Spring 2020

Connecting to Nature: Mindfulness and Desire to Engage in Pro-Environmental Behaviors

Mikayla L. Shea
Western Washington University, 13mikayla13@gmail.com

Connecting to Nature: Mindfulness and

Desire to Engage in Pro-Environmental Behaviors

By

Mikayla L. Shea

Accepted in Partial Completion
of the Requirements for the Degree
Master of Science

ADVISORY COMMITTEE

Dr. Christie Napa Scollon, Chair

Dr. Barbara Lehman

Dr. Michael Warren

GRADUATE SCHOOL

David L. Patrick, Interim Dean

MASTERS THESIS

In presenting this thesis in partial fulfillment of the requirements for a master's degree at Western Washington University, I grant to Western Washington University the non-exclusive royalty-free right to archive, reproduce, distribute, and display the thesis in any and all forms, including electronic format, via any digital library mechanisms maintained by WWU.

I represent and warrant this is my original work and does not infringe or violate any rights of others. I warrant that I have obtained written permissions from the owner of any third party copyrighted material included in these files.

I acknowledge that I retain ownership rights to the copyright of this work, including but not limited to the right to use all or part of this work in future works, such as articles or books.

Library users are granted permission for individual, research and non-commercial reproduction of this work for educational purposes only. Any further digital posting of this document requires specific permission from the author.

Any copying or publication of this thesis for commercial purposes, or for financial gain, is not allowed without my written permission.

Mikayla Shea

May 29, 2020

Connecting to Nature: Mindfulness and Desire to Engage in Pro-Environmental Behaviors

A Thesis

Presented to

The Faculty of

Western Washington University

In Partial Fulfillment

Of the Requirements for the Degree

Master of Science

By

Mikayla L. Shea

May 2020

Abstract

The present set of studies used a brief mindfulness induction with an active control group to examine how mindfulness affects connectedness to nature and desire to engage in pro-environmental behaviors. Additionally, phone use was included as another variable to test how technology may change the effect of mindfulness practice. Participants were randomly assigned to one of four conditions in a 2(mindfulness vs. control) x 2(phone use vs no phone use) design. Results indicated that participants in the mindfulness condition experienced higher levels of mindfulness than those in the control condition. Correlational analyses showed an association between state mindfulness and being more connected to nature and desire to engage in pro-environmental behaviors. However, the mindfulness practice did not lead to a direct increase in connection to nature or pro-environmental behaviors. The participants who used a phone also reported higher levels of connection to nature and pro-environmental behaviors, opposite of the original hypothesis. These results suggest that individuals may need extended mindfulness practice in order to see any change in behavior.

Acknowledgements

First and foremost, I would like to express my gratitude to my thesis chair, Dr. Christie Napa Scollon, for her unwavering support and dedication to help me grow to become the researcher I am today. I would additionally like to thank the other members of my committee, Dr. Barbara Lehman and Dr. Michael Warren, for their insight and guidance throughout the entirety of my academic journey at Western. I am also grateful to Robert Fredreiksen, for his willingness to spend multiple hours to create the audio recordings utilized in this thesis study. Additionally, this thesis project would not have been possible without the hard work and dedication of the research assistants in my lab; Hannah Proctor, Eoin Ellis, Stephanie Todd, and my fellow graduate student Kris Tran. Each one of them volunteered numerous hours to run studies and help me see this project through. I would also thank my family for their support throughout my academic career, without them, I doubt I would have gotten this far. Finally, I would like to thank my Experimental Psychology cohort, Jerry Barrnet, Chelsea Noble, and Natalia Saavedra, whose constant support, feedback, and encouragement helped me through this journey and made it so much more rewarding.

Table of Contents

List of Tables and Figures

Connecting to Nature: Mindfulness and Desire to Engage in Pro-Environmental Behaviors

Every year, approximately 26 million tons of plastic ends up in the world's oceans and 167 million tons of trash and waste ends up in landfills in the United States (Environmental Protection Agency, 2017). The amount of waste generated globally is expected to increase from the current 2.01 billion tons per year to approximately 3.4 billion tons per year by 2050 (Kaza, Yao, Bhada-Tata, & Van Woerden, 2018). In response to these challenges, psychologists and other social scientists have been trying to study different ways to encourage people's participation in pro-environmental behaviors such as recycling, composting, and cycling (Bratanova, Loughnan, & Gatersleben, 2012; Gronhoj & Thogersen, 2012; Miao & Wei, 2013). Pro-environmental behaviors can help to decrease the negative impact and increase the positive impact on the natural environment (Kollmuss & Agyeman, 2002). For example, in 2013, 87 million tons of waste was recycled and composted, which prevented the release of 186 million metric tons of carbon dioxide into the air.

In order for individuals to engage in more pro-environmental behaviors, they must change their daily habits, which is a difficult task to take on. On a daily basis, each person goes through the day acting on previously established habits (Hargreaves, 2011). When individuals continue to practice these already established habits, their day is spent on 'auto-pilot' and can be extremely difficult to change (Hargreaves, 2011; Kollmuss & Agyeman, 2002). The first step in engaging in more pro-environmental behaviors is becoming aware of the problems and concerns about the environment, as well as becoming aware of what actions to take in order to lower their impact on the environment (Kollmuss & Agyeman, 2002). As people become more aware of the issues facing the environment and the actions they can take to help the problem, the more likely they are to participate in pro-environmental behaviors (Kollmuss & Agyeman, 2002).

Researchers have investigated associations with pro-environmental behaviors such as well-being and connection to nature (Mayer & Frantz, 2004). One psychological trait that has been found to be positively associated with pro-environmental behaviors is mindfulness (Fischer, Stranszus, Geiger, Grossman, & Schrader, 2017).

Mindfulness

For the purpose of this study, mindfulness will be defined as nonjudgmental intentional awareness of experiences and behaviors in the present moment (Brown & Ryan, 2003; Kabat-Zinn, 1990). Mindfulness has been shown to affect behaviors related to awareness of experiences (Chatzisarantis & Hagger, 2007). For example, when an individual is in a mindful state, behaviors and experiences that were once automatic are brought into conscious awareness (Barbaro & Pickett, 2016; Bargh & Chartrand, 1999). When individuals are not aware of their immediate environment or of their actions, they may forget certain behaviors that they originally wanted to participate in. However, being in the present moment an individual may remember the reusable grocery bags in the car before walking into the store that may otherwise be forgotten or throw a paper in the recycling bin after noticing it a few feet away from the trash bin.

