forest has a very calming atmosphere that slows me

down from the rapid pace of everyday life, and I'm grateful that I was able to witness that firsthand through these trips!"

Setting an Intention for the Walk Supports Improved Mental Well-Being

Second, in contrast to going for a nature walk or spending time in nature, practicing forest bathing involves an intention to relax and cultivate a healing connection with the forest or nonhuman beings wherever it is practiced. Setting this intention, as happened in this study during the YPAR project with participants, may be another factor that facilitates increased mental well-being after forest bathing. This is because setting an intention before an experience can influence the outcome (Di Malta et al., 2019) or perceptions of the outcome in both adults (Sibthorp, 2003; Sibthorp & Authur-Banning, 2004) and adolescents (Beauchamp et al., 2011).

More specifically, Pasanen et al. (2018) found that the person's intent significantly affects the outcome of nature visits. In other words, because forest bathing practitioners engage in forest bathing with the intent to support their wellness and health, it does support their wellness and health. In this study, participants showed this intent when they responded to an open-ended prompt in the presurvey. For example, Jay and Luna wrote, "I think my forest bathing experience will be very relaxing," and "I think I will feel happier and calmer," indicating their anticipation of feeling relaxed and calm. Anticipating these positive mental well-being effects could be at least partially responsible for the significant increase in measured adolescent mean mental well-being after forest bathing. This is aligned with other research with adolescents that also shows that when adolescents set an intention before an activity, it influences both the outcome and perceptions of the activity (Beauchamp et al., 2011).

Forest Bathing Takes Place Outside in Nature, Which Supports Mental Well-Being

Although it seems obvious, a third explanation for the efficacy of forest bathing is that it takes place outside, often in natural environments. However, it is important to note that in addition to forests, forest bathing can be practiced in any environment, including more built environments like urban parks or hospital and nursing home gardens (Antonelli et al., 2022; Hansen et al., 2017; Sauerlender, 2021; Tsao et al., 2022; Zhou et al., 2019). In this study, participants were guided through the forest bathing sequence twice in a forested environment and once in an open beach environment (see Figure 3.1). In other words, throughout the 3-week forest bathing series, participants were exposed to green and blue spaces, both of which have been shown to improve mental well-being (Beyer et al., 2014; Britton et al., 2020; Faber Taylor & Kuo, 2011; Chawla, 2014).

Numerous studies have shown that spending time in nature increases human well-being (Kuo, 2015), particularly mental well-being, including alleviating the symptoms of anxiety and depression (Bratman et al., 2019; Kuo, 2015; White et al., 2019) and posttraumatic stress disorder (Anderson et al., 2018; Westlund, 2015). In their review, Bratman et al. (2019) used this research to support their proposal that mental health be included as an ecosystem service provided by nature. Shanahan et al. (2019) recommended nature-based interventions, including increasing access to green spaces, to improve community and organization mental well-being. This recommendation was particularly relevant to this research, which occurred during the COVID pandemic when levels of adolescent anxiety, depression, and posttraumatic stress disorder increased (Catty 2021; Cénat & Dalexis, 2020; Czeisler et al., 2020; Singh et al., 2020; Styck et al., 2021). Data from the WEMWBS gathered in this study not only showed significant increases in mean mental well-being over the forest bathing series but also indicated the number

of participants meeting the WEMWBS threshold for depression decreased after practicing forest bathing once. One participant journaled about their forest bathing experiences: “They were relaxing and calming. It benefited my peace of mind, and any anxieties and stresses I had were gone.”

In addition to suffering from general anxiety and depression, many adolescents suffer from a particular type of anxiety caused by environmental degradation called eco-grief or eco-anxiety (Berman et al., 2012). Eco-anxiety symptoms include low mood, disturbed sleep, panic attacks, and feelings of anger, guilt, or helplessness (Hickman et al., 2021). Spending time in nature can be a way for adolescents to relieve their eco-grief or eco-anxiety by experiencing more intact ecosystems and perhaps learning to care for their local place (Chawla, 2015, 2020; Ojala, 2018; Pihkala, 2020; Chawla, 2014). Participant responses included expressions of care and concern for nature: “I realized how much I truly care about the things in nature and now feel like I am connected to the web of life,” and “All forms of nature are important in their own ways. It is important to know that all ecosystems deserve to be protected.”

Furthermore, spending time in nature is also a potential conduit for mindfulness and experiences of awe, both shown to improve mental well-being (Anderson et al., 2018; Deringer, 2017; Lawlor, 2016). Lawlor (2016) stated that "Moment to moment awareness when in nature, focusing attention on sights, sounds, and smells, may encourage inner stillness, contemplation, and gratitude" (p. 70). Deringer (2017) explored mindfulness through the lens of outdoor adventure education. They suggested outdoor education should emphasize a connection to place through mindfulness instead of only emphasizing experiences. This is particularly relevant for this study with adolescents, as much research supports a connection between adolescent mindfulness and adolescent mental well-being (Brensilver et al., 2017; Lawlor, 2016; Parto &

Besharat, 2011). Many participants in this study, such as Bri, expressed increased mindfulness and connection:

> I was able to fully connect with myself with nature and become very aware of the surroundings. I was able to notice things such as the ways the plants swayed in the wind and the different creatures living within the forest.

Further Research

Although this investigation had a small sample size and participants practiced an abbreviated forest bathing walk each of the three times over 3 weeks, these findings suggest that practicing forest bathing can improve adolescent mental well-being, and that adolescents practicing forest bathing is an important area of research that merits further exploration. Exploring the difference between adolescents practicing forest bathing in nature with those spending time in nature in an experimental study is a logical next step to tease out the practice's effects. In addition, it would be interesting to study the impact of practicing forest bathing for a longer time, such as practicing for more than 90 minutes or for more than three weeks. Also, to further strengthen our understanding of forest bathing's impact on adolescent mental well-being, future research could include participants who are not my students, which could minimize participant bias, as well as adolescents in settings other than high schools. It would also be useful to determine how long lasting the mental health benefits of forest bathing last, in order to recommend how frequently forest bathing must be practiced to maintain elevated mental well-being.

Final Thoughts and Recommendations

Anne Frank believed that "nature brings solace in all troubles." As schools and communities are searching for ways to alleviate the epidemic of adolescent mental suffering from anxiety and depression, they are adapting new SEL standards and programs. Practicing forest bathing could become part of an SEL toolkit. Forest bathing does not require special equipment and increases adolescent mental well-being and feelings of mindfulness, relaxation, and peace. In other words, nature brings solace, something many adolescents desperately need.

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Chapter 4 Forest Bathing Increases Adolescent Connection to Nature

Abstract

Previous research has demonstrated that practicing forest bathing has significant positive effects on well-being. However, few studies have investigated whether forest bathing increases practitioner connectedness to nature. Considering the ongoing environmental crisis, determining if forest bathing increases connectedness to nature is a critical expansion of forest bathing research, as connectedness to nature is linked to environmental care and concern. This study investigated the possibility that forest bathing, a nature-based mindfulness practice, could increase adolescent connectedness to nature and sought to determine participants' experiences of practicing forest bathing. This study used a convergent parallel mixed-methods design that was partially co-created with 24 participants aged 16-18 as part of a youth participatory action research (YPAR) project where participants practiced forest bathing three times over three weeks. After practicing forest bathing, participants' connectedness to nature increased significantly as measured by the Connectedness to Nature Scale. Participants described increased connection to nature, gratitude for nature, concern for nature, and desire to care for nature. In addition, data on mental well-being that was gathered simultaneously showed significant increases in mean participant mental well-being. Although this is one of the first studies to examine forest bathing impacts on participants' connectedness to nature, these findings correlate with other studies showing that spending time outside in nature increases connectedness to nature and care and concern for the environment. People working with adolescents could consider forest bathing as a practice that increases connectedness to nature while also increasing mental well-being.

Keywords: Forest Bathing, Forest Therapy, Adolescent Well-being, Ecoanxiety, YPAR, Mixed Methods, Photovoice, Nature Connection, Nature Connectedness, Connection to Nature

The more clearly we can focus our attention on the wonders and realities of the universe about us, the less taste we shall have for destruction.

Rachel Carson 1954

Introduction

Rachel Carson's 1954 talk at the Society of Woman Journalists highlighted the link between anthropogenic environmental devastation and a disconnection from nature. Despite decades of research highlighting the deep damage some cultures are causing the Earth, including accelerating climate change and biodiversity loss, this damage continues (Conference of the Parties, 2018; Intergovernmental Panel on Climate Change, 2022), seemingly unabated. It seems as if many parts of humanity do not care. To improve humanity's care for the environment, many suggest finding ways to strengthen people's connection to nature (Charles et al., 2018; Chawla, 2020; Cheng & Monroe, 2012; Müller et al., 2009; Mackay & Schmitt, 2019).

Spending time outside in nature is strongly linked to connection to nature (Barrable & Booth, 2020; Cheng & Monroe, 2012; Elliot et al., 2014; Larson et al., 2019; Sheldrake et al., 2019; Soga et al., 2018). I was curious if practicing forest bathing, a nature-based mindfulness practice, would also increase connection to nature. Although there has been much research into the effects of both time in nature in general and forest bathing in particular, few studies (McEwan et al., 2022) have examined correlations between forest bathing and connection to nature. This study aimed to determine the impact of forest bathing on adolescents' connection to nature and explore adolescent experiences of forest bathing.

Connection To Nature

Connection to nature has been defined as the sense of connection to or belonging to the natural world as part of a larger community of nature (Capaldi et al., 2015; Lumber et al., 2017; Mayer et al., 2009). Cultivating connection to nature is essential for several reasons. First, people with more connection to nature show more proenvironmental and pronature behavior (Balundė et al., 2019; Barrera-Hernández et al., 2020; Chawla, 2014, 2020; Hughes et al., 2019; Mackay & Schmitt, 2019; Marschall, 2021; Richardson et al., 2019; Tam, 2013; Whitburn et al., 2018). These behaviors include actions such as working with conservation groups, recycling, joining a nature club, volunteering with environmental organizations, and any behavior that helps the environment (Balundė et al., 2019; Hughes et al., 2019; Richardson et al., 2019).

Another reason increasing connection to nature is important is that it can help nurture constructive hope (Chawla, 2020, 2021; Chawla & Derr, 2012; D'Amore & Chawla, 2020). Constructive hope is the ability to see environmental challenges and uncertainties while still having the ability to take action to address these serious threats (Ojala, 2017). Generating constructive hope in young people is essential, as young people are, according to the United Nations Sustainable Development Report (2015), “critical agents of change” and have “infinite capacities for activism into the creation of a better world” (para 51). To face the incredible challenges of our future and stay engaged in positive change will require tremendous constructive hope.

A third reason for increasing connection to nature is that higher levels of connection to nature are correlated with higher levels of multiple components of well-being, such as health, learning, creativity, and happiness, in both children and adults (Barrera-Hernández et al., 2020; Capaldi et al., 2015; Chawla, 2021; Harvey et al., 2020; Kuo, 2015; Kuo et al., 2019; Larson et

al., 2019; Leong et al., 2014; Mayer et al., 2009; McEwan et al., 2022; Piccininni et al., 2018; Pritchard et al., 2020; Richardson et al., 2019; Sheldrake et al., 2019; van den Bosch & Bird, 2018; Whitten et al., 2018). This may be because activities that increase connection to nature often occur outside in nature. Numerous studies have shown that spending time outside in nature also increases well-being (Kuo, 2015), including alleviating the symptoms of anxiety and depression (Bratman et al., 2019; Kuo, 2015; White et al., 2019) and posttraumatic stress disorder (Anderson et al., 2018; Westlund, 2015).

If connection to nature is essential, then understanding what "nature" refers to is also critical. However, defining nature is challenging, as the concept of "nature" is elusive and culturally defined. In much of the Western world, such as the United States, humans and nature are considered separate, in a worldview with roots in Descartes and Bacon (Ducarme & Couvet, 2020). In contrast, non-Western worldviews hold that all beings, culture, and matter are intimately connected, as in Indigenous (Aikenhead & Michell, 2011; Cajete, 2018) and Eastern (Hanh, 2020; Nguyen & Hanh, 2019) worldviews. However, for this study and much of the connection to nature research, “nature” includes everything that grows and changes on its own, independently of human intervention (Chawla, 2021).

It is important to note that some also consider the concept of connection to nature problematic. For example, Fletcher (2017) said connection with nature is "oxymoronic" (p. 226). Fletcher linked the focus on a lack of connection to nature as the root of environmental degradation as problematic because this focus frames environmental problems and solutions as individual responsibility within the world's overarching neoliberal economic framework. This critique argues that the concept of connection to nature can perpetuate the othering of nature—

and nature as something separate from humans—that people must connect with to have an inclination to care for nature (Clark & Mcphie, 2020).

Although connection to nature is essential, adolescence is a time for lower connection to nature in the United States and Europe because adolescents spend less time in nature (Hughes et al., 2019; Larson et al., 2019; Richardson et al., 2019). There are many reasons for this reduction. Adolescence is when many young people spend more time inside watching TV and engaging with video games and social media (Bruni & Schultz, 2010; Larson et al., 2019). Adolescence also finds many young people increasing their emphasis on academics (Greenwood & Gatersleben, 2016; Lomsdal et al., 2022) and sports (Chawla, 1992), turning their attention to friends, and creating their own identities (Eames et al., 2018). This observed drop is an opportunity to increase connection to nature over a person's lifespan, as adults with a higher connection to nature had more time in nature as children (Chawla, 2020; Cleary et al., 2018; Rosa et al., 2018; Tam, 2013).

Since increasing nature connection is so critical, suggestions for increasing it abound. Spending time in nature is strongly linked to connection to nature (Barrable & Booth, 2020; Cheng & Monroe, 2012; Elliot et al., 2014; Larson et al., 2019; Sheldrake et al., 2019; Soga et al., 2018). Unfortunately, not everyone can easily access nature or other green spaces, such as parks (Parker & Simson, 2020; Schwab et al., 2020). In addition, as mentioned, adolescents have many external demands and personal preferences that decrease their time in nature, even when it is nearby. However, research suggests that connection to nature could be increased by providing adolescents opportunities for recreation, discovery, challenges, time with friends (Owens & McKinnon, 2009; Schwab et al., 2020), to relax, recharge, and find calm (Hatala et al., 2020; Owens & McKinnon, 2009; Tseng & Wang., 2020; Schwab et al., 2020). In this study, I wanted

to explore if forest bathing, a nature-based mindfulness practice, could increase connection to nature in adolescents.

Forest Bathing

Forest bathing, often called nature or forest therapy in North America, refers to the practice of spending time in forested areas to invite healing interactions (Clifford, 2018). This nature-based contemplative practice evolved from the Japanese practice of shinrin-yoku. The term shinrin-yoku was coined by the Japanese Ministry of Agriculture, Forestry, and Fisheries in 1982 (Park et al., 2010). Forest bathing is described as making contact with and taking in the atmosphere of the forest (Park et al., 2010) and is similar to natural aromatherapy (Li, 2010). North American forest bathing is a structured walk that invites participants to become embodied and "experience a deeper sense of relationship with the world" (Page, 2019, p. 28).

The standard sequence of North American forest bathing has many components that support practitioners in having a healing connection with whatever natural environment they choose to practice. A North American forest bathing walk is a 1.5- to 3-hour ritualized walk with three stages. These stages are called connection, liminal space/time, and incorporation, and each stage is designed to create opportunities for embodiment, sensuality, and relationships (Clifford, 2018; Page, 2019). In his book, *Your Guide to Forest Bathing*, Amos Clifford (2018) first described the standard sequence of North American forest bathing. Ben Page took the work of Amos Clifford and wrote the *Training Manual for Nature and Forest Therapy Guides* (2019).

As described in *Training Manual for Nature and Forest Therapy Guides*, the connection stage uses sensory connection to shift participants' awareness from the everyday thinking experience to their senses, the present moment, and the present place. This stage is composed of two parts. The first, pleasures of presence, is where the guide invites participants to focus on

each sense and notice what they are experiencing. The second part, what's in motion, invites participants to slow down and notice what is moving in the forest (Page, 2019, 2021b).

Once participants connect with the present moment, they enter the second stage, liminal space/time. To facilitate this shift into liminal space, a guide offers participants several partnership invitations that can be thoughtful, creative, playful, or introspective. They are called partnership invitations because they emerge from a guide's partnership with the land and the beings that live there (Clifford, 2018; Page 2019, 2021). These invitations are open-ended and allow participants to interpret their experiences in their own way. After each invitation, the participants circle up, and everyone has a chance to respond to the prompt, "what are you noticing?" Participants share with the whole circle while the rest of the group listens or partakes in a pair-share. Everyone has a turn to share their stories and have their stories witnessed by others multiple times during a walk. The last partnership invitation is always a sit spot, where participants find a place to meditate alone quietly.

The third stage of the forest bathing walk, incorporation, leads participants out of liminality and back to more conscious cognition. Incorporation is marked by a tea ceremony ritual prepared by the guide. Here, the group gathers one last time for a tea ceremony where they share tea, food, and stories and express gratitude. Completing the tea ceremony marks the departure from liminal space and reentry into regular life.

In forest bathing, participants spend time outside in natural areas to enhance their well-being, which includes health and happiness (Page, 2019). Although it can be practiced alone, forest bathing is often practiced in groups with a guide. This creates opportunities for relationships and social connections with other humans and nonhuman beings during a walk. Practicing forest bathing also involves reciprocity that, in addition to healing people, includes

healing for the forest, river, desert, or whatever environment a practitioner is visiting (Page, 2019).

In addition, forest bathing has many research-backed health benefits for its practitioners. Most studies of forest bathing's impact on human physiology have been completed in Japan and South Korea, where shinrin-yoku is considered a part of preventive medicine (Hansen et al., 2017). Much of the research on the physiological effects of forest bathing has focused on cardiovascular indicators (Hansen et al., 2017; Lee et al., 2014; Li et al., 2011) and stress hormones. Forest bathing lowers salivary cortisol, indicating reduced stress levels (Hansen et al., 2017; Kuo, 2015; Li et al., 2011; Sung et al., 2012). Decreased stress has positive health outcomes, including improved sleep, immune function, and reduced inflammation (Hansen et al., 2017; Kuo, 2015). Another avenue of research has been how forest bathing impacts the human immune response. Multiple studies have linked forest bathing to increased levels of anticancer immune cells (Hansen et al., 2017; Li et al., 2011). Forest bathing allows participants to breathe in phytoncides, a volatile organic compound emitted by trees, which trigger this human immune response (Li et al., 2011; Shanahan et al., 2019). Kuo (2015) proposed the human immune system as the central pathway leading to the myriad health benefits of spending time in nature and doing activities like forest bathing.

This Study

As mentioned above, this study aimed to determine the impact of forest bathing on adolescents' connection to nature and explore adolescent experiences of forest bathing. The participants, high school students in my Advanced Placement (AP) Environmental Science class, partly cocreated this convergent parallel mixed methods study as part of a Youth Participatory

Action Research (YPAR) project on improving connection to nature and mental well-being. I wanted to answer the following research questions:

1. Does practicing forest bathing impact adolescents' connection to nature?
2. What are adolescents' experiences of practicing forest bathing?

Using the Connectedness to Nature Scale (CNS) (Mayer & Frantz, 2004), I measured connection to nature before and after one and three times practicing forest bathing over 3 weeks. As most forest bathing research has studied quantitative mental and physical well-being measures, I also documented participants' lived experiences through responses to open-ended survey questions, journaling, and photovoice after forest bathing to add depth to our understanding of the effects of practicing forest bathing.

Methods

Participants and Site

Participants

This research took place in the spring of 2022 at a New York public high school located on the ancestral lands of the Shinnecock Nation in what is now Southampton, New York, USA. This school is the high school for a small suburban school district where over 50% of students are eligible for free or reduced lunch because of low family income (United States Department of Education, 2018). Participants were 24 11th and 12th-grade students in my AP Environmental Science classes. Each year after the AP exam in May, students take the last 5 weeks of school to complete a student- or class-chosen action research project to conclude their year of study. In the spring of 2022, students completed an in-class YPAR project on student mental well-being. Students wondered how spending time in nature while forest bathing might increase their connection to nature and alleviate their stress and anxiety. All participants completed the first 2

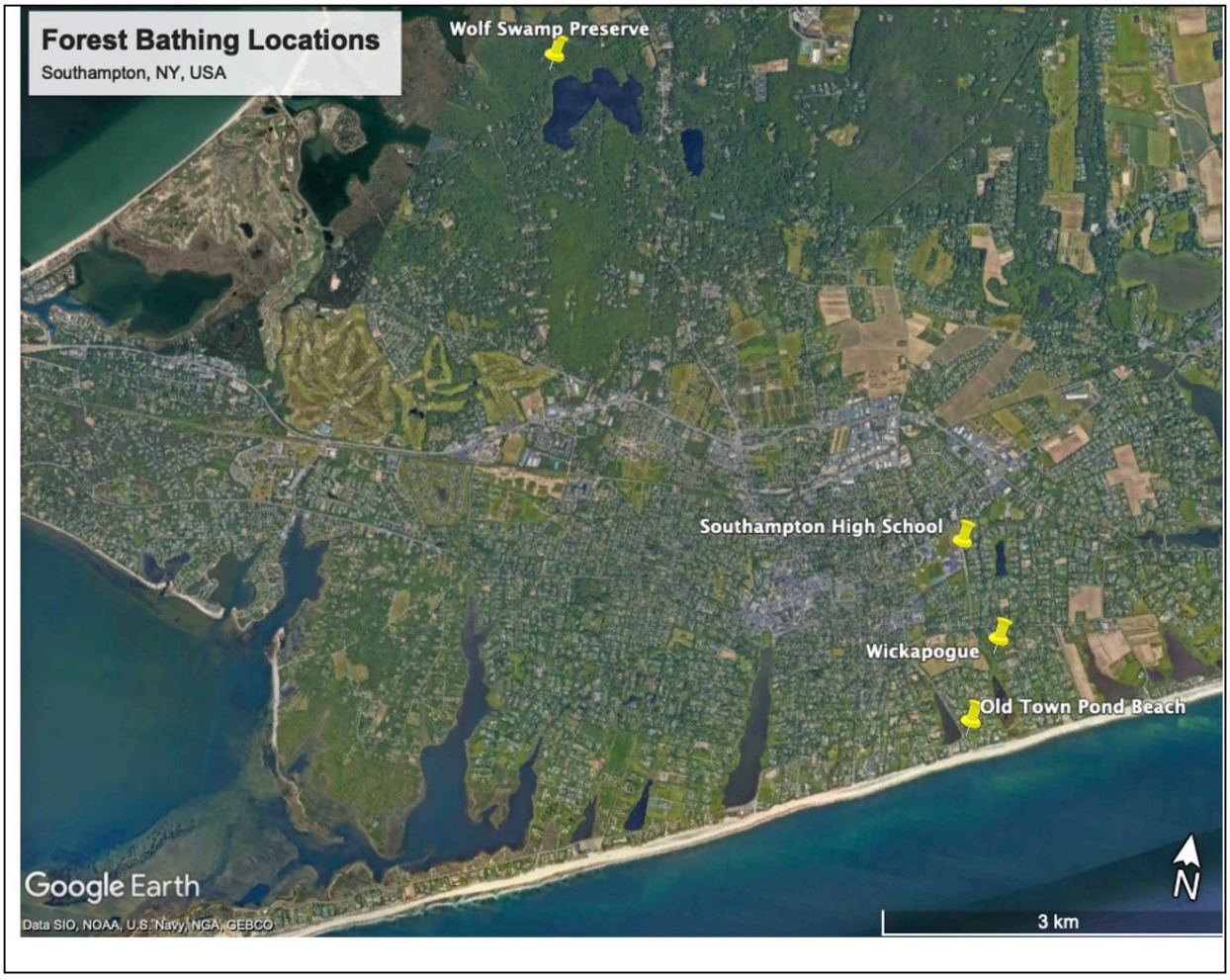
weeks of the forest bathing series, with 16 completing all 3 weeks of the series. This research underwent Institutional Review Board review and was approved by Antioch University, New England's Institutional Review Board committee. Participants or their parents/guardians could choose to have their data excluded from this study with no academic or other penalties.

Sites

This study took place in our classroom and three nearby nature preserves (see Figure 4.1). One nature preserve is in an area called Wickapogue, which in Algonquian means "end of the water" or "end of the land" (Tooker, 1911, p. 282). In 1986, Wickapogue was renamed the Richard Fowler Nature Preserve by Southampton Village (Bottini, 2003) to honor Richard Fowler, a former Southampton Village trustee. This site was chosen because it is very close to the school and would maximize forest bathing time. This location also provided a mix of closed and open canopy forest and a small pond shoreline, which offered a variety of spaces for partnership invitations.

Figure 4.1

Forest Bathing Locations in Southampton, NY



Note. From Google, 2022

Another nature preserve in which we practiced forest bathing was the Wolf Swamp Preserve near a lake now called Big Fresh Pond. This lake is called Missapogue in Algonquian, which means “large lake” or “large water” (Citizens Statewide Lake Assessment Program, 2018; Tooker, 1911). Icould not determine when the lake's name officially changed. The New York State Department of Environmental Conservation and a local homeowner’s association still use Missapogue to refer to the lake (Citizens Statewide Lake Assessment Program, 2018; New York

State Federation of Lake Associations, n.d.). The Wolf Swamp Preserve is on the northwest side of Big Fresh Pond. Elizabeth Morton Tilton donated this 20-acre preserve to the Nature Conservancy in 1957 (Bottini, 2003). Despite its name, there are no wolves in Wolf Swamp Preserve, as wolves were hunted to extinction on Long Island due to a bounty system established by settlers in the 1600s and 1700s (Elswick, 2005; McCully, 2018). Like the Richard Fowler Preserve, this site also provides a mix of closed and open canopy forest and the lake's shoreline. There were loud home construction noises at Richard Fowler on our first visit. Therefore, participants and I decided that our second time practicing forest bathing should be in an area away from development. We chose Wolf Swamp Preserve as it is more isolated than the Richard Fowler Preserve, yet close enough to the school that we would have enough time for forest bathing.

The third location is part of Southampton Village's Old Town Pond Park and Beach. The area is called Old Town because it was the location of the first English settlement in Southampton. It is an ocean beach with a grassy and shrubby open foredune environment. Although our original intent was to return to the forest in the Wolf Swamp Preserve, several participants found ticks on themselves after forest bathing in Wolf Swamp Preserve. The first author I decided that choosing a location with a low probability of tick activity was essential to have one last time practicing forest bathing before school ended for the summer. This was to minimize the potential for tick-borne diseases and decrease participant drop-out because of the fear of ticks.

Mixed Methods

Creswell and Plano Clark's (2018) mixed methods participatory social justice design was used to investigate the research question: How does practicing forest bathing impact adolescent connectedness to nature? This design adds mixed methods research to a participatory or social justice perspective that involves participants in the research and foster changes in individuals, institutions, or communities (Creswell & Plano Clark, 2018). Mixed methods participatory social justice, sometimes called transformative mixed methods (Mertens, 2003, 2010; Ponterotto, 2010; Tashakkori & Teddie, 2010), includes participants voices to identify and describe issues while generating evidence that is useful and persuasive to individuals and stakeholders (Creswell & Creswell, 2018; Creswell & Plano Clark, 2018). The collaborative intent of participatory research provided a framework for conducting aspects of mixed methods research in the classroom. In the case of this study, the I embedded a convergent parallel mixed methods design into a YPAR methodological framework. YPAR provides a space for young people to be researchers into their own experiences (Radina & Schwartz, 2019). In addition, using YPAR allowed us to gain more authentic and nuanced insight into the research questions than if conducting the research in a more hierarchical and traditional approach. The YPAR project was designed and conducted with the my students to investigate their experiences of practicing forest bathing and if forest bathing impacted their connectedness to nature and their mental well-being.