Higher levels of trait mindfulness, the underlying psychological trait of being aware of the immediate environment, are associated with higher levels of life satisfaction, agreeableness, conscientiousness, vitality, self-esteem, empathy, sense of autonomy, competence, and many other benefits (Keng et al., 2011). Higher levels of mindfulness are also associated with lower levels of depression, absent-mindedness, rumination, social anxiety, and avoidance. Meditation mindfulness, or active mindfulness, is when people are actively participating in mindfulness practice and focusing on the present moment rather than the past or future (Keng, Smoski, & Robins, 2011). There are many different types of mindfulness practice; each focuses on a

specific area of mindfulness or a certain topic. Different types of mindfulness practice include loving-kindness, open awareness, body-scan, and many others. Individuals who practice mindfulness meditation report more trait mindfulness as well as higher levels of compassion and well-being (Keng et al., 2011). Practicing mindfulness meditation can have lasting effects that can increase an individual's overall level of mindfulness not just in the moment, but in everyday life (Kiken, Garland, Bluth, Palsson, & Gaylord, 2015).

Trait mindfulness can be categorized into five distinct facets: observing, describing, acting with awareness, nonreactivity to inner experience, and nonjudging of experiences (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). For the purpose of this study, the mindfulness facet of observing will be the main focus. Mindful observing can be described as the ability to notice and attend to internal stimuli, such as thoughts and sensations, and to external stimuli, such as birds chirping (Baer et al., 2006). The mindfulness facet of observing is positively associated with engagement in pro-environmental behaviors (Barbaro & Pickett, 2015). Research that looked at individuals' daily engagement in pro-environmental behaviors found that those who were observant of their surroundings and environment engaged in more pro-environmental behaviors (Amel, Manen &Scott, 2009; Barbaro & Pickett, 2015).

Mindfulness Increases Sustainable Behaviors

Through mindful observing, attention can be focused towards sustainable behavior options, such as composting or public transportation, that might ordinarily be overlooked (Brown & Kasser, 2005). Based on their review of the literature, Fischer et al. (2017) proposed a theory that identified four distinct reasons why mindful observing could lead to pro-environmental behaviors. These include disruption of routines, non-material values and well-being, pro-social behavior, and congruence. Disruption of routines emphasizes awareness and enables individuals

to change habits that were previously unconscious (Grossman, Niemann, Schmidt, & Walch, 2004). For non-material values and well-being, mindfulness is associated with an increase of clarifying values and enhancing the role of non-material values in people's live (Ericson et al., 2014). Through increasing well-being and orienting people's focus to other intrinsic values and behavior, the focus is removed from materialistic and hedonistic values (Burroughs & Rindfleisch, 2002; Kasser et al., 2014). Pro-social behavior consists of compassion and an other-oriented focus which has shown to increase through mindfulness practice (Lim et al., 2015). An increase in pro-social behavior is positively associated with pro-ecological behaviors (Pfattheicher et al., 2016). Congruence is the perceived inattention to everyday experiences, where one might hold a belief but not act according to that belief. This leads to an increased attitude-behavior gap, meaning that attitudes regarding a matter do not predict corresponding behavior (Chatzisarantis & Hagger, 2007). Since mindfulness promotes attentiveness, it can help to lessen the attitude-behavior gap (Ericson et al., 2014; Rosenberg, 2005). This is a possible explanation as to why the mindfulness facet of observing is strongly related to the engagement in pro-environmental behaviors. There are other possible variables that lead to the positive relationship between mindfulness and pro-environmental behaviors. This includes combining the ideas of pro-social behavior and non-material values and well-being into being more in tune and connected to nature.

Mindfulness has been shown to increase and enhance individuals' connectedness to nature through the increase in compassion and overall connection to non-material values and objects (Ericson et al., 2014; Howell, Dopko, Passmore, & Buro, 2011). Connectedness to nature is the extent to which people feel part of the natural environment and feel that nature is included in their sense of self (Mayer & Frantz, 2004; Schultz, 2002). Amel and colleagues (2009)

expanded on the definition of connectedness to nature to emphasize the self-world connection and focus on the natural environment. Individuals who have this self-world connection see themselves as connected to the natural environment and the world. In order for these individuals to create a positive future for themselves, they are less likely to participate in activities that may harm the natural environment (Mayer & Frantz, 2004). Mindfulness has been found to enhance moment-to-moment experiences by orienting one's focus toward the immediate environment, resulting in a greater connection to nature (Howell et al., 2011). This closely reflects the idea the mindfulness increases engagement in pro-environmental behaviors through pro-social behavior and non-material values and well-being. Connectedness to nature focuses on the well-being of oneself as well as the value that nature has and how it impacts daily life (Mayer & Frantz, 2004). Connectedness to nature also is closely tied to compassion for others in such a way that caring for the environment and nature is a way to care for another individual (Amel et al., 2009). This supports the idea that mindfulness, connectedness to nature, and engagement in pro-environmental behaviors are connected to each other.

Indirect Relationship Between Mindfulness and Environmental Behaviors

Two studies tested whether connectedness to nature mediates the association between mindfulness and pro-environmental behaviors. Amel et al. (2009) utilized a green scale to measure people's tendencies to participate in pro-environmental behaviors. Participants self-reported how "green" they were from light green (less environmentally friendly) to dark green (more environmentally friendly). Amel et al. (2009) found that participants with higher levels of trait mindfulness rated themselves as more "green" and this relationship was partially mediated by participants' connectedness to nature. Barbaro and Pickett replicated the findings of Amel et al. using a different scale to measure pro-environmental behaviors, the short versions of the pro-

environment behavior scale (PEB; Whitmarsh & O'Neill, 2010). They also found that the mindfulness facet of observing was the only facet that fit the mediation model. Although these studies utilized different scales to measure pro-environmental behaviors, the similar results demonstrate the robustness of this process.