A convergent parallel design was chosen because it allowed us to obtain "different but complementary data on the same topic" (Morse, 1991, p. 122); in this case, the impact of forest bathing on adolescent connectedness to nature. In convergent design, the qualitative and quantitative data collection and analysis are considered separate (Creswell & Creswell, 2018). This is based on the assumption that qualitative and quantitative data provide different types of

information. The qualitative data provided depth of participants' experiences, and the quantitative data provided breadth.

Quantitative Methods

I used the Connectedness to Nature Scale (CNS) (Mayer & Frantz, 2004) to determine participants' connection to nature. I chose the CNS as this tool has been used to create a snapshot of a person's connection to nature at a certain point in time (Salazar et al., 2020) and detect changes in connectedness to nature as a result of a program or other intervention (Bruni et al., 2017; Cheng & Monroe, 2012; Ernst & Theimer, 2011; Mayer & Frantz, 2004; Mayer et al., 2009; Mullenbach et al., 2019; Ogburn, n.d.; Salazar et al., 2020). The CNS measures an individual's emotional and experiential response to nature (Mayer & Frantz, 2004) and the extent to which an individual feels a sense of community, equality, kinship, embeddedness, and belonging to nature (Salazar et al., 2020). This is important because these are also stated goals of forest bathing (Clifford, 2018; Page, 2019, 2021). The CNS has also been used to assess the role of nature connection in predicting whether a person is likely to engage in behaviors that support the environment (Barbaro & Picket, 2016; Gosling & Williams, 2010; Hoot & Friedman, 2011; Ibáñez-Rueda et al., 2020; Rosa et al., 2018; Salazar et al., 2020). YPAR co-researchers were given the opportunity to choose an additional survey or create their own survey to measure nature connection and chose to add open-ended questions, described below, at the end of the CNS.

The CNS is a short survey, with only 14 items scored on a 1–5 Likert scale. This was essential, as our time for forest bathing and postevaluation was limited to 90 minutes by the school's schedule. The CNS is considered a valid assessment of nature connection because the CNS survey results correlate with other measures that assess connection to nature and

environmental attitudes (Salazar et al., 2020). The CNS has high internal consistency and test-retest reliability (Mayer & Frantz, 2004; Olivos et al., 2011). It has also been translated into French (Navarro et al., 2017) and used extensively as a measure of nature connection in studies with participants as young as 10 (Salazar et al., 2020). This was an important consideration, as I wanted to connect this study with other research on adolescents' nature connection.

The CNS can be scored by reversing the scores of statements 2, 12, and 14, then summing the responses to each item, creating a total CNS score ranging from 14 to 70. Analyses can then be performed using the total CNS score. However, thresholds for low, moderate, and high connection to nature are indicated by the average CNS scores, which, after reversing the scores of statements 2, 12, and 14, range from 1–5. CNS scores of 1–2 indicate a low connection to nature, whereas scores of 4–5 indicate a higher connection to nature. A score of 3 indicates a moderate level of connection to nature.

Qualitative Methods

Participants determined the qualitative methods during their in-class YPAR project after learning about various qualitative methods in a research carousel adapted from the University of California, Berkely's YPAR Hub (2015). These methods included open-ended survey responses, journal entries, and photovoice. Open-ended survey responses and journaling helped participants document and reflect on their work as researchers and their experiences with forest bathing. In addition, during the research design, we discussed participant response and researcher bias. Although essential for any research project, this discussion was particularly relevant in this study as the participants were both my students and coresearchers, and they knew I would be using the deidentified data in my PhD dissertation. I told participants I would write my dissertation and earn her PhD no matter what the data showed or how participants responded to surveys or

written responses and, as I valued and respected their experiences, they should be truthful and authentic in their responses so any trends or patterns in the data would be authentic. I also reminded them that their responses had no bearing on their grade in the course. In addition to discussing participant bias, every time data were generated, I reminded participants that the data would be deidentified, and that they should respond truthfully about their experiences.

Participants wanted to add a place for free-response writing at the end of the CNS to gather information the survey might miss about their experiences. Participants also wanted to provide a separate, more extended journaling opportunity outside of the CNS survey. Journaling is a reflective practice where practitioners can describe and reflect on their feelings and lived experiences of an event or occurrence (Blake, 2005; Kolb, 2015). Journaling is often used in an experiential learning cycle (Hubbs & Brand, 2005; Kolb, 2015) and in action research (Stringer & Ortiz-Aragon, 2021). We also chose journaling as it is a time-efficient and effective method of gathering participants' personal experiences (Arndt & Rose, 2022; Hyers, 2018; Sullivan et al., 2012). Although journaling can be free form, participants collaboratively co-created prompts for the open-ended survey question and journal entries to help guide participants' reflections on their experiences of practicing forest bathing.

At the end of the preforest bathing CNS survey, participants responded to the prompt, "Describe what you imagine your forest bathing experience will be like." At the end of the postforest bathing surveys, participants responded to the prompt, "Describe what your forest bathing experience was like, including any impacts on your well-being or connection to nature you may have experienced." The prompt for post-forest bathing journaling were, "Describe your experience of forest bathing and compare your experience to what you thought the experience would be like."

The last type of qualitative data participants generated was photovoice. Photovoice is a qualitative method where participants use photographs to document their experiences (Coghlan & Brydon-Miller, 2014; Sutton-Brown, 2014; Wang & Burris, 1997). Participants can use their photos to identify, highlight, and represent issues of importance to them. They can write about or discuss their photographs, which can be shared with others if desired. Photovoice enables researchers to understand the issue under study (Barraza, 2020; Breny & McMorrow, 2021; Nykiforuk et al., 2011). After the second time practicing forest bathing, participants used their phones to take photos in Wolf Swamp Preserve. Their prompt was "What would you want to share about your forest bathing experience?" They were also invited to complete another photovoice after practicing forest bathing for the third and last time at Old Town Park Beach. Back in the classroom, participants selected one photo that best showed their forest bathing experience. They wrote captions about their photographs describing their forest bathing experiences and responded to the following prompt: "What are you showing the viewer about the forest bathing experience?" Seeing participants' photos and reading their descriptions and captions gave me a more authentic and nuanced insight into their experiences than I would have received from only the survey results and observations during practicing forest bathing.

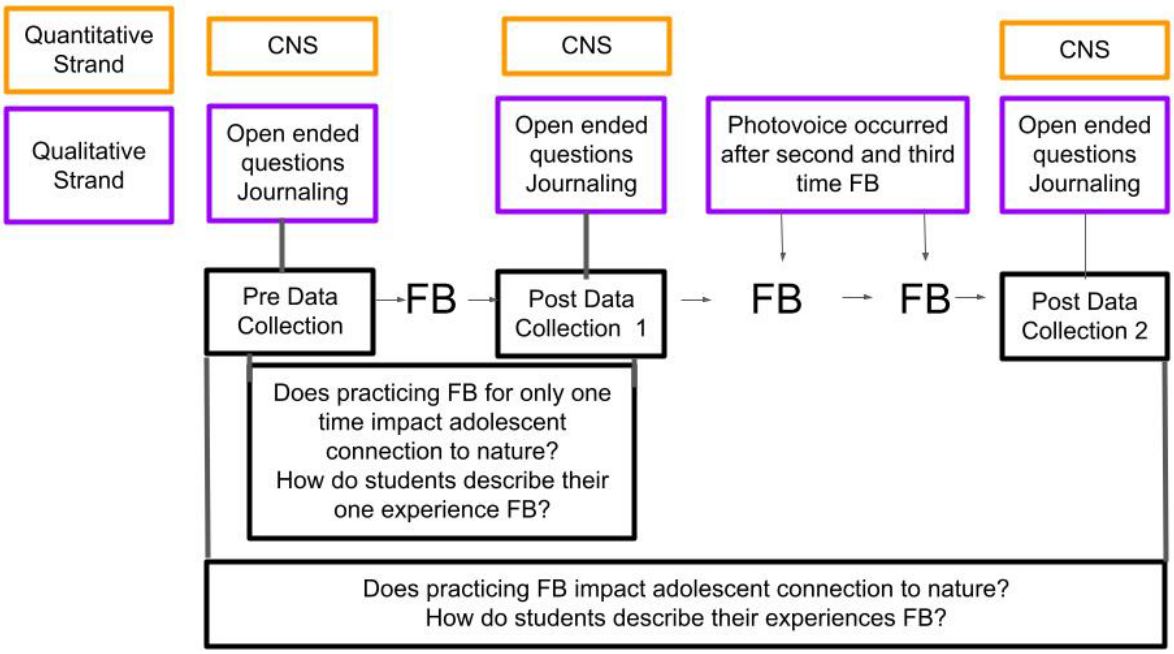
Procedure

Figure 4.2 presents the flow of the data collection and procedure. Data were collected before forest bathing, after forest bathing once, and at the end of the entire 3-week forest bathing series. Data was gathered after one forest bathing experience as some members of the Forest Therapy Guide community were curious about the impact of a single forest bathing walk (Page, 2021b). I wanted to address this curiosity I determined how changes in connection to nature after

one walk compared to any changes that occurred after completing a series of 3 walks over 3 weeks.

Figure 4.2

Procedure for Convergent Parallel Mixed Methods



To determine participant connection to nature before forest bathing, participants completed the CNS survey with a free-response prompt (see Appendix A) in Google Forms during the class the day before forest bathing. The next day, the I guided participants through a 90-minute shortened version of the North American forest therapy sequence of forest bathing at Wickapogue. This shortened version included a reduced 5-minute what's-in-motion invitation instead of the typical 15–20 minutes. It also included one to three partnership invitations instead of the typical two to five partnership invitations, and a 5-minute sit spot instead of a 10–20-minute sit spot.

We started the first walk inside the Richard Fowler Preserve and finished with the sit spot and tea ceremony at Wickapogue Pond. After completing the final tea ceremony of forest bathing, all 24 participants immediately completed post-CNS surveys in Google Forms on their phones. They also responded to the following prompt we added to the end of the CNS survey: "Describe what your forest bathing experience was like, including any impacts on your well-being or connection to nature you may have experienced." Participants also had an opportunity to journal about their experience in response to the prompt, "Describe your experience of forest bathing and compare your experience to what you thought the experience would be like" (see Appendix B). Participants who could not access the Google form on their phones were given a paper copy of the survey to complete. Completing the survey, responding to the prompt, and journaling took participants approximately 10 minutes. Before completing the CNS and questions, participants were reminded that the data would be deidentified and that they should respond truthfully about their experiences.

Six days later, the I took the 24 participants to the Wolf Swamp Preserve to practice forest bathing for the second time. We changed locations because of construction noise near the Richard Fowler Preserve. Wolf Swamp Preserve is more remote, and we thought it would have less human-created noise. I led participants in forest bathing by following the same sequence as the first. After completing the final tea ceremony, participants had 10 additional minutes in the nature preserve to use their phones as cameras to document their most meaningful experiences forest bathing through photovoice (see Appendix C). Before taking pictures for their photovoices, participants were reminded that their names would be removed from the photovoice and that they should document whatever was most meaningful to them. Participants choose to take pictures of themselves, the nature preserve, and each other in the nature preserve. The next

day, participants each selected one photo, gave voice to the photo by writing a descripton and caption describing the selected photo, then uploaded the photo, its description and caption to a Google Doc. Participants also added their photovoice to a shared Google Slides presentation to share with the whole class, the school, or on social media.

Because of concern for ticks in the woods, we again relocated our practice. The third time forest bathing took place 5 days after the second, on the ocean beach of the Old Town Park, which we also thought would have less human-created noise than the Richard Fowler Preserve. I again led participants in practicing forest bathing by following the same sequence as the first and second times. After completing the final tea ceremony of forest bathing, the 16 participants immediately completed post-CNS surveys in Google Forms. They also responded to the following prompt we added to the end of the CNS survey: “Describe what your forest bathing experience was like, including any impacts on your well-being or connection to nature you may have experienced.” Participants who could not access the Google form on their phones were given a paper copy of the survey to complete. Before completing the CNS and questions, participants were reminded that the data would be deidentified and that they should respond truthfully about their experiences. After completing the surveys, participants were also invited to complete another photovoice using their phones as cameras. Participants were also given an opportunity to journal about their forest bathing experiences. If participants chose, the next day, they could select and upload a photo with a description and caption, giving voice to the photo, to a Google Doc. They could also add the photovoice to the shared Google Slides presentation as mentioned previously.

Quantitative Analysis And Results

Quantitative Analysis

To determine significance, the I used the Microsoft Excel descriptive statistics function to determine that the data were normally distributed, with low skewness and kurtosis, to select the appropriate types of analyses. As the data were normally distributed, I performed a one-factor ANOVA analysis to determine if there were significant differences among all three groups. I also used a Tukey-Kramer post hoc test to examine pairwise differences between groups because the number of participants dropped from 24 to 18 between the second and third time forest bathing, so there were different sample sizes. An alpha level of 0.05 was used for statistical significance. I shared the results of these analyses with my YPAR co-researchers for use in their in-class research project.

Hedges-*g* was used to determine the effect size of practicing forest bathing. Hedges-*g* is considered appropriate when evaluating responsiveness in single-group prepost studies, particularly when comparing samples of different sizes (Lakens, 2013) or small sample sizes (Grissom & Kim, 2005). Hedges-*d* was also chosen as it is an effect size statistic often used in nature connection studies and meta-analyses (Collado et al., 2020; Ellis, 2010; Sheffield et al., 2022; van de Wetering et al., 2022), and I wanted the results of this study to be comparable with other studies on adolescent connection to nature.

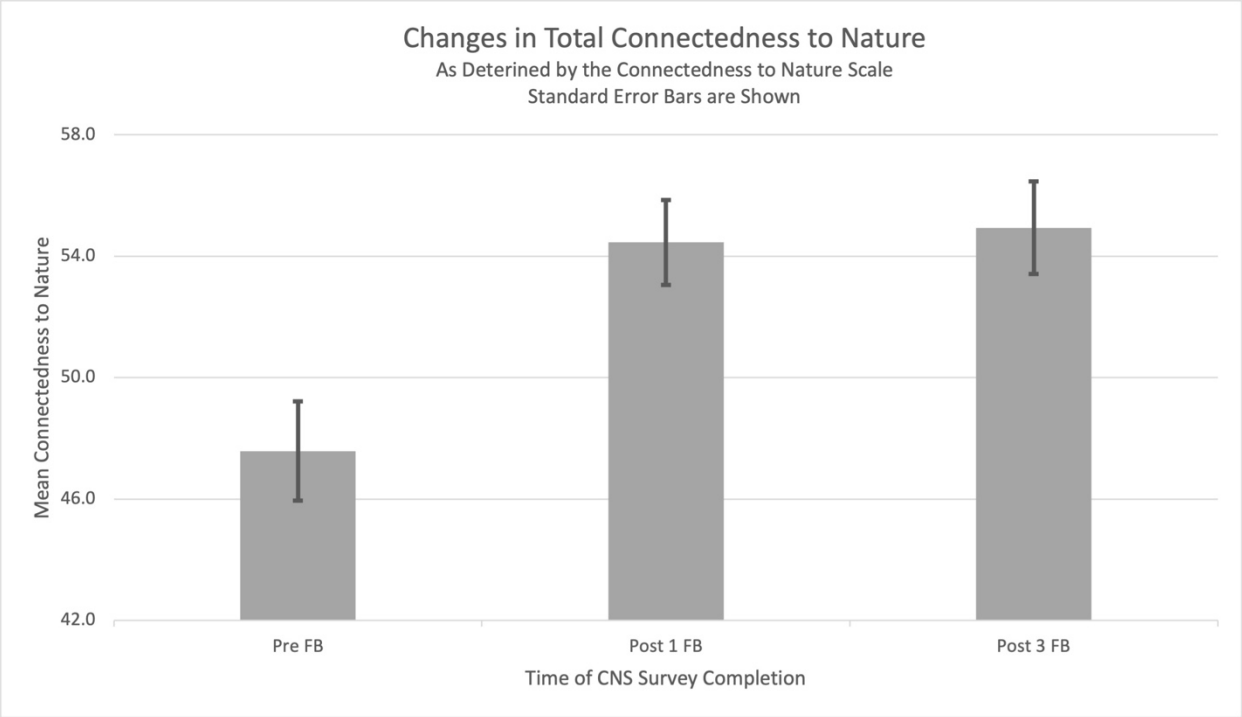
Quantitative Results

Mean total connectedness to nature, as measured by the CNS, increased significantly after participants practiced forest bathing (see Figure 4.3). A single-factor ANOVA analysis of all three groups showed that the difference among all three groups was significant ($p<0.01$). After one time forest bathing, mean connectedness to nature increased from 47.6 ± 1.6 to $54.5 \pm$

1.4 ($p<0.01$). This 6.9-point increase showed a large effect size (Hedges $g = 0.9$). Practicing forest bathing three times further increased connectedness to nature to 55.0 ± 1.5. This is a large effect size (Hedges $g = 1.0$) and significant compared to the preforest bathing survey score ($p<0.01$). The difference in connectedness to nature between one and three times was small (0.5) and nonsignificant.

Figure 4.3

Changes in Total Connectedness to Nature Graph



In addition, before forest bathing, participants had a median average connectedness to nature score of 3.5, which is considered average (Mayer & Frantz, 2004). After forest bathing once, participants' median average connectedness to nature score increased to 4.0, which, according to Mayer and Frantz (2004), is considered a high score. Connectedness to nature remained at 4.0 after forest bathing three times.

Qualitative Analysis And Findings

Qualitative Analysis

To analyze the qualitative data, I printed participants' anonymized journal entries and their responses to the end of the survey prompts and shared them with her YPAR co-researchers. I then read through the text. To analyze participants' expectations of their forest bathing experiences, I used participant responses to the end of the presurvey prompt. To analyze participants' descriptions of their forest bathing experiences, I used participants' post-one-time forest bathing and post-three-times forest bathing journal entries and responses to the end of the survey prompt. The second time we read through the text, my YPAR co-researchers and I separately highlighted specific words and phrases, made notes, and formed initial codes. I also coded participants' captions and descriptions while viewing each photovoice in Google Docs to analyze the photovoice data, and some YPAR co-researchers also chose to do this.

After the YPAR concluded at the end of the school year, I created three documents. I took all the participants' anonymized responses to the end of the presurvey prompt and placed them in one document. Then, I did the same for all the post-one-time forest bathing and post-three-times forest bathing journal entries and participants' responses to the end of the post survey prompt. I uploaded all documents separately into NVivo software and did a second coding round in NVivo. During coding on paper and in NVivo, I was looking for similar patterns and themes. Four themes emerged: connection to nature, noticing nature, gratitude for nature, and care for nature. These are described below, with all participants' names changed to pseudonyms.

Qualitative Findings

Connection to Nature

Connecting with nature was the most common coding of participants' journals and open-ended questions. Some participants described their forest bathing experiences in a way that implied their original perception was of nature being somewhere else and separate, such as Jack and Mollie, respectively, with, "I found a connection I previously lacked" and "It will also help me connect to nature and feel closer to it." Other participants described their experiences in a way that implied they view themselves as part of nature, such as Alexis, who placed themselves within a community of beings with statements like, "I see a community that I am part of." Or Sam, who wrote, "I loved just closing my eyes and listening to the forest around me and just becoming fully immersed with nature." Some, like Frank, appreciated connecting with other participants as well when they wrote that "it was nice to reflect with others. It made us feel more connected."

Meanwhile, Chris's photovoice (see Figure 4.4) caption described their connection reflected in the beings in the forest: "I felt that the branch wrapped around the tree represented that everything and everyone is connected, especially with nature." Chris was not the only participant who mentioned specific beings. Kevin and Aby, respectively, wrote "I talked to a rock which sounds silly, but it helped organize my thoughts" and "I sat on a nice bridge as well as picked a tree to get to know."

Figure 4.4

Chris's Photovoice

	I felt that the branch wrapped around the tree represented that everything and everyone is connected, especially with nature. We are all intertwined. Of course the tree is connected with its own branch but since I noticed the tree while on the forest bathing experience I thought of it as a coincidence since that is one of the parts about forest bathing, to begin to feel more connected to nature.

Some, like Brandon, described the quality of their existing connection to nature as deepening during forest bathing: "I thought I was already in tune with nature and had a connection with nature, but forest bathing has made this connection deeper." Others, like Kelly, wrote about finding a part of themselves that they once had, lost, and was regained while forest bathing. She wrote in her journal, "I definitely think that forest bathing has rekindled my connection with nature."

Noticing Nature

The theme of noticing nature included both expressions of noticing and increased awareness of the forest bathing locations. Participants like June described the process of forest bathing as facilitating more awareness: "It made me become more aware of my surroundings,"

which, according to Luna, helped them notice more: “I noticed things I probably wouldn't normally notice.” Some, such as Jakes and Juan, respectively, also paired increased connection to themselves and nature with their increased awareness: “There was time to focus on yourself and talk to yourself to realize what you need to work on” and “I was able to fully connect myself with nature and become very aware of the surroundings.” Emma’s photovoice (see Figure 4.5) connected noticing to feeling soothed by nature. Others highlighted how the sharing circle made them more aware, like Jaz with, “I liked how there were different invitations to complete that allowed us to speak to our classmates and see other people’s perspectives” on what they were noticing.

Participants said slowing down while forest bathing helped them take the time to notice nature. For example, Kathy wrote that forest bathing “helps us slow down and change our pace so you can notice more of what’s right in front of you.” Sara continued in this theme: “Noticing all the details that have always been there have helped me slow down and enjoy moments like these.” In addition, some, like Ella and Kate, respectively, wrote about how increased sensory awareness also added to their noticing nature: “I got to use all of my senses during the experience,” and “I paid very close attention to the sounds and smells around me”.

Figure 4.5

Emma's Photovoice

	Forest Bathing allows you to really notice your surroundings, and take everything in. It allows you to focus on something that you would normally not give a second thought. You notice the different shades of green and the different texture of everything. You really take the time to just look. Noticing every little detail can be soothing.

Gratitude for Nature

Participants described gratitude for nature, often by expressing appreciation, like Noah, Sam and Kim, respectively: "This experience gave me a deeper appreciation for nature," and "I believe that after this trip I may begin to understand more of my place on earth and be more appreciative of the nature that surrounds me," and "I am very thankful to have gotten the chance to further connect with nature." Sometimes gratitude was linked to the variety of experiences that can happen in nature, as illustrated in Julie's photovoice (see Figure 4.6) where she highlighted the sit spot. Also, Kyla and Andy wrote: "This experience allowed me to appreciate the different aspects of nature," and "Finding the two turtles allowed me to have a greater appreciation for the little things." Some participants like Dylan also linked their gratitude to increased awareness: "After three experiences of forest bathing, I feel way more appreciative of nature and more

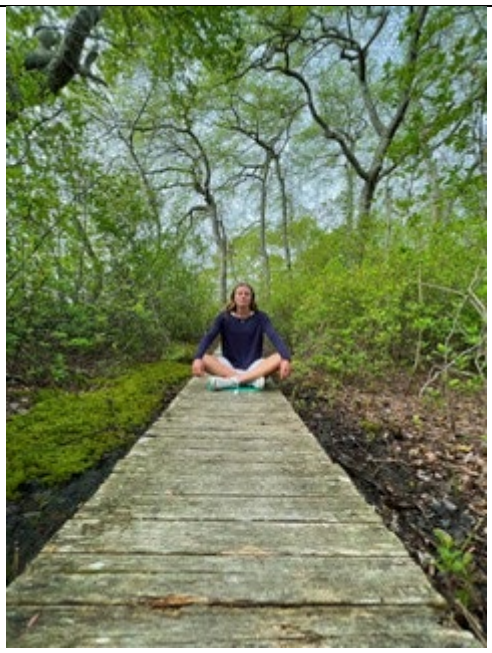
aware of the nature around me." For others, like Mike and Lori, respectively, time outside without technology led to their gratitude and even relaxation:

> As someone who spends most of their time indoors and online, my forest bathing experience was extremely eye-opening. It was very relaxing to disconnect from the online world and clear my mind. This experience gave me a deeper appreciation for nature.

and, "they were relaxing and calming. It benefited my peace of mind, and any anxieties and stresses I had were gone."

Figure 4.6

Julie's Photovoice

	I am showing the viewer where my sit spot was and how relaxed I was while sitting. During this picture, I was enjoying the sunlight and birds chirping.

Care for Nature

Participants indicated care for nature stating a desire for or imperative to care for and protect nature, which they did in a variety of ways. For example, Sam linked their care for nature to their connection to nature: "I realized how much I truly care about the things in nature and

now feel like I am connected to the web of life." Some, like Jasmine, wrote about the imperative of moving people's perception from being anthropocentric to more ecocentric: "we should start appreciating beaches as more than just an area for us, but an area for other types of organisms." Others like Kayleigh expressed that it is critical to keep all environments in mind when considering conservation: "All forms of nature are important in their own ways. It's important to know that all ecosystems deserve to be protected." Laura's photovoice (see Figure 4.7) also highlighted how the walk increased her awareness of the "impact human presence has on the natural world."

In addition, some participants framed their caring for nature in terms of compassion. For example, Carlos wrote, "It gave me more compassion for nature and the organisms within it." Similarly, Olive shared feelings of love and empathy for nature when they wrote in their journal, "I think it shows us as humans how we have empathy when it comes to creatures smaller than us, and how we can find love for them more than they could ever imagine for us."

Figure 4.7

Laura's Photovoice

This photo shows the viewer how delicate nature truly is. It was a simple human disturbance that caused the bunny to run away from its sitting position. This disturbance demonstrates the impact human presence has on the natural world and how humans affect it both intentionally and unintentionally. This interaction helped me change my pace as I was standing still when the bunny began to move. Understanding the impact humans have on the natural world inspired me to become immersed in nature and enter "nature mode" for the remainder of the field trip.

Discussion

My goal was to determine the impact of practicing forest bathing on adolescents' connection to nature and to explore adolescents' experiences of forest bathing. The 6.9-point increase in the mean connectedness to nature, from 47.6 ± 1.6 to 54.5 ± 1.4, as measured by the CNS survey, suggests that practicing forest bathing, even just once, significantly increases adolescent connection to nature (p<0.01) with a large effect size (Hedges g=0.9). However, the

slight 0.5 increase in mean connectedness to nature between one and three times forest bathing was nonsignificant. In addition, participants' descriptions of their experiences practicing forest bathing indicated they found the experience increased their connection to nature, awareness of nature, gratitude, and care for nature. All four traits have been linked in previous research to increased environmental care and concern (Barbaro & Pickett, 2016; Chawla, 2020; Clayton et al., 2017; Cleary et al., 2018; Elliot et al., 2014; Nisbet et al., 2019; Tam, 2013; Tseng & Wang, 2020). Three primary factors could contribute to forest bathing's positive impact on adolescent nature connection. These factors include forest bathing practitioners set an intent for their forest bathing walk; forest bathing takes place outside, often in nature; and the structure of the forest bathing walk.

Setting an Intention for the Walk Supports Increased Nature Connection

Before going for the first forest bathing walk, several participants indicated they were anticipating an increase in their nature connection. For example, Molie wrote, "It will also help me connect to nature and feel closer to it." This anticipation, combined with setting an intention before a forest bathing walk, may be a factor that facilitates forest bathing increasing nature connection in practitioners. This is because setting an intention before an experience can influence the outcome (Di Malta et al., 2019) or perceptions of the outcome in both adults (Sibthorp, 2003; Sibthorp & Authur-Banning, 2004) and adolescents (Beauchamp et al., 2011). In contrast to going for a nature walk, or merely spending time in nature, practicing forest bathing involves cultivating a healing connection with the forest or nonhuman beings wherever it is practiced (Clifford, 2018; Page, 2019, 2021a). More specifically, Pasanen et al. (2018) found that the person's intent significantly affects the outcome of nature visits. In other words, because

forest bathing practitioners engage in forest bathing with the anticipation of and intent to connect and cultivate a relationship with nature, it supports increasing their connection to nature.