The studies reported in these two papers on the indirect relationship between mindfulness and pro-environmental behaviors have all been correlational and were unable to establish that mindfulness practice increases pro-environmental behaviors. Since the research on the relationship between trait mindfulness, connection to nature, and engagement in pro-environmental behaviors has been correlational, it is possible that another variable such as conscientiousness could be causing high trait mindfulness, connectedness to nature, and high pro-environmental behaviors. Although it is possible that there is a causal indirect relationship between mindfulness, connection to nature, and pro-environmental behaviors, this link has not yet been studied experimentally. Only one study experimentally induced mindfulness and found that, indeed, mindful meditation led to increased connectedness to nature compared to a control group (Aspy & Proeve, 2017). Aspy and Proeve (2017), however, did not examine pro-environmental behaviors. Furthermore, there is a need to test the effects of mindfulness on pro-environmental behaviors in settings which closely mimic our everyday experiences, where there is competition for our already divided attention. This can be obtained by adding additional variables that people would encounter in daily life that could interfere or interrupt the act of being mindful. The proposed study seeks to do this.

Technology and Mindfulness

Cell phones and technology have become so common in daily life that people have reported preferring to interact with their phone rather than hold a face-to-face conversation

(Turkle, S., 2016). Eighty-nine percent of Americans have stated that they have looked or engaged with their phone during their last in person conversation, and 82 percent stated that it negatively affected the conversation. Thus, it seems that cell phone use may have negative effects on sustained attention. This could also relate to possible negative implications on overall trait mindfulness and mindfulness practice. Meanwhile, individuals who report lower levels of mindfulness also reported being fixated on their phones more than individuals who report higher levels of mindfulness (Terry & Terry, 2014). Trait mindfulness has also been found to moderate the relationship between phone use and anxiety/depression. Less mindful individuals who used their phones more throughout the day and reported lower overall well-being than more mindful individuals (Yang, Zhou, Liu, & Fan, 2019).

Research has shown that the use of technology can also counteract and moderate the impact that nature may have on the individual (Jiang, Schmillen, & Sullivan, 2018). Individuals who used technology while in a green space, a space that is ecologically friendly and incorporates nature, did not have an increase in attention, a digit span task, while individuals that did not use technology had an increase in attention while in green spaces. This study helped to explore the use of technology and how it could interfere with attention and attention related tasks. Smartphone use has also been demonstrated to reduce an individuals' level of connectedness to nature (Richardson, Hussain, & Griffiths, 2018). In this particular study, researchers assessed participants' reported phone use in hours, as well as assessed the number of pictures and the types of pictures that were taken. Problematic smartphone use and selfie taking were negatively associated with connectedness to nature. Individuals who reported using their phone for over four hours per day also reported lower levels and impaired connection to nature decreased.

One of the few studies that examined at smartphone use and mindfulness found that automatic use of phones was negatively associated with the mindfulness facets of awareness and observing (Bayer, Dal Cin, Campbell, & Panek, 2015). Individuals who check their phone automatically or use their phone as a distraction are less aware and observant of their surroundings and external environment. Due to phone use giving instant gratification to the user, the behavior of being on a phone or compulsively checking a phone becomes automatic (LaRose, Lin & Eastin, 2003). Over time the automatic behavior of checking a phone or swiping through a phone can become a habit that is difficult to deter from or break (Neal, Wood & Quinn, 2006). This automatic behavior could potentially disrupt or interfere with the effects of mindfulness practice. Although researchers have increasingly incorporated technology and phone use into studies, there are no studies that tested the moderating effects of phone use on a mindfulness induction. It is necessary to study the use of cell phones and how it may interact with practicing and being mindful. The majority of mindfulness studies are done in a laboratory setting under controlled conditions without any distractions from the mindfulness practice. Outside the laboratory setting, there are many distractions as well as different factors that compete for peoples' attention, one of those in particular is the cell phone.

Current Study

Unfortunately, the correlational nature of the above studies makes the causal nature of mindfulness meditation unclear. Correlational studies suggest that there is an indirect relationship between mindfulness and pro-environmental behaviors through connection to nature (Amel et al., 2009; Barbaro & Pickett, 2016). However, Aspy and Proeve (2017) found a causal relationship between mindfulness meditation and connectedness to nature such that mindfulness

induction led to higher levels of connection to nature. However, no research has examined if phone use might undo or reduce the effects of a mindfulness meditation.

The purpose of the present studies was to examine at the causal relationship between mindfulness and pro-environmental behaviors. The indirect relationship with mindfulness practice, connectedness to nature, and desire to engage in pro-environmental behaviors was also analyzed. Phone use was added by allowing half of the participants use their phone after the mindfulness meditation to see if phone use moderates the effectiveness of mindfulness practice. This study utilized an active control of a progressive muscle relaxation induction as a comparison for the mindfulness meditation induction. Because mindfulness meditation can induce a relaxation response, the present study used progressive muscle relaxation as an active control (Carson et al., 2004; Kristeller & Johnson, 2005; Aspy & Proeve, 2017). The active control was able to be utilized to see if the mindfulness meditation does effect connection to nature and pro-environmental behaviors or if it is just the relaxation from both inductions. Participants were randomly assigned to one of four conditions in a 2(mindfulness vs. control) x 2(phone use vs no phone use) design. This helped to understand how mindfulness and phone use effect pro-environmental behaviors and how mindfulness and phone use interact to effect pro-environmental behaviors.

Two studies were conducted. Study1 examined the effects of mindfulness practice and phone use on connectedness to nature and pro-environmental behaviors. Study 2 only examined the effect of the mindfulness induction on connectedness to nature and pro-environmental behaviors. The hypotheses for Study 1 were H1: Mindfulness induction would increase connection to nature and desire to engage in pro-environmental behaviors. H2: Participants who used their phone would be less likely to engage in pro-environmental behaviors. H3: Phone use

would interact with the mindfulness practice, and there would only be an effect of mindfulness on pro-environmental behaviors in the no phone condition. H4: Connectedness to nature would mediate the relationship between mindfulness practice and pro-environmental behaviors (Figure 1). H5: Phone use would moderate the mediated relationship between mindfulness and connectedness to nature as well as mindfulness and pro-environmental behaviors (Figure 2). Study 2 tested H1 and H4.

Study 1

Method

Participants

Participants were recruited for a study on "relaxation and cognitive focus" through the Psychology subject pool at Western Washington University. Participants earned credit as compensation for participation in the study. A power analysis indicated I needed 128 participants in order to have an 80% chance of detecting and effect size of .30, using .05 as the threshold for statistical significance. This was based on a 2x2 between-subjects design in which the effect of the mindfulness induction was .30 (Apsy & Proeve, 2017). In order to compensate for participants who failed the attention checks, more participants were recruited. Participants were asked during the study if they have previous experience with mindfulness meditation or yoga. If participants had previous experience with mindfulness meditation or yoga, they were excluded from the study. Out of 216 participants, only 138 met the necessary inclusion criteria for their data to be utilized in the study (42 males, 93 females, 3 other, *M* age = 19.36, *SD* = 1.56). Participants' ethnicity was also assessed: 73.2% of participants identified as White, non-Hispanic, 8% were Hispanic or Latino, 2.2% were Black or African American, 7.2% were Asian or Pacific Islander, and 9.4% identified as other.

Procedure

This study was a 2 (mindfulness vs progressive muscle relaxation) x 2 (phone use vs no phone use) between-subjects design looking at the effects of mindfulness meditation and phone use on the desire to engage in pro-environmental behaviors. Participants were randomly assigned, using a random number generator online, *Random.org*, to one of four conditions: mindfulness and phone, mindfulness and no phone, progressive muscle relaxation and phone, and progressive muscle relaxation and no phone. Prior to participants arriving at the lab, a research assistant set up the computers and placed a white noise machine outside of the door and a sign asking for quiet in the hallways. The experiment was conducted in groups of four, with each participant placed in their own small room with a computer terminal. Upon arrival at the lab, a research assistant asked participants to leave their cell phones in a box in a secure common area of the laboratory "in order to minimize interference with the experiment." The informed consent was ready on the computer when the participants enter the room, and they read through the consent form prior to beginning the experiment.

Once the participants gave consent to participate in the study, the researcher conducting the study read a script with specific instructions for the participants. The researcher stated, "You are participating in a study about cognitive focus and mood. In order to complete the study, we will have you listen to a recording on the computer. Once you put on the headphones the narrator will instruct you on what to think about or focus on. You are to follow the instructions in the recording." In keeping with the cover story, participants begun by completing a state emotion report in which they rated how well 10 negative emotions and 10 positive emotions describe their current mood, on a scale from 1 (not at all) to 5 (extremely). After rating their emotions,

participants started the experimental induction by putting on headphones and activating the self-guided audio recording.

Participants who were in the mindfulness condition listened to a 12-minute mindfulness induction instructing them to observe the feelings that were occurring in their body then gradually shifting that focus to the immediate environment (see Appendix A for script). This is typical of a mindfulness induction consisting of a basic meditation over a short period of time. Participants in the control condition listened to a 12-minute progressive muscle relaxation induction. This induction asked participants to focus on certain muscle groups in the body and relax them before moving on to the next muscle group (see Appendix B for script). After the end of the recording, the narrator stated the name of the recording as either "simple relaxation," for the progressive muscle relaxation induction, or "calm mind," for the mindfulness induction.

Once the recording was completed, participants were asked compliance questions to assess the extent to which they followed directions and listened to the entire recording. For example, "To what extent did you follow instructions during the recording," and "What was the name of the recording?" These questions were used as attention checks to see if the participants listened to the recording. If the participants did not answer the questions correctly, they were removed from the study (participants removed $N = 37$). After the participants answered the compliance questions, the participants were informed that they are almost done with the study and the next portion will begin shortly. All participants in the same session were assigned to the same phone condition. Participants assigned to the phone condition were given their phones back as the researcher stated, "before I forget, let me hand back your phones as we are waiting." Those that were not in the phone condition were asked to wait patiently while the computer loaded the next section of the study. Both the phone condition and no phone condition waited for

two minutes before moving on to the next set of questionnaires. Meanwhile, experimenter documented the participants' use of their phone and if they complied with the instructions. The researcher recorded the phone usage of each participant as 0 = did not use their phone ($N = 12$), 1 = looked at the phone or minimal usage of the phone ($N = 15$), or 2 = used the phone for the majority of the time ($N = 45$).

After the two minutes were up, the researcher took note of the participants' phone usage and entered in a password into the computer to begin the next section of the study. The participants in the phone condition were asked to put their phones away and continue with the questionnaire. In the no phone condition, participants were asked to continue with the questionnaire. Participants then completed the state mindfulness scales, connection to nature scale, pro-environmental behavior scale, and demographic questions. Once all the participants completed the survey they were be debriefed about the study and given the opportunity to ask questions or withdraw from the study at that point. Participants were thanked for their participation and given credit.

Materials

Mindfulness. To measure state mindfulness, participants completed the five-item Mindfulness Attention and Awareness Scale - State (MAAS; Brown & Ryan, 2003). The scale consists of items such as, "In the last 15 minutes, I was finding it difficult to stay focused on what was happening." Items are scored on a seven-point scale from 0 (not at all) to 6 (very much). Each item is reverse coded and averaged, higher scores indicating higher state mindfulness levels ($\alpha = 0.83$). The full questionnaire can be found in Appendix C.

State mindfulness was also measured by having participants complete a four-item that I adapted from the Observe subscale of the Five Facet Mindfulness Questionnaire (FFMQO; Baer

et al., 2006). The scale consisted of items such as, “In the last 15 minutes, I deliberately noticed the feeling of air on my skin.” Respondent answered on a seven-point scale from 0 (not at all) to 6 (very much). Items were averaged with higher scores indicating higher levels of state mindfulness. This subscale of the FFMQ that was adapted in this study to be a state measure demonstrated moderate levels of reliability ($\alpha = 0.67$). The full questionnaire can be found in Appendix D.

Connection to nature. Participants completed the state connectedness to nature scale (CNS: Frantz, Mayer, Norton, & Rock, 2005) to measure the perceived connection to the natural world. The CNS contains 13 items measured on a five-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). An example item is, “Right now, I’m feeling a sense of oneness with the natural world around me.” A composite score was calculated for each participant ($\alpha = .88$) with higher scores indicating stronger connectedness to nature. The full scale can be found in Appendix E.