Some participants, like Sam, also anticipated being more grateful for nature when they wrote, “I believe that after this field trip, I may begin to understand more my place on earth and be more appreciative of the nature that surrounds me.” Anticipating these positive effects could be partially responsible for the significant increase in measured adolescent mean connectedness to nature after forest bathing. This finding aligns with other research that showed when adolescents set an intention before an activity, it influences both the outcome and perceptions of the activity (Beauchamp et al., 2011).

Forest Bathing Takes Place Outside, Which Supports Nature Connection

Sam wrote, “I loved just closing my eyes and listening to the forest around me and just becoming fully immersed with nature.” Indeed, the most apparent reason that forest bathing increased participants’ connection to nature is that forest bathing takes place outside in nature. As mentioned in the introduction, many studies and reviews of these studies have shown that people who spend more time in nature have a greater connection to nature (Barrable, 2019; Chawla, 2020; Cheng & Monroe, 2012; Elliot et al., 2014; Larson et al., 2019; Sheldrake et al., 2019; Soga et al., 2018). However, in addition to forests, forest bathing can be practiced in any environment, including more built environments like urban parks or hospital and nursing home gardens (Antonelli et al., 2022; Hansen et al., 2017; Sauerlender, 2021; Tsao et al., 2022; Zhou et al., 2019). In this study, participants were guided through the forest bathing sequence twice in a forested environment and once in an open beach environment (see Figure 4.1).

This is important because, as mentioned previously, adults who show more proenvironmental behavior spent more time outside in nature as children and have a higher

connection to nature (Chawla, 2020; Cleary et al., 2018; Elliot et al., 2014; Tam, 2013). More importantly, a connection to nature is an essential part of human development (Chawla, 2021; Nussbaum, 2011) and, therefore, vital to cultivate. Despite this, adolescence is often a time of reduced engagement in natural environments as adolescents turn their attention to friends, electronics, sports, and academics (Chawla, 1992, 2021; Larson et al., 2019; Eames et al., 2018), and thus a time of lower nature connection (Hughes et al., 2019; Richardson et al., 2019). Some participants' journal entries, such as Lori's, showed awareness around this when they wrote: "As someone who spends most of their time indoors and online, my forest bathing experience was extremely eye-opening."

Hughes et al. (2019) called adolescence a "critical" (p. 268) time for reengagement with nature to increase connection to nature. Adolescents practicing forest bathing could be a way to rekindle or strengthen that connection, as shown in Brandon's journal: "I thought I was already in tune with nature and had a connection with nature, but forest bathing has made this connection deeper." Forest bathing could also provide an opportunity to create a crucial connection to nature that did not have a chance to develop in childhood, as Jack expressed when he wrote that he thought he found "a connection that I previously lacked."

In this study, participants' connection to nature increased significantly. These results are aligned with McEwan et al.'s (2022) study of Scouts practicing forest bathing outside in a park in London. However, neither this nor McEwan et al.'s study compared practicing forest bathing with spending time outside without a contemplative practice. Some researchers, such as Nisbet et al. (2019) and Unsworth et al. (2016), have investigated combining contemplative practices with time outside. Both these studies reported a larger increase in connection to nature in participants who combined walking meditation (Nisbet et al., 2019) and meditation (Unsworth et al., 2016)

with time outside than those who were just in nature. Forest bathing's effectiveness could be related to it being a contemplative practice that takes place outside and invites creating relationships with the more-than-human world (Clifford, 2018; Page, 2019, 2021a). These relationships are essential to cultivating nature connection (Chan et al., 2016; Chawla, 2021). Journal entries, like Olive's, reflected this: "I think it shows us as humans how we have empathy when it comes to creatures smaller than us, and how we can find love for them more than they could ever imagine for us."

The Structure of the Forest Bathing Walk Support Developing a Connection to Nature

Several participants highlighted how different parts of the forest bathing walk increased their connection to nature. For example, Jaz wrote in her journal, "I liked how there were different invitations to complete that allowed us to speak to our classmates and see other people's perspectives." Jaz's entry shows how forest bathing provides social interactions with people during shared encounters with nature, a component of active engagement that increases nature connection more than passively spending time in nature (Chawla, 2015, 2021; Jordan & Chawla, 2019; Ojala, 2016). Other participants' journal entries, such as Jakes with "There was time to focus on yourself and talk to yourself, to realize what you need to work on" showed how their experience forest bathing included additional elements, such as time for autonomy and discovery, through which young people can come to know nature, as described by Chawla (2021). In addition, the walk's structure creates more opportunities for open awareness than merely spending time in nature. This is important because open awareness increases one's connection to nature (Barbaro & Pickett, 2016; Clayton et al., 2017; Nisbet et al., 2019; Tseng & Wang, 2020). As a nature-based contemplative practice, forest bathing creates these

opportunities through a sequence with many elements that encourage active engagement and a shift to open awareness.

Participants noticed this shift, as Juan wrote that he was "able to fully connect myself with nature and become very aware of the surroundings." This shift to more open awareness is accomplished in several ways. At the beginning of a forest bathing walk, participants check in with their bodies while being guided through their senses. They are also invited to notice what they are experiencing to encourage awareness and openness to experience before then being invited to slow down to notice what is moving in the forest. Slowing down, paying attention, and increasing open awareness, as mentioned previously, can increase opportunities for nature connection (Chawla, 2020; Elliot et al., 2014; Larson et al., 2019; Leong et al., 2014; Sobko et al., 2018). Participants journaled how slowing down made them more aware of the nature preserve. For example, Kathy described how forest bathing "helps us slow down and change our pace so you can notice more of what's right in front of you," whereas Sara wrote how "noticing all the details that have always been there have helped me slow down and enjoy moments like these."

Other elements of forest bathing supported increasing participants' connection to nature. For example, during a forest bathing walk the guide offers participants several open-ended partnership invitations, directing participants' attention and encouraging active engagement and relational interactions. These can support an increased connection to nature (Chan et al., 2016; Chawla, 2021) through the curiosity, play, and creativity that can arise from participants exploring these invitations. It is important to note that the invitations are just that—invitations—and not commands or even prescribed activities, as noted by Jaz: "I liked how there were different invitations to complete." This autonomy allows participants to interpret the invitation

and experience it in their own way. Autonomy while outside in safe and supportive nature spaces is also linked to increased nature connection and personal growth (Chawla, 2021; Nussbaum, 2011; Ryan & Deci, 2017). Descriptions of the various partnership invitations filled many participants' journal entries, such as, Kevin and Aby, who wrote, respectively, “I talked to a rock which sounds silly, but it helped organize my thoughts” and “I sat on a nice bridge as well as picked a tree to get to know.” The sharing circle that follows each partnership invitation allows each participant to experience nature as a member of a social group, as Frank described, “it was nice to reflect with others. It made us feel more connected.” This is similar to what Tam (2013) proposed as a collective dimension of nature connection or what Green (2018) called natural world socialization, which occurs when adults and peers encourage a positive connection with nature in a safe environment while allowing independent exploration.

Julie’s photovoice shows that participants valued the last partnership invitation, the sit-spot. She not only chose to capture the moment with a picture but also chose to write, as her caption, “I am showing the viewer where my sit spot was and how relaxed I was while sitting. During this picture, I was enjoying the sunlight and birds chirping.” The sit spot is where participants find a place alone to meditate quietly. Meditation is a mindfulness practice long shown to improve the well-being of its practitioners (Brewer et al., 2011; Greenberg & Harris, 2012; Sauer-Zavala et al., 2013). Meditation in the sit spot allows participants to begin integrating their forest bathing experience. Integrating transformative experiences, whether using psychedelic medications or rites of passage, improves the effectiveness of these experiences (Janusz & Walkiewicz, 2018; Lertzman, 2002; Morgan, 2020; Payne et al., 2021; Wagstaff, 2011). In addition, meditation outside in nature also increases connection to nature (Nisbet et al., 2019; Unsworth et al., 2016).

The gratitude participants expressed may have been strengthened during the last part of a forest bathing walk, where the guide creates a tea ceremony ritual. For example, Lori and Kim wrote, respectively, “This experience gave me a deeper appreciation for nature,” and “I am very thankful to have gotten the chance to further connect with nature.” Here, participants gather one last time to share tea, food, and stories and express gratitude. Expressing gratitude, as occurs in the tea ceremony, has been shown to increase happiness and motivate self-improvement and positive change (Armenta et al., 2017; Davis et al., 2016; Komase et al., 2021; Wood et al., 2010), including in adolescents (Bono et al., 2020; Froh et al., 2008). This is another reason forest bathing may be such a powerful practice. It could motivate constructive hope, which is the capacity to face environmental challenges, while finding positive meaning in taking action (Ojala, 2016, 2017, 2018), as discussed further on.

Other Benefits of Forest Bathing

Participants frequently journaled about forest bathing reducing their stress, such as "They were relaxing and calming. It benefited my peace of mind, and any anxieties and stresses I had were gone." This is not surprising. As mentioned in the introduction, practicing forest bathing also has many research-backed health benefits for its practitioners, including lowering blood pressure (Bikomeye et al., 2022; Dogaru, 2020; Hansen et al., 2017; Lee et al., 2012; Li et al., 2011) and salivary cortisol, indicating reduced stress levels (Hansen et al., 2017; Kuo, 2015; Li et al., 2011; Sung et al., 2012). Decreased stress has positive health outcomes, including improved sleep, immune function, and reduced inflammation (Hansen et al., 2017; Kuo, 2015). Additional data on mental well-being gathered at the same time as this study showed a significant increase in adolescent mental well-being (Keller et al., 2023), which aligns with McEwan et al.’s (2022) findings. These findings are important as the rates of anxiety and

depression in teenagers have increased dramatically in the US between 2007 and 2021(Centers for Disease Control (CDC), 2021; Geiger & Davis, 2019; McCarthy, 2019). These rates increased further in 2020 during the COVID pandemic (Catty, 2021; CDC, 2021; Czeisler et al., 2020; Singh et al., 2020; Styck et al., 2021).

Many studies have shown a link between spending time in green spaces, such as forests, nature preserves, and parks, or blue spaces, such as outdoor water environments, and improved mental and physical well-being (Adams & Beauchamp, 2020; Beyer et al., 2014; Britton et al., 2020; Chawla, 2014, 2020, 2021; Faber Taylor & Kuo, 2011; Kuo, 2015; White et al., 2019). In addition, the sequence of forest bathing allows many opportunities for interactions with nature to improve adolescents' mental well-being (Bang et al., 2018; Hohashi & Kobayashi, 2013; Keller et al., 2023; McEwan et al., 2022). Similarly to an increased connection to nature, increased well-being may come, at least partly, from practicing forest bathing outside in green or blue spaces.

Several participants also highlighted their interactions with the more-than-human-world, such as "Finding the two turtles allowed me to have a greater appreciation for the little things" and "It was a simple human disturbance that caused the bunny to run away from its sitting position. This disturbance demonstrates the impact human presence has on the natural world and how humans affect it both intentionally and unintentionally." They may have noticed these beings as a forest bathing walk is structured to strengthen practitioners' relationships with nature, which may further contribute to this practice's mental well-being benefits. These relationships may also include affiliations with other species, a part of human flourishing (Nussbaum, 2011), and thus are an essential part of a young person's development (Chawla, 2021).

Some participant journal entries also included expressions of care and concern for nature, such as “I realized how much I truly care about the things in nature and now feel like I am connected to the web of life” and “All forms of nature are important in their own ways. It is important to know that all ecosystems deserve to be protected.” Spending time in nature can relieve adolescents' ecoanxiety, a particular type of anxiety caused by environmental degradation (Baudon & Jachens, 2021; Berman et al., 2012; Ojala, 2018), by providing opportunities for adolescents to experience more intact ecosystems and perhaps learn to care for their local place (Baudon & Jahens, 2021; Chawla, 2014, 2015, 2020; Ojala, 2018; Pihkala, 2020). Specific recommendations for treating ecoanxiety include encouraging young people to take action, finding social connection and emotional support, and connecting young people with nature (Atkinson, 2022; Baudon & Jachens, 2021), all of which may help alleviate the sadness and worry related to environmental destruction and generate constructive hope (Chawla, 2020; Ojala, 2016, 2018).

Interestingly, forest bathing was notably absent in Baudon and Jachen's (2021) review of interventions for the treatment of ecoanxiety. Forest bathing not only takes place in nature, it is a contemplative practice (Page, 2021a) shown to relieve depression and anxiety (Hansen et al., 2017; Keller et al., 2023; Markwell & Gladwin, 2020; McEwan et al., 2022; Zhou et al., 2019). Adding a nature-based contemplative practice like forest bathing to time spent outside in nature could enhance the ecoanxiety-relieving properties of spending time outside in nature and foster constructive hope and resilience in the face of environmental degradation.

Conclusion

Although this investigation had a small sample size and participants practiced an abbreviated forest bathing walk once a week for 3 weeks, these findings suggest that practicing

forest bathing, even just once, increases adolescent connectedness to nature and that adolescents practicing forest bathing is an important area of research that merits further exploration. Exploring the difference between adolescents practicing forest bathing outside in nature with those spending time outside in nature or engaging in other contemplative practices outside in nature in an experimental study is a logical next step to tease out the practice's effects. In addition, it would be interesting to study the impact of practicing forest bathing for a longer time, such as practicing for more than 90 minutes or more than 3 weeks. Determining the duration of the effects would also be helpful, as this could help determine how often forest bathing must be practiced to realize its benefits over an extended time. Also, to further strengthen our understanding of forest bathing's impact on adolescent connection to nature, future research could include participants from a variety of contexts as well as participants who are not my students, which could minimize participant bias and adolescents in settings other than high schools.