Pro-environmental behaviors. Pro-environmental behavior was measured using the modified pro-environmental behavior scale (PEB: Whitmarsh & O’Neill, 2010). Participants answered 17 items about their desire to engage in pro-environmental behaviors such as recycling, composting, etc. The participants will rate their desire to engage in these behaviors on a four-point Likert scale from 0 (never) to 3 (always). Composite scores were created for each participant with higher scores indicating stronger desire to engage in pro-environmental behaviors. The modified PEB showed high levels of reliability ($\alpha = 0.86$). The full questionnaire can be found in Appendix F.

Mindfulness induction. The mindfulness recording was approximately 12 minutes in length and began with a breathing exercise without any background music. The narrator

instructed participants to focus awareness on their breath, sensations on their skin, other physical sensations, and then as many different sensations as possible. Participants were asked to maintain awareness during the silent periods of the recording. As an attention check at the end of the recording, the narrator stated that the name of the recording was, “calm mind.”

Progressive muscle relaxation induction. The same narrator that narrated the mindfulness induction also narrated the progressive muscle relaxation induction. The progressive muscle relaxation recording is of the same duration as the mindfulness recording, approximately 12 minutes. The recording began the same with a breathing exercise without any background music. The narrator, then instructed participants to systematically release tension in various area of their body. Participants were asked to continue relaxing during the silent periods of the recording. As an attention check at the end of the recording, the narrator stated that the name of the recording was, “simple relaxation.”

Phone use manipulation. The researcher informed the participants that they are almost done with the study and the next section will begin shortly. Half of the participants were instructed that they can have their phones back before the researcher forgot, while the other half of the participants were instructed to wait patiently. All participants in the same session were assigned to the same phone condition, phone or no phone. Participants were unable to start the next section of the surveys until the computer automatically moved to the next section of the survey after two minutes. During this break period, the researcher stood outside of rooms in which the participants were sat, as to not interfere with the participants. After two minutes passed participants were prompted to resume taking the rest of the questionnaires. Participants who did have the opportunity to use their phones were asked to silence their phones and put them away prior to returning to the questionnaires. The researcher took note during this period of time

of the participants that used their phones, and those that do not. Each participant was given a score by the researcher for how much they used their phone, 0 = not at all, 1 = minimal phone use, 2 = used phone the majority of the time. If participants asked to leave during this time period, the researcher tried to discourage leaving by saying they are about to begin and will conclude very shortly.

Distractor questionnaires. In keeping with the cover story and in order to disguise the true nature of the experiment, participants completed filler questionnaires about current mood. The Positive and Negative Affect Schedule (PANAS) involves 10 adjectives each for positive affect (e.g., "enthusiastic") and negative affect (e.g., "scared"; Watson, Clark, & Tellegen, 1988). Participants indicated how well these adjectives describe their mood on a scale of 1 (very slightly or not at all) to 5 (extremely). The full scale can be found in Appendix G. The Attention Questionnaire Scale (AQS) was used to measure daily cognitive attention of the participant (Kim et al., 2010). Participants rated on 15 items how often the behaviors happen (e.g., "become inattentive") and how much they agree with the items (e.g., "good at concentrating") on a scale of 0 (never or none) to 2 (many or always). The full questionnaire can be found in Appendix H. Participants also answered some brief demographic questions prior to the end of the study.

Data Analysis Plan

For the successful completion of this study, a set of different analyses were used to test the different hypotheses set forth prior to the study being conducted. After cleaning the data, I conducted two 2 x 2 ANOVAs to test the effects of mindfulness and phone use on both connectedness to nature as well as desire to engage in pro-environmental behaviors. In order to test the indirect relationship between mindfulness and pro-environmental behaviors, I used Preacher and Hayes (2013) multiple mediation analysis on SPSS (Figure 1). In this analysis,

mindfulness was the X or predictor variable, and pro-environmental behaviors was the Y or outcome variable. Connectedness to nature was the M or mediator variable. I also used SPSS Process (Hayes, 2015) to conduct a moderated mediation of phone use as the moderator of the mindfulness, connectedness to nature, and desire to engage in pro-environmental behaviors mediation model (Figure 2, model 8). In this analysis, phone use was the W or moderator variable.

Results

After data collection was completed, the data were transferred from Qualtrics to SPSS for screening, cleaning, and analysis. Data from 216 participants were collected. After examining the attention and mindfulness and yoga experience questions, 81 participants did not meet the necessary inclusion criteria and had to be excluded from the study. Of those excluded, 17 practiced meditation and yoga regularly, 9 practiced yoga regularly, 23 practiced meditation regularly, 23 did not know the name of the recording, and 9 wrote that they participated in a mindfulness or progressive muscle relaxation practice. The final number of participants that were used in data analysis was 138. Once the participants that did not meet the inclusion criteria were excluded from the study, data cleaning and screening began. All scales were computed to assess the participants' average score across all questions for each individual scale. Once all scales were computed frequency distributions, skewness, and kurtosis were assessed for all scales that were utilized in the study. The State MAAS had a small positive skew and was transformed using a square root transformation. This transformation fixed the skewness of the State MAAS variable and no other transformations were needed. The rest of the data were also assessed for outliers or out of range answers, but all answers were within two standard deviations of the mean and did not include any answers that were considered out of range.

In order to check if the mindfulness recording increased state mindfulness for the participants, an independent subjects t-test was preformed across the two recording conditions on the State MAAS and State FFMQ Observe. The results of the manipulation check showed a statistically significant difference between mindfulness and progressive muscle relaxation for the State MAAS scale (t (136) = 3.73, $p < 0.001$). For the State MAAS, those in the mindfulness condition were more mindful (M = 1.8, SD = 0.36) than those in the progressive muscle relaxation (M = 1.5, SD = 0.38). The results of the manipulation check for the State FFMQ Observe showed a difference between mindfulness and progressive muscle relaxation that was marginally significant, t (136) = 1.86, p = .06. Those in the mindfulness condition were slightly more mindful (M = 4.7, SD = 1.32) than the progressive muscle relaxation condition (M = 4.3, SD = 1.18).

Table 1 displays the correlations between State MAAS, State FFMQ Observe, Pro-environmental behaviors (PEB), and Connectedness to Nature (CNS). All scales were intercorrelated except the State MAAS. Due to the lack of relationship between State MAAS and the other measures, I used State FFMQ Observe in statistical testing.