Schools and communities are searching for ways to engage adolescents in the care of Earth. Practicing forest bathing could become part of a place-based pedagogy designed to cultivate environmental care and concern. Forest bathing does not require special equipment and has the additional benefit of increasing adolescent mental well-being, so it could also satisfy social-emotional learning standards in many schools. Returning to Rachel Carson's words of wisdom, when adolescents have the opportunity to focus their attention on the wonders and realities of the world, the less taste they will have for its destruction and the more hope and motivation to act for its care and repair.

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Chapter 5 Conclusions, Implications and Recommendations

Summary

My goal was to determine the impact of practicing forest bathing on adolescents' mental well-being and connection to nature and to explore adolescents' experiences of forest bathing to answer the research questions:

1. How does practicing forest bathing impact adolescents' mental well-being and connection to nature?
2. What are adolescents' experiences of practicing forest bathing?
3. How can forest bathing bridge SEL and place-based education programs?

Both mental well-being and connection to nature increased in participants in this study. The 6.5 point increase in the mean mental well-being, from 47.8 ± 3.2 to 54.3 ± 4.0 as measured by the WEMWBS survey, suggests that practicing forest bathing, even just once, significantly increases adolescent mental well-being (p<0.01) with a moderate effect size (Hedges g=0.7). Practicing forest bathing three times had a large effect size (Hedges g = 1.0) and further increased participant mean mental well-being by two points to 56.3± 4.0. Also, based on the pre-forest bathing survey, three participants did meet the threshold for possible/mild depression and six the threshold for probable depression. After practicing forest bathing once, no participants met the threshold for possible/mild depression, and the number of participants meeting the threshold for probable depression decreased to three. In addition, participants' descriptions of their experiences practicing forest bathing indicated they found the experience relaxing, that forest bathing increased their mindful awareness, and that they felt like they got away from their everyday experiences. All three of these traits have been linked in previous research to improved

mental well-being (Carmody, 2015; Korpela & Hartig, 1996; Lawlor, 2016; Taren et al., 2015; Wood et al., 2018).

The 6.9-point increase in the mean connectedness to nature, from 47.6 ± 1.6 to 54.5 ± 1.4, as measured by the CNS survey, suggests that practicing forest bathing, even just once, significantly increases adolescent connection to nature ($p<0.01$) with a large effect size (Hedges $g=0.9$). However, the slight 0.5 increase in mean connectedness to nature between one and three times forest bathing was nonsignificant. In addition, participants' descriptions of their experiences practicing forest bathing indicated they found the experience increased their connection to nature, awareness of nature, gratitude, and care for nature. All four traits have been linked in previous research to increased environmental care and concern (Barbaro & Pickett, 2016; Chawla, 2020; Clayton et al., 2017; Cleary et al., 2018; Elliot et al., 2014; Nisbet et al., 2019; Tam, 2013; Tseng & Wang, 2020).

Also as mentioned in each manuscript, three primary factors could contribute to forest bathing's positive impact on adolescent well-being and nature connection. These factors include forest bathing practitioners set an intent for their forest bathing walk; forest bathing takes place outside, often in nature; and the structure of the forest bathing walk. All of these are discussed in detail in the manuscripts in Chapters 3 and 4.

Therefore, I devote Chapter 5 to further expanding on the implications and recommendations for research, educational policy and practice in the three papers.

Limitations

As this is a manuscript-format dissertation, a discussion of the conclusions of my research, limitations, implications and recommendations are also described in each of the

manuscripts. Limitations of this research include that this research had a small sample size and participants practiced an abbreviated forest bathing walk once a week for 3 weeks and that participants were my own students. Therefore, next steps could include exploring the difference between adolescents practicing forest bathing outside in nature with those spending time outside in nature or engaging in other contemplative practices outside in nature. Additional next steps could be to study the impact of practicing forest bathing for a longer time, such as practicing for more than 90 minutes or more than 3 weeks. Because part of my goals was to determine how forest bathing could fit into a school's SEL programming, investigating shorter times forest bathing that could fit into a school's schedule would also be important. Also, to further strengthen our understanding of forest bathing's impact on adolescent connection to nature, future research could include participants who are not my students, which could minimize participant bias, and also include adolescent participants in settings other than high schools.

In addition to the limitations described above, it's important for me to note that although my school district is a high-poverty district (United States Department of Education, 2018), it is also a highly-resourced district due to high real estate values (Frank, 2023). This meant that I had an easier time not only conducting my research, but also acting on the implications of my research, than I might in another under-resourced district. My school is able to provide bussing for field trips so students could forest bathe in areas off the school campus. However, as I describe in the manuscripts and below, forest bathing can be practiced anywhere. Creating opportunities for adolescents to connect to nature in their place is critical in any environment.

Recommendations For Research

These finding suggest that practicing forest bathing, even for a single session, increases adolescent connectedness to nature and that adolescents practicing forest bathing is an important

area of research that merits further exploration. One recommendation I make is to exploring the difference between adolescents practicing forest bathing outside in nature with those merely spending time outside in nature, or engaging in other contemplative practices outside in nature, in an experimental study to tease out forest bathing's effects. Second, I recommend similarly exploring the difference between adolescents in an SEL program practicing forest bathing with those in the same program who do not practice forest bathing. Third, I recommend also exploring the difference between adolescents in an SEL program spending time outside in nature with those in the same program who do not spend time outside in nature.

In addition, I recommend researching the impact of practicing forest bathing for a longer time, such as practicing for more than 90 minutes, or more than 3 weeks. Determining the duration of forest bathing's effects would also be helpful, as this could help determine how often forest bathing must be practiced to realize its benefits. To further strengthen our understanding of forest bathing's impact on adolescent connection to nature, future research could include participants who are not a researcher's students, as well as adolescents in settings other than high schools and adolescents living in locations other than Southampton, New York, United States.

Recommendations For Educational Practice

Forest bathing or time outside in nature incorporated into SEL programs.

My first recommendation is that SEL programs incorporate forest bathing, or at least time outside in green spaces, into their programs. This is a critical expansion of SEL programs for two reasons. First, schools are seeking ways to alleviate adolescents' anxiety and depression and improve their mental well-being. Second, schools want to increase students' ability to pay attention and focus. Practicing forest bathing or spending time outside in nature is a way to satisfy both of these needs.

Sadly, only some, if any, SEL programs incorporate increasing student time in nature to increase mental well-being. This is despite the well-documented benefits of spending time in green spaces, such as forests, nature preserves, and parks, or blue spaces, such as outdoor water environments, and such as improved mental and physical well-being (Adams & Beauchamp, 2020; Beyer et al., 2014; Britton et al., 2020; Chawla, 2014, 2020, 2021; Faber Taylor & Kuo, 2011; Kuo, 2015; White et al., 2019). These benefits include alleviating the symptoms of anxiety, depression (Bratman et al., 2019; Kuo, 2015; Hansen et al., 2017), and post-traumatic stress disorder (Anderson et al., 2018; Poulsen et al., 2016; Westlund, 2013) Therefore, Increasing student time outside in green spaces, such as parks, gardens, and nature preserves is a crucial expansion of SEL programs in schools.

As mentioned in previous chapters, in addition to general anxiety and depression, young people also suffer from ecogrief or ecoanxiety, a particular type of anxiety caused by environmental degradation (Baudon & Jachens, 2021; Berman et al., 2012; Ojala, 2018). Schools must recognize this important component of adolescent anxiety and incorporate methods that specifically alleviate it into their SEL programs and classrooms. Schools can help alleviate their students' ecoanxiety by encouraging students to take action, finding social connection and emotional support, and connecting young people with nature (Atkinson, 2022; Baudon & Jachens, 2021), all of which may help alleviate the sadness and worry related to environmental destruction and generate constructive hope, the ability to see environmental challenges and uncertainties while still having the ability to take action to address serious environmental threats (Chawla, 2020; Ojala, 2016, 2017, 2018). Time outside in nature can do this by providing opportunities for adolescents to experience more intact ecosystems and learn to care for their local place (Baudon & Jahens, 2021; Chawla, 2014, 2015, 2020; Ojala, 2018; Pihkala, 2020).

In addition to alleviating student anxiety and depression, schools are concerned about students' abilities to focus and achieve academically. Children and adults with ADHD have challenges paying attention, find it challenging to remain focused on a task, retain information in short-term memory, and display hyperactivity (Brown, 2005; Wolraich et al., 2011). Children with ADHD often have behavioral and academic issues stemming from these challenges (Loe & Feldman, 2007). There are two primary treatments for ADHD: behavior therapy and stimulant medication. These two treatments are not effective for all people with ADHD and offer only limited relief from symptoms (Hinshaw & Arnold, 2015). Behavioral therapies are typically insufficient to bring children into normal functioning ranges (Hinshaw & Arnold, 2015). Stimulant medications, like methylphenidate, tend to be more effective at alleviating symptoms yet have risks and side effects (Brown, 2005; NIH, 1998; Wolraich et al., 2011).

As mentioned in Chapters 2-3, over the past two decades, there has been much research around nature as a treatment for ADHD (e.g., Faber-Taylor et al., 2001; Kuo & Faber-Taylor, 2004; Faber-Taylor & Kuo 2009, 2001; van den Berg & van den Berg, 2011; Markevych et al., 2014) literature reviews of this research (e.g., Gill, 2014; Tillman et al., 2018) and books on this topic (e.g., Louv 2008). Some suggest that ADHD is not a disorder, but instead that the built environment, indoor lifestyle, and increasing time on screens cause symptoms that are diagnosed as ADHD (Froehlich et al., 2011; Martinez-Badía & Martinez Raga, 2015) but are the effect of inadequate time outside in nature, or as Louv (2008) calls it *Nature Deficit Disorder*. Nature provides variability in stimuli and opportunities for child autonomy that are essential for healthy development (Besthorn, 2005; Chawla, 2021; Nussbaum, 2011; Ryan & Deci, 2017). These factors are often tragically absent in schools where young people spend so much time. The

absence of both of these elements may prevent appropriate development in many children, which could manifest as ADHD symptoms (Besthorn, 2005).

As I recommend below, practicing forest bathing outside in nature or spending time outside in nature does not have to be as long as the 90 minutes in this study, or the more typical 2-3 hours forest bathing. Research shows that even short periods of time outside in nature can provide relief from anxiety, depression and increase focus and creativity (Anderson et al., 2018; Besthorn, 2005; Faber-Taylor et al., 2001; Kuo & Faber-Taylor, 2004; Faber-Taylor & Kuo 2009, 2001; Nussbaum, 2011; Ryan & Deci, 2017). Therefore, it is possible for teachers and schools to incorporate small elements of a forest bathing walk to improve student well-being. These include actively connecting with the senses, noticing what's in motion, and perhaps a partnership invitation, each followed by a sharing circle.

Young people are suffering psychologically, they often have trouble focusing and retaining information, and our planet is suffering from human exploitation. I recommend schools and teachers incorporate time outside in nature, ideally incorporating a nature-based mindfulness practice, such as forest bathing, with their students. Doing this will increase students' mental well-being and connection to nature. Incorporating forest bathing and time outside in nature into classrooms could alleviate student and planetary suffering, cultivate crucial connections to nature, and foster the generation of constructive hope needed in so many young people.

Incorporate participatory methods into secondary science

Many in the US consider STEM education critical for students for the STEM content and the problem-solving and critical thinking skills it can help develop (National Science and Technology Council Committee, 2018; Bybee, 2018; Weld, 2017). However, many also consider PK-12 STEM education inadequate because of its focus on standardized assessments

instead of being focused on practical applications of STEM subjects (Funk, 2018; Kelley & Knowles, 2016; Morales-Doyle & Frausto, 2019). In other words, we do not teach students how to use the science they learn. This last critique is especially relevant and shows how science education has been tragically decontextualized (Aikenhead, 2016; Bang et al., 2013; Bang & Vossougi, 2016; Wallace, 2012), like much US public education (Benson, 2006; Camangian, 2011; Firestone et al., 2004; Wexler, 2020). Participatory methods and critical pedagogies are perspectives that challenge hegemonic assumptions about knowledge production in science education (Bang et al., 2013, 2018; Morales-Doyle and Frausto, 2021; Lodge, 2021; Schindel, 2016; Weinberg et al., 2018;). I recommend that methods such as Youth Participatory Action Research (YPAR) and Youth Participatory Science (YPS) (Radina & Schwartz, 2019; Morales-Doyle & Frausto, 2021) be included as part of the science curriculum to both challenge these assumptions and link students and their science learning to issues relevant to students.

Mirra et al. (2016) defined YPAR as "a practice of mentoring young people...engaging them in all aspects of the research cycle, from developing research questions and examining relevant literature to collecting and analyzing data and offering findings" (p. 2). YPAR can bridge the gap between a classroom curriculum and the experiences and realities of students (Cammarota & Romero, 2011). More important, however, is the way YPAR provides a space for young people to be researchers into their own experiences (Radina & Schwartz, 2019). The YPAR experience can empower young people to become aware of and liberate themselves from the institutionally supported power dynamics of school and society (Radina & Schwartz, 2019). In this way, YPAR is inspired by Paulo Freire as a mode of consciousness-raising and helps participants understand their inherent power to make changes (Ayala et al., 2018; Scott et al., 2015; Radina & Schwartz, 2019). YPS is an approach to science teaching that draws from

YPAR. However, YPS also emphasizes methods and tools of natural sciences while prioritizing young people and democratic participation in all phases of knowledge production (Morales-Doyle & Frausto, 2021).

Perspectives that challenge traditional assumptions about knowledge production in science education have called for including participatory methods and critical pedagogies in science classrooms (Bang et al., 2013, 2018; Milne, 2012; Morales-Doyle & Frausto, 2021; Poon & Cohen, 2012; Weinberg et al., 2018). I recommend that science teachers be taught about knowledge democracy, YPAR, and YPS by supporting science teachers through professional development or science teacher preparation programs. Science teachers can be encouraged to create more authentic, participatory, and expansive projects within their classrooms that focus on sustainability and justice (Albanesi et al., 2023; Bang & Vossoughi, 2016; Sadler & Dawson, 2012; Tuck & Yang, 2018; Vesterinen et al., 2016), as opposed to "reifying the cannons of science disciplines" (Morales-Doyle & Frausto, 2021, p. 62). YPAR and YPS have the additional benefit of being aligned with effective SEL programs, fostering the development of interpersonal skills, cognitive awareness, leadership, and agency (Anyon et al., 2018; Poon & Cohen, 2012). These skills are precursors to other positive outcomes such as academic success, employment, and housing stability (Anyon et al., 2018; Jenson & Bender, 2014)

My dissertation research used YPAR methods, and student journal entries described how empowering the experience was and how excited they were to create a research project that directly investigated issues vital to them, such as their well-being and connection to nature. Including YPAR and YPS in science classrooms will support students in becoming critical agents of change, integrate classrooms and schools into community issues, and increase opportunities for young people to be engaged in the issues that are important to them. Teachers,

schools, and teacher preparation programs must start to include YPAR and YPS methods as essential components of science teaching and learning.

Recommendations For Educational Policy

Make time outside in nature an educational requirement.

I recommend that there be a requirement for students to spend 120 minutes per week outside in green spaces. In New York State, students K-12 are required to spend 120 minutes a week in physical education (New York State Education Department, 2022), and thus all students have 120 minutes/week of physical education. Some states have additional requirements for unstructured play, such as recess, in addition to PE (Illinois General Assembly, 2021; Quinones, 2023; Slater et al., 2012), and there is a bill in the New York State Assembly that may make it a requirement (Quinones, 2023). Although there is no requirement for physical education or unstructured play to be outside in nature, the health and cognitive benefits of time outside in nature make it a simple solution to improving student well-being and learning. There could be requirements for students to spend school time outside in green spaces like school gardens, parks, and nature preserves.

Just as 120 minutes per week is required for physical education, 120 minutes should be required for time outside in green spaces. I recommend this because White et al. (2019) showed that 120 minutes per week outside in nature is necessary to experience the health benefits of spending time outside in nature. The 120 minutes could be divided into 25 minutes daily over a 5-day school week. It could also be all at once in a two-hour immersion, incorporating a nature-based mindfulness practice like forest bathing, which increases mental well-being in both adults and adolescents.

I recommend that students be required to spend time outside in natural settings, like school gardens, parks, nature preserves, beaches, or gardens. Even if teachers cannot take students off campus, opportunities could be provided by markers on campus for self-guided forest bathing, as described by Moyers (2023) and Sauerlender (2021). Time outside in nature can be a support that increases student well-being, creativity, and ability to focus. Policymakers, schools, and teachers must create opportunities for young people to spend time outside in natural environments.

New teachers need to be induced into the place they are teaching to support place-conscious education.

Many teachers in my district come from out of the district, often commuting over 45 minutes each way, and thus need to learn the place in which they teach. Although my district, like many school districts, has a new teacher induction program and a state-mandated new teacher mentor program, these programs do not create connections to our community and this place for teachers to be aware of the history, ecology, or current and past community structure. I recommend that new teacher induction and mentoring programs become place-conscious. This is critical, as place-conscious education includes a place's perceptual, sociological, ideological, political, and ecological components (Gruenewald, 2003). Place-conscious education can bridge culture and ecology and help create culturally responsive education where students learn to care for both land and people in their community and beyond (Chinn, 2012; Greenwood, 2010).

Grounding education in place has decades of research to support its benefits. Including increasing academic engagement and achievement.(Bartosh et al., 2009; Danforth et al., 2008; Heaton, 2020; Lieberman & Hoody, 1998; Lloyd et al., 2018). Although justifying incorporating place-conscious education by citing increases in standardized tests scores is problematic because

standardized tests are themselves problematic (Mooney, 2018; Perry et al., 2003; Royal, 2012; Truss, 2019), can be considered oppressive (Torres, 2019) and also serve a neoliberal agenda (Gruenewald & Smith, 2007), it is a way often used to justify needed changes in education successfully.

New teacher induction programs are comprehensive and sustained professional development processes organized by a district to train, support and retain new teachers (Wong, 2005). They are not required by any state law, but many districts mandate and pay for teachers who are new to the district to attend professional development before and during the school year. New teacher induction programs must evolve (Howe, 2006), as Hawaii's did through its Kahua Induction Program (Iii & Kekahio, 2010; Thigpen, 2011), to include components to support place-conscious teaching. These components include district-facilitated opportunities to engage and collaborate with local community members, including Indigenous knowledge keepers (McKinley & Stewart, 2012), learn the history of the district's place from multiple perspectives, explore the ecology and natural history of the area, and engage in collaborative research and study to understand the unique, and universal, characteristics of their new district (Howe, 2006; Luft et al., 2011; Mendoza, 2018; Yavetz et al., 2014).

In addition, new teacher mentoring is provided by a single person whose function is to help a new teacher (Wong, 2005). Mentoring is required by New York State law. Still, this mentoring aims to support the "recruitment and retention" of teachers and to strengthen "teaching practice as informed by the …Common Core Learning Standards" (New York State Education Department, 2022, p. 1). This purpose reflects the current state of education – focused on achievement and improvement of standardized test scores. In other words, instead of encouraging new teachers to look critically at the system in which they are starting their careers,

mentoring supports compliance and indoctrination into a conservative system (Selwyn, 2019) that supports neoliberal policies (Ali, 2019) which uphold the status quo and views education as a way to develop students as human capital (Arar et al., 2021; Hastings, 2022). Mentoring, like induction, must start to include critical components that support a transition to place-conscious education. Place-conscious mentoring would support new teachers as they learn about the district's community and ecology so new teachers can integrate local examples, stories, and context into their lessons and make connections between their students and community members (Mendoza, 2018; McKinley & Stewart, 2012; Yavetz et al., 2014).

Schools often focus on national or global issues too early in a child's education, causing students to lose, or never develop, their sense of place (Gruenewald & Smith, 2014; Sobel, 2004, 2020). Students must be grounded in their community's ecology, culture, and history before moving on to broader subjects. For students to be grounded in place to become place-conscious, new teachers must also be mentored and inducted into a district's place.

Going Forward

Imagine if every student had the opportunity to connect with nature and experience nature-based mindfulness/wellness. Recognizing that healing the planet reflects healing our relationships with ourselves, educators can embrace place-conscious teaching, take students outside in nature and incorporate nature-based mindfulness practices like forest bathing that encourage reciprocity, increase well-being and increase environmental care and concern.

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Appendices

Appendix A –Surveys With Open-Ended Questions

WEMWBS and CNS Surveys with Open Ended Questions

Pre Forest Bathing Survey

Completed in Google Forms

Any analysis will have names and emails removed so all responses will be anonymous

* Required

Email *

Take a minute to think about what this time has been like in terms of school and other things going on in your life.

Check all that apply.

I thought about what this time has been like in terms of school and other things going on in my life.

The Warwick-Edinburgh Mental Well-Being Scale (WEMWBS) *

Completed in Google Forms

Below are some statements about feelings and thoughts.

Please tick the box that best describes your experience of each over the last 2 weeks.

Statements	**None of the time**	**Rarely**	**Some of the time**	**Often**	**All of the time**
I've been feeling optimistic about the future.	1	2	3	4	5
I've been feeling useful.	1	2	3	4	5
I've been feeling relaxed.	1	2	3	4	5
I've been feeling interested in other people.	1	2	3	4	5
I've had energy to spare.	1	2	3	4	5
I've been dealing with problems well.	1	2	3	4	5
I've been thinking clearly.	1	2	3	4	5
I've been feeling good about myself.	1	2	3	4	5

I've been feeling close to other people.	1	2	3	4	5
I've been feeling confident.	1	2	3	4	5
I've been able to make up my own mind about things.	1	2	3	4	5
I've been feeling loved.	1	2	3	4	5
I've been interested in new things.	1	2	3	4	5
I've been feeling cheerful.	1	2	3	4	5

Warwick-Edinburgh Mental Well-Being Scale (WEMWBS)

Connectedness to Nature Scale *

Completed in Google Forms

Please answer each of these questions in terms of *the way you generally feel*. There are no right or wrong answers. Using the following scale, in the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

1	2	3	4	5
Strongly disagree		Neutral		Strongly agree

____1. I often feel a sense of oneness with the natural world around me.

____2. I think of the natural world as a community to which I belong.

____3. I recognize and appreciate th
e intelligence of other living organisms.

____4. I often feel disconnected from nature.

____5. When I think of my life, I imagine myself to be part of a larger cyclical process of living.

____6. I often feel a kinship with animals and plants.

____7. I feel as though I belong to the Earth as equally as it belongs to me.

____8. I have a deep understanding of how my actions affect the natural world.

____9. I often feel part of the web of life.

____10. I feel that all inhabitants of Earth, human, and nonhuman, share a common 'life force'.

____11. Like a tree can be part of a forest, I feel embedded within the broader natural world.

____12. When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature.

____13. I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.

____14. My personal welfare is independent of the welfare of the natural world.

What is your gender identity? (Optional)

Mark only one oval.
Female
Male
Nonbinary
Prefer not to Say

What is your age?
Mark only one oval
15
16
17
18

Open Ended Questions*
Describe what you imagine your forest bathing experience will be like, including any benefits you think you might experience? 2-5 sentences

Go to the google classroom and answer question #2 in the Journal about the research process so far

Link to copy of Google Form Pre Survey

Post Forest Bathing 1 Survey
Completed in Google Forms

Any analysis will have names and emails removed so all responses will be anonymous

* Required

Email *

Take a minute to think about what this time has been like in terms of school and other things going on in your life.
Check all that apply.

I thought about what this time has been like in terms of school and other things going on in my life.

The Warwick-Edinburgh Mental Well-Being Scale (WEMWBS) *
Completed in Google Forms
Below are some statements about feelings and thoughts.
Please tick the box that best describes your experience of each over the last 2 weeks.

Statements	**None of the time**	**Rarely**	**Some of the time**	**Often**	**All of the time**
I've been feeling optimistic about the future.	1	2	3	4	5
I've been feeling useful.	1	2	3	4	5
I've been feeling relaxed.	1	2	3	4	5
I've been feeling interested in other people.	1	2	3	4	5
I've had energy to spare.	1	2	3	4	5
I've been dealing with problems well.	1	2	3	4	5
I've been thinking clearly.	1	2	3	4	5
I've been feeling good about myself.	1	2	3	4	5

I've been feeling close to other people.	1	2	3	4	5
I've been feeling confident.	1	2	3	4	5
I've been able to make up my own mind about things.	1	2	3	4	5
I've been feeling loved.	1	2	3	4	5
I've been interested in new things.	1	2	3	4	5
I've been feeling cheerful.	1	2	3	4	5

Warwick-Edinburgh Mental Well-Being Scale (WEMWBS)

Connectedness to Nature Scale *

Completed in Google Forms

Please answer each of these questions in terms of *the way you generally feel*. There are no right or wrong answers. Using the following scale, in the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

1	2	3	4	5
Strongly disagree		Neutral		Strongly agree

____1. I often feel a sense of oneness with the natural world around me.

____2. I think of the natural world as a community to which I belong.

____3. I recognize and appreciate th
e intelligence of other living organisms.

____4. I often feel disconnected from nature.

____5. When I think of my life, I imagine myself to be part of a larger cyclical process of living.

____6. I often feel a kinship with animals and plants.

____7. I feel as though I belong to the Earth as equally as it belongs to me.

____8. I have a deep understanding of how my actions affect the natural world.

____9. I often feel part of the web of life.

____10. I feel that all inhabitants of Earth, human, and nonhuman, share a common 'life force'.

____11. Like a tree can be part of a forest, I feel embedded within the broader natural world.

____12. When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature.

____13. I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.

____14. My personal welfare is independent of the welfare of the natural world.

Open Ended Question:
Any analysis will have names and emails removed so all responses will be anonymous

Describe what your forest bathing experience was like, including any impacts on your well-being or connection to nature you may have experienced? 2-5 sentences

Link to copy of Google Form Post 1 FBSurvey

Post Forest Bathing 3 Survey

Completed in Google Forms
Any analysis will have names and emails removed so all responses will be anonymous

* Required
Email *
Take a minute to think about what this time has been like in terms of school and other things going on in your life.
Check all that apply.
I thought about what this time has been like in terms of school and other things going on in my life.
The Warwick-Edinburgh Mental Well-Being Scale (WEMWBS) *
Completed in Google Forms
Below are some statements about feelings and thoughts.
Please tick the box that best describes your experience of each over the last 2 weeks.

Statements	**None of the time**	**Rarely**	**Some of the time**	**Often**	**All of the time**
I've been feeling optimistic about the future.	1	2	3	4	5
I've been feeling useful.	1	2	3	4	5
I've been feeling relaxed.	1	2	3	4	5
I've been feeling interested in other people.	1	2	3	4	5
I've had energy to spare.	1	2	3	4	5
I've been dealing with problems well.	1	2	3	4	5
I've been thinking clearly.	1	2	3	4	5
I've been feeling good about myself.	1	2	3	4	5
I've been feeling close to other people.	1	2	3	4	5
I've been feeling confident.	1	2	3	4	5

I've been able to make up my own mind about things.	1	2	3	4	5
I've been feeling loved.	1	2	3	4	5
I've been interested in new things.	1	2	3	4	5
I've been feeling cheerful.	1	2	3	4	5

Warwick-Edinburgh Mental Well-Being Scale (WEMWBS)

Connectedness to Nature Scale *

Completed in Google Forms

Please answer each of these questions in terms of *the way you generally feel*. There are no right or wrong answers. Using the following scale, in the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

1	2	3	4	5
Strongly disagree		Neutral		Strongly agree

____1. I often feel a sense of oneness with the natural world around me.

____2. I think of the natural world as a community to which I belong.

____3. I recognize and appreciate th
e intelligence of other living organisms.

____4. I often feel disconnected from nature.

____5. When I think of my life, I imagine myself to be part of a larger cyclical process of living.

____6. I often feel a kinship with animals and plants.

____7. I feel as though I belong to the Earth as equally as it belongs to me.

____8. I have a deep understanding of how my actions affect the natural world.

____9. I often feel part of the web of life.

____10. I feel that all inhabitants of Earth, human, and nonhuman, share a common 'life force'.

____11. Like a tree can be part of a forest, I feel embedded within the broader natural world.

____12. When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature.

____13. I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.

____14. My personal welfare is independent of the welfare of the natural world.

Open Ended Question:

Any analysis will have names and emails removed so all responses will be anonymous

Describe what your forest bathing experience was like, including any impacts on your well-being or connection to nature you many have experienced? 2-5 sentences

Link to copy of Google Form Post 3 FB Survey

Appendix B – Journal Prompts

Name:
Remember all responses will be made anonymous.
Journal 1
Describe how life is going right now? 2-5 sentences - if you want to go longer that's ok

Journal 2
Take 2 or 3 sentences to reflect on the research process so far.