Two 2 (recording condition) x 2 (phone use condition) ANOVAs were performed one with CNS as the dependent variable, and one with PEB as the dependent variable. A main effect of phone condition ($F_{(1,135)}$ = 6.50, p = .012), emerged such that participants in the phone condition (M = 4.37, SE = 0.12) reported greater CNS than the participants in the no phone condition (M = 3.94, SE = 0.13; see Table 2 for results). With regard to PEB, a main effect of phone condition ($F_{(1,135)}$ = 6.08, p = .015), emerged. Participants in the phone condition (M = 3.02, SE = 0.06) reported higher PEBs than participants in the no phone condition (M = 2.81, SE = 0.06; see Table 3 for results). There was not a significant effect of mindfulness induction on

CNS ($F_{(1,135)} = 0.60$, $p = .441$) or PEB ($F_{(1,135)} = 0.061$, $p = .806$), there was also no effect of the interaction of phone use and recording on CNS ($F_{(1,135)} = 0.91$, $p = .343$) or PEB ($F_{(1,135)} = 0.44$, $p = .506$). Since there was not a significant interaction, no post-hoc tests were run for simple effects.

Continuing with testing H4, the indirect effect between recording condition, connectedness to nature, and pro-environmental behaviors was analyzed using Preacher & Hayes Multiple Mediation analysis. The association between recording condition and pro-environmental behaviors was not significant ($\beta = .03$, t (135) = .32, $p = .75$) nor was the association between connectedness to nature ($\beta = -.12$, t (135) = -.67, $p = .50$).

The moderated mediation analysis was conducted using Process version 3.4 by Hayes. For the moderated mediation model (Figure 2), the significance of the conditional direct and indirect effects identified in H5 were examined. Results for the conditional direct and indirect effects are shown in Table 6. The results of the moderated mediation analysis showed that the overall model and conditional indirect effects were not statistically significant.

Supplementary Analyses

Due to the nonsignificant results of the original hypotheses utilizing mindfulness practice as the independent variable, each hypothesis test was run using State FFMQO as the independent variable. These analyses would allow for a replication and comparison to previous experiments using correlational analyses.

Th effect of mindfulness, phone use, and the interaction of phone use and mindfulness were tested using State FFMQO in place of the recording condition. For these analyses, multiple regression analysis was used to test the effect of state mindfulness and phone condition, as well as the interaction of the two on CNS and PEB. When looking at CNS, state mindfulness was a

significant predictor ($t = 3.40$, $\beta = 0.28$, $p < .001$) and phone condition was also a significant predictor ($t = 2.04$, $\beta = 0.17$, $p = .044$) CNS. There was not a significant interaction between state mindfulness and phone condition (Table 5). For every one-point standard deviation increase in average state mindfulness, the participants' predicted connection to nature increased by .28 standard deviations. The participants in the phone condition were more connected to nature ($M = 4.34$, $SE = 0.12$) than the participants in the no phone condition ($M = 4.00$, $SE = 0.12$).

When looking at PEB as the dependent variable, state mindfulness was a significant predictor of PEBs ($t = 3.58$, $\beta = 0.29$, $p < .001$) and phone condition was a significant predictor of PEBs ($t = 1.99$, $\beta = 0.16$, $p = .049$). There was not a significant interaction between state mindfulness and phone condition. For every additional one-point standard deviation increase state mindfulness predicted PEB increased by .29 standard deviations. Participants in the phone condition had a greater desire to engage in pro-environmental behaviors ($M = 2.99$, $SE = 0.06$) than participants in the no phone condition ($M = 2.83$, $SE = 0.06$; see Table 6 for results).

The analysis for H4 was replicated using state mindfulness instead of recording condition. There was a statistically significant association between state mindfulness and pro-environmental behaviors (B = .12, t (135) = 3.87, $p < .001$) as well as connectedness to nature ($\beta = .25$, t (135 = 3.69), $p < .001$). Connectedness to nature was significantly associated with pro-environmental behaviors (B = .16, t (135) = 4.04, $p < .001$). Connectedness to nature did mediate the relationship between state mindfulness and pro-environmental behaviors ($M_{ab} = .04$, $SE_{ab} = .02$; 95% CI [.02, .08]), resulting in a 25% reduction in the standardized coefficient (see Figure 3).

The moderated mediation analysis was run using state mindfulness as the independent variable. For the model, the significance of the conditional direct and indirect effects identified in

H5 and depicted in Figure 2 were examined. Results for the conditional indirect effects are shown in Table 7. Phone condition did not moderate the indirect effect from state mindfulness to pro-environmental behaviors through connectedness to nature, B= .03, 95% CI [-.02, .08].

Discussion

Study 1 investigated the effect of mindfulness meditation and phone use on connectedness to nature and pro-environmental behaviors. Study 1 also looked at the indirect effect of connectedness to nature on the relationship between mindfulness and pro-environmental behaviors and how phone use could moderate the indirect relationship. The results did not support the original hypotheses involving mindfulness meditation as a causal relationship; however, two hypotheses were supported as correlational analyses. Results supported H1: A greater level of state mindfulness would be associated with a greater desire to engage in pro-environmental behaviors. H4 was also supported: Connectedness to nature mediated the relationship between state mindfulness and desire to engage in pro-environmental behaviors. Study 2 sought to investigate the relationship between mindfulness practice and pro-environmental behaviors and replicate the previous findings by excluding the use of cellphones during the study. This is because the phone use or lack of phone use could have indirectly caused a change in CNS an PEB. By excluding the phone use variable, the effect of mindfulness practice could be more closely examined.

Study 2

Overview

Study 2 examined the causal relationship between mindfulness and pro-environmental behaviors without having the phone use manipulation. The indirect relationship with mindfulness, connectedness to nature, and desire to engage in pro-environmental behaviors was

analyzed, and mindfulness meditation induction was used. In order to keep the studies as similar as possible, the present study used progressive muscle relaxation as an active control. The hypotheses for this study were H1: Those in the mindfulness condition will have a greater desire to engage in pro-environmental behaviors than those in the progressive muscle relaxation condition. H2: Connectedness to nature will mediate the relationship between mindfulness practice and pro-environmental behaviors.

Method

Participants

Participants were recruited for a study on "relaxation and cognitive focus" through the Psychology subject pool at Western Washington University. Participants earned credit as compensation for participation in the study. A power analysis indicated I needed 84 participants in order to have an 80% chance of detecting and effect size of .30, using .05 as the threshold for statistical significance. This was based on a between-subjects design in which the effect of the mindfulness induction was .30 (Apsy & Proeve, 2017). However, more participants needed to be recruited after the initial 84 due to participants failing the attention checks throughout the study. Participants were asked during the study if they have previous experience with mindfulness meditation or yoga. If participants had previous experience with mindfulness meditation or yoga, they were excluded from the study. Out of 142 participants, only 81 met the necessary inclusion criteria for their data to be utilized in the study (15 males, 64 females, 2 other, *M* age = 20.07, *SD* = 12.95). Participants' ethnicity was also assessed: 66.7% of participants identified as White, non-Hispanic, 8.6% were Hispanic or Latino, 4.9% were Black or African American, 12.3% were Asian or Pacific Islander, 1.2% were Native American or American Indian, and 6.2% identified as other.

Procedure

This study was a between-subjects design looking at the effects of mindfulness meditation on the desire to engage in pro-environmental behaviors. Participants were randomly assigned, using a random number generator online, *Random.org*, to one of two conditions: mindfulness meditation recording or progressive muscle relaxation recording. The same procedure was utilized as in Study 1, however there were some changes. The phone use manipulation was removed from the study as well as one of the distractor questionnaires

Materials

The same materials were used in Study 2 as Study 1, except for one change that included removing the AQS, a distractor questionnaire, to reduce the length of procedures.

Data Analysis Plan

For the successful completion of this study, a set of different analyses were used to test the different hypotheses set forth prior to the study being conducted. After cleaning the data, I conducted a two t-tests to test the effects of mindfulness on both connectedness to nature as well as desire to engage in pro-environmental behaviors. In order to test the indirect relationship between mindfulness and pro-environmental behaviors, I used Preacher & Hayes (2013) multiple mediation analysis on SPSS (Figure 1). In this analysis, mindfulness was the X or predictor variable, and pro-environmental behaviors was the Y or outcome variable. Connectedness to nature was the M or mediator variable.

Results

After collecting data collection was complete, the data were transferred from Qualtrics over to SPSS for screening, cleaning, and analysis. Data from 142 participants were collected. After examining the attention and mindfulness and yoga experience questions, 61 participants

did not meet the necessary inclusion criteria and had to be excluded from the study. Of the participants excluded 22 practiced yoga and meditation regularly, 9 practiced yoga regularly, 24 practiced meditation regularly, and 6 did not remember the name of the recording. Once participants were excluded, 81 participants were used for the remaining analyses. Once the participants that did not meet the inclusion criteria were excluded from the study, data cleaning and screening began. All scales were computed to assess the participants' average score across all questions for each individual scale. Once all scales were computed frequency distributions, skewness, and kurtosis were assessed for all scales that were utilized in the study. All values for the frequency distributions were within a normal so no transformations were made to the data. The rest of the data were also assessed for outliers or out of range answers, but all answers were within two standard deviations of the mean and did not include any answers that were considered out of range.

In order to check if the mindfulness recording did increase state mindfulness for the participants, an independent subjects t-test was performed comparing the two recording conditions on the State MAAS and State FFMQ Observe. The results of the manipulation check showed a non-statistically significant difference between mindfulness and progressive muscle relaxation for the State MAAS scale (t (79) = -.22, p = .83). The results of the manipulation check for the State FFMQ Observe showed a difference between mindfulness and progressive muscle relaxation that was marginally significant (t (79) = -1.79, p = .076. Those in the mindfulness condition were slightly more mindful (M = 4.6, SD = 1.02) than the progressive muscle relaxation condition (M = 4.2, SD = 1.19). Due to the non-significant results of that State MAAS, State FFMQ Observe was used in all further analyses.

The correlations between State FFMQO, State MAAS, PEB, and CNS were assessed to see if the previous correlations were replicated in this study. All variables were intercorrelated with each other, except for all variables with State MAAS. Due to the replication of the previous results, I continued with the planned analyses of the hypotheses using State FFMQO as the measure for state mindfulness.

Two independent sample t-tests were performed to test H1, to test the effect of recording condition on PEBs and CNS. After analyzing the t-test for recording condition and connectedness to nature, there was not a statistically significant difference between the two recordings (t (79) = .10, p = .92). There was also not a statistically significant difference between the two recording conditions for PEBs (t (79) = .59, p = .56).

Continuing with testing H2, the indirect effect of connectedness to nature on the relationship between recording condition and pro-environmental behaviors was tested using Preacher & Hayes Multiple Mediation analysis. Recording condition did not predict PEBs (β = .07, t (79) = .32, p = .56) or CNS (β = -.02, t (79) = -.10, p = .92).

Supplementary Analyses

Due to the nonsignificant results of the original hypotheses utilizing mindfulness practice as the independent variable, each hypothesis test was run using State FFMQO as the independent variable. These analyses would allow for a replication and comparison to previous experiments using correlational analyses.

H1 was run using State FFMQO as the independent variable using two linear regression analyses. In the analysis of state mindfulness and CNS, there was a statistically significant relationship between the two variables ($F_{(1,79)}$ = 11.70, β = 0.36, p = .001, R^2 = .13). In this analysis, for every one-point standard deviation increase in state mindfulness, participants'

predicted CNS increased by .36 standard deviations. For the analysis of state mindfulness and PEBs, there was a statistically significant relationship between the two variables ($F_{(1,79)} = 7.12$, $\beta = 0.29$, $p = .009$, $R^2 = .08$). For this relationship, for every one-point standard deviation increase in state mindfulness, participants' predicted PEB increased by .29 standard deviations.

The mediation analysis was replicated using State FFMQO instead of recording condition. There was a statistically significant association between state mindfulness and PEBs ($\beta = .14$, t (79) = 2.67, $p < .01$) as well as CNS ($\beta = .35$, t (79) = 3.42), $p = .001$). Connectedness to nature was significantly associated with PEBs ($\beta = .28$. t (79) = 5.87, $p < .001$). CNS mediated the relationship between state mindfulness and PEBs ($M_{ab} = .10$, $SE_{ab} = .04$; 95% CI [.04, .19]), resulting in a 71% reduction in the standardized coefficient (see Figure 4).