Journal 3
Describe your experience of Forest Bathing, and compare your experience to what you thought the experience would be like. 3-10 sentences.

Journal 4
Reflect on these experiences of Forest Bathing, and any impacts the practice had (if any!) on your well-being or connection to nature. 2-10 sentences

Journal 5
Reflect on this experience of YPAR. 2-10 sentences

Appendix C – Photovoice Prompts

Name: _____ Forest Bathing Photovoice:

Photo:

Caption:

What are you showing the viewer about the Forest Bathing experience?

Appendix D – Permissions

Assent/Consent to Reproduce Data

Dear former APES Student and Parent Guardian of Student,

As part of our end-of-the-year project last year in APES, we completed a project investigating how practicing forest bathing might improve our well-being and connection to nature. We completed this project to see if practicing forest bathing is something we want to incorporate into our lives or advocate for in our school or community.

As I shared with you last year, I am completing my Ph.D. in Environmental Studies at Antioch University. I would like your, and your parent or guardian's (if you are under 18) permission to use, include, and reproduce the data, including the photovoice you created during our project. Your contributions will be included and reproduced in my completed dissertation, which will be published in the Antioch University Repository and Archive, OhioLINK Electronic Theses and Dissertations Center, both of which are open access, and Proquest Dissertations and Theses Database, which is a commercial database. They may also be included and reproduced in future journal articles which may be open-access or commercial in nature.

If you have any questions about the study, please contact me at If you have any questions about your student's rights as a research participant, you may contact or Provost, Antioch University New England,

Kind Regards,

	Student Assent (if under 18) or Consent (if you are 18 or older)	Parent/Guardian Consent (if under 18)
I am OK with reproducing my data, including photovoice, I created, as described above.		

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Permission to use WEMWBS in doctoral dissertation

2 messages

[redacted] Tue, Mar 15, 2022 at 4:43 PM

To: ventures@warwick.ac.uk

Hello there,

I am working on my doctoral dissertation proposal and would like permission to use the WEMWBS to determine adolescent (15-19year olds) mental well-being in my project. I will be investigating the impacts of practicing forest bathing on adolescent mental well-being and connection to nature and would like to use the WEMWBS as the instrument to determine mental well-being. I will be completing this project in a public high school in New York, USA and there is no commercial advantage or monetary compensation associated with this project. My dissertation will be published on ProQuest, a commercial database that is publicly searchable. Although I would consider my use of the WEMWBS non-commercial, because the dissertation will be published on ProQuest I wanted to see if I needed to complete other requirements other than registration for a WEMWBS non-commercial license.

I look forward to hearing from you.

[redacted]

[redacted] Tue, Mar 29, 2022 at 3:52 AM

Good Morning,

Thanks for your email, you can register for a non-commercial licence here.

Further information can be found on our FAQ pages here.

Regards

[redacted]

WEMWBS Licence Administrator

Warwick Innovations, Junction Building, The University of Warwick, Coventry, CV4 7AL

FAQs

You can download a PDF of these FAQ's here:

1. Purpose of WEMWBS

How can I use WEMWBS?

WEMWBS can be used to:

1.1 Assess change in mental wellbeing in individuals: WEMWBS was designed as a research tool to be used in populations. The WEMWBS responsiveness to change has been evaluated both at the population and the individual level which shows that a change of about 3 or more points can be considered significant.

1.2 Measure depression: The scale is not designed to measure depression, but low scores do relate to depression. Recent studies show that you can define a cut-off point in a WEMWBS score which has optimum sensitivity and specificity for depression (as measured by other scales). Wherever you put the cut-off point you will either miss some people with depression or include people who do not have depression. You would expect this from a scale that is normally distributed and designed to measure wellbeing in the general population.

1.3 Screen mental illness: The scales were not designed for this purpose. Cut points corresponding to probable or possible mental illness have been defined from studies of WEMWBS performance vis-à-vis mental illness measures with validated cut points. These are valid for categorising the scales in epidemiological studies.

1.4 Cover spiritual wellbeing: No, although aspects of spiritual wellbeing such as connectedness, growth and development, and purpose in life (which may be regarded as part of psychological functioning) are covered.

1.5 Monitor change at the individual level: Although the scales were not designed to monitor change at the individual level, they have been used in such a way because they enable conversations about mental wellbeing. Studies have now indicated that the scales could be valid for this purpose and suggest a level of change in scores that can be regarded as important.

Which groups of people can WEMWBS be used with?

WEMWBS be used with the following:

1.6 Validation studies of the English version of WEMWBS in different populations can be found here. This includes studies with children aged 11 years to adulthood, cross-cultural populations, populations living with learning difficulties, clinical populations and various occupational groups.

1.7 Children and Adults: The scale is validated for use with individuals aged 13 to 74 according to a 2011 study amongst others and for children from 11 years in a 2019 study. There is no evidence for the use of WEMWBS with children below the age of 11. It is therefore not recommended that WEMWBS be used with children aged under 11. We recommend the Stirling Children's Wellbeing Scale for children aged 8-13. The Strengths and Difficulties Questionnaire is also designed for use in children.

1.8 Ethnic minority groups in the UK: Use of this scale in all population groups is encouraged. It has been validated among people with a Chinese and a Pakistani family background living in a city in England.

1.9 I understand the 14 point scale has been well validated but can you advise if the 7 point scale has also been validated as its own individual tool Yes, the SWEMWBS (7 point scale) is also very well validated now. Validations are available from our website here

2. Eligibility for a Commercial or a Non-Commercial Licence

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2.2 I am self-employed but I'm not charging for my services, can I have a Non-Commercial Licence? Unfortunately not, the licence depends on the status of the organisation applying regardless of whether you are charging for services.

2.3 We are part of the NHS but are working with a consultant to develop an application to host the scale, we are still eligible for a Non-Commercial licence as part of the NHS aren't we? Unfortunately not, as per the terms and conditions. If you are working with a third party (consultant or private organisation) and they are developing a system or application to host the scale, then they need to have a commercial licence in place.

3. Obtaining a Licence

3.1 How long does the licence last for?The licence is valid for 12 months. When you complete the application form, it asks you to confirm the start date for your licence so you can apply for a licence now for a project which starts in the future.

3.2 What does participant mean, does it mean the number of people who complete the scale?In this context participant relates to the number of individuals you offer the scale to for completion not the number of respondents. So if you are offering the scale to 1,000 people you need a licence for 1,000 participants regardless of how many respond.

3.3 How many times can I use the scale during my 12 month licence There is no limit to the number of times you can use the scale during the term of your licence if you are using it with the same participants. If you offer the scale to additional participants you will need to apply for a further licence to cover the difference. Example: You are running a training course with 90 people and want to measure their wellbeing at the beginning, mid-point and end, you would need a licence for 100 participants. If however you are running the same course during the same year with a new cohort of 80 people you would need to apply for a further licence for 100 participants, the second licence could have a later start date and again be used at start, mid-point and end.

3.4 I have registered, but I haven't received my login details, when will I receive them? When you register you need to make sure you request an email receipt on the second page (this page appears when you have clicked the submit form button) when you receive the email receipt it will contain a link to the resources area where you can find the scale and associated resources. If you didn't request a receipt we suggest you re-register. There are no login details associated with your access to the scale, please just save the link to the resources area and please do not share this link outside of the registered organisation.

3.5 Can I have a digital version of the scale? At the current time we do not have digital versions of either of the scales available although the terms and conditions of both the Non-Commercial and Commercial licence allow you to reproduce the scale providing you meet certain conditions including sending a copy to us for approval before using. Please read the terms and conditions (section 2.1 applies here) for further detail.

3.6 Do you have WEMWBS version in other languages? Once registered you have access to the resources page where you will find all of the translations we currently have access to. You may not be able to access the full list of translated version which is shown on the "WEMWBS in other languages" page, we can only provide translations with signed agreement of the translator which is not available in all cases.

3.7 What resources do I get?

Resources provided includes:

- User Guides to help you implement the scale and interpret the results
- Practice based User Guide and workbook to use WEMWBS to evaluate a service or other intervention
- Data analysis calculation templates (Excel workbooks)
- Translations of the scale and associated validations
- Other relevant guides and references

4. Including WEMWBS in your Questionnaire

4.1 Can I change the layout of the scale? You should not alter the layout of the scale, if you are replicating it, it should be reproduced as faithfully as possible. Please read the terms and conditions (section 2.1 applies here) for further detail.

4.2 **Do the following infringe copyright?**

4.3 Adding other questions, for example, demographic description such as age and gender: No, this does not infringe copyright and is acceptable. It is envisaged that WEMWBS will frequently be included in the context of a questionnaire containing other questions so that other information about respondents can also be captured. As well as providing general information about the respondents, such data can be used in cross-tabulations with the WEMWBS data for wider analysis purposes.

4.4 Changing the text size of WEMWBS: No, this does not infringe copyright and is acceptable as long as no changes to the wording, response categories or layout of WEMWBS are made.

4.5 Using the questions in a different format: The scales are validated in their original format, and any significant change will compromise the validity and may infringe copyright. Changing the size of the text is acceptable as long as no changes to the wording, response categories or layout of WEMWBS are made. It is fine to add questions to WEMWBS as part of your study, however removing questions will mean the scale is no longer valid. If you do still wish to use any part of the scale in an altered format we request that you discuss with us first and ensure to acknowledge the source of the questions.

4.6 Do the numbers (1-5) in the boxes for WEMWBS response influence how people answer the questions? We have not seen any evidence that the numbers in the boxes affect response. If you decide to delete these numbers, then you should mention it in your report because it may affect its comparison with other studies. On a website, the numbers will not normally be seen, because the option will be to select buttons rather than boxes.

4.7 How do I reference WEMWBS scales in my questionnaire? If you are publishing the questionnaire on a website, app or elsewhere, it should have the below copyright statement underneath it:

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5. Using the WEMWBS Scale

5.1 The statements used in the WEMWBS questionnaire asks the individual to relate to their previous two week period when considering their response, can I change that? All the validation studies of the scales relate to this previous two week period, and so, any modification is not recommended.

5.2 How do I interpret the scores? When you have registered you will have access to a User Guide which will help you implement the scale and interpret the results.

5.3 Is it appropriate to provide information such as support contacts for people with low WEMWBS scores? Providing a supplementary page with information on support contacts is perfectly acceptable, but if such information is provided, then it should be available to all those who complete the questionnaire, not just to those with scores deemed to be 'low'.

5.4 What is the average score for WEMWBS? Mean scores for the general population are reported in population surveys and are generally around 51 in the UK

5.5 Are there cut-off points for interpretation of WEMWBS scores? The scale was not developed with a view to categorising the population according to level of mental wellbeing. While this approach is attractive to researchers and policy makers, it goes against the grain of whole population approaches that need to focus on changes in the average of whole population groups. As interest in mental wellbeing is so comparatively recent a phenomenon, we do not yet know what 'optimum' mental wellbeing looks like and any cut-off points we define on the basis of WEMWBS scores would, of necessity, be arbitrary. Those wanting to assess the proportion of a population that suffers from mental health problems should use a scale validated for that purpose, e.g. the GHQ 12 identifies those with a possible psychiatric disorder.

5.6 If it is essential to present data in a categorical way, for example, for analytical purposes, the best approach to date is that used in the analysis of WEMWBS data from the Scottish Government's 'Well, What do you think? 2006' survey. Scores were categorised according to the extent of their standard deviation from the mean.

- A categorical variable was derived for the purposes of the report by dividing the survey population into three groups:
- Those with relatively "good mental wellbeing" (a WEMWBS score of over one standard deviation above the mean),
- Those with "average mental wellbeing" (a WEMWBS score of within one standard deviation of the mean) and,
- Those with relatively "poor mental wellbeing" (a WEMWBS score of more than one standard deviation below the mean).

5.7 This three-fold classification was used as a key analysis variable throughout the report.

5.8 An alternative approach, published in a 2015 research paper by Stewart-Brown *et al.*, has also been used successfully, is to divide the populations into quintiles based on WEMWBS scores.

5.9 **Could the scale be validated for use with individuals before and after interventions?** WEMWBS was designed as a research tool to be used in populations however, its responsiveness to change has been evaluated both at the population and the individual level, and at the individual level a change of about three or more points can be considered significant. There are currently no plans to validate the scale as a screening tool for use with individuals to categorise their individual level of mental wellbeing.

5.10 Can the questions in WEMWBS be used as triggers for conversations? Individual questions from WEMWBS can be used as triggers for conversations in the context of qualitative research and to guide focus groups, etc. They have also been used in the context of 'health promoting projects'. This approach is well received but has not been formally evaluated. It should be noted that this should not be carried out if the research then includes completion of the scale by the same individuals for evaluation of an intervention. Discussing the individual items and asking for opinions from a group is likely to bias results if individuals are subsequently asked to complete the questionnaire to obtain the mean score for the group.

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