Discussion

Results of Study 2 did not support H1: participants in the mindfulness induction would have a greater desire to engage in pro-environmental behaviors and H2: connectedness to nature mediating the relationship between mindfulness practice and pro-environmental behaviors. Results of Study 2 support H1 looking at the correlational effect of state mindfulness on pro-environmental behaviors; participants with greater levels of state mindfulness had a greater desire to engage in pro-environmental behaviors. Results of Study 2 also support H2 looking at the correlational effect of the indirect relationship of connectedness to nature, state mindfulness, and pro-environmental behaviors.

General Discussion

The purpose of this study was to test the effect of mindfulness meditation practice on connectedness to nature and desire to engage in pro-environmental behaviors, as well as to see if smartphone use may change the effect of mindfulness. To my knowledge, this is the first study to

utilize a mindfulness induction with an active control to test state changes in connectedness to nature and desire to engage in pro-environmental behaviors.

I predicted that participants in the mindfulness meditation condition would report higher levels of state mindfulness than participants in the progressive muscle relaxation condition. This hypothesis was supported for Studies 1 and 2, participants in the mindfulness meditation condition did report higher levels of state mindfulness. Furthermore, I hypothesized that for Studies 1 and 2, those in the mindfulness meditation condition would report higher levels of state connectedness to nature and desire to engage in pro-environmental behaviors. This hypothesis was not supported, there were no differences in connectedness to nature or pro-environmental behaviors between the recording conditions. I also hypothesized a correlation between state mindfulness and connectedness to nature and desire to engage in pro-environmental behaviors. The correlational hypothesis between state mindfulness, connectedness to nature and pro-environmental behaviors was supported in Studies 1 and 2. Furthermore, I predicted in Study 1, individuals who used their phone would report less desire to engage in pro-environmental behaviors than individuals that did not used their phone. This hypothesis was not supported but was opposite of what was predicted, participants that used their phone reported higher levels of desire to engage in pro-environmental behaviors. Similarly, I hypothesized that the effects of mindfulness would be the strongest for participants in the no phone condition. This hypothesis was not supported given that there was no interaction between recording condition and phone condition. Additionally, I predicted that connectedness to nature would mediate the relationship between mindfulness and pro-environmental behaviors, and that phone condition would moderate the mediation. This hypothesis was partially supported, connectedness to nature did mediate the relationship between mindfulness and pro-environmental behaviors. However, phone

use did not moderate the indirect link from state mindfulness to pro-environmental behaviors through connectedness to nature. Results revealed that there were changes in state mindfulness immediately after the induction suggesting that state mindfulness can increase after a brief practice with no prior training. The effect of the meditation practice did not transfer to connectedness to nature or pro-environmental behaviors. The findings indicate that participants that were more mindful after either recording were more likely to be connected to nature and had a greater desire to engage in pro-environmental behaviors.

The findings of no difference between connectedness to nature and pro-environmental behaviors for the type of recording could be explained by the shorter induction period causing a weaker effect of mindfulness practice. Change in behavior as well as connection have been found to increase with the greater number of quality practices that participants engage in (Goldberg, Del Re, Hoyt & Davis, 2014). In other studies, participants who engaged in high quality mindfulness practice over a two-month period reported a greater change in behaviors than participants who reported a high number of lower quality practices. Most likely, if participants had practiced mindfulness meditation over multiple, high quality, practices, a change might have been seen in state connectedness to nature and desire to engage in pro-environmental behaviors. Another possible explanation for the findings in both Study 1 and 2 could be that the mindfulness meditation decreased task motivation for pro-environmental behaviors. Previous research done by Hafenbrack and Vohs (2018) found that participants who engaged in a mindfulness meditation practice were less motivated to do mundane tasks in the moment as well as less motivated to engage in tasks in the future. This could possibly explain why participants had no difference in their desire to engage in pro-environmental behaviors when comparing the mindfulness mediation to the control.

Phone Use

Following the induction, participants were either assigned to receive their phones to utilize during a break or were asked to sit patiently without their phone during the break. After this brief period of time, participants that utilized their phone during the break reported greater connectedness to nature and a greater desire to engage in pro-environmental behaviors. These results contradicted my original hypothesis that participants in the no phone condition would report a greater level of connectedness to nature and desire to engage in pro-environmental behaviors. I also hypothesized that there would be an interaction between phone use and recording for desire to engage in pro-environmental behaviors. This hypothesis came back as not significant, even though there was an interaction for state mindfulness.

Through additional reviewing of the literature, there is a relationship between positive affect, state mindfulness, connectedness to nature, and engagement in pro-environmental behaviors (Capaldi, Dopko & Zelenski, 2014). When originally trying to find the cause of the difference between the phone conditions, I also found that participants in the phone use condition reported higher levels of positive affect than participants in the no phone condition. It is possible the increase in positive affect explains the greater levels of connectedness to nature and desire to engage in pro-environmental behaviors.

Mediation and Moderated Mediation

Given the result from Amel and collogues in 2009 and Barbaro and Pickett in 2016, I had hypothesized that the relationship between mindfulness practice and pro-environmental behaviors would be mediated by connection to nature. I also predicted that the mediation model would be the same for state mindfulness and pro-environmental behaviors. The results for the mediation model involving mindfulness practice, as an experimental variable, were not

significant in Study 1 and Study 2. These results emphasize that the mindfulness induction was not powerful enough to affect connectedness to nature or pro-environmental behaviors. However, the results for the mediation model utilizing state mindfulness were significant in Study 1 and Study 2. These results replicate previous findings of connectedness to nature mediating the relationship between mindfulness and pro-environmental behaviors (Amel et al., 2009; Barbaro & Pickett, 2016). This study utilized state mindfulness, emphasizing that a state level change is associated with greater levels of connection to nature and desire to engage in pro-environmental behaviors.

Additionally, I predicted that phone use condition would moderate the mediation of mindfulness, connectedness to nature, and pro-environmental behaviors. When the analysis was run using mindfulness practice, again I saw that it was not significant. These results suggest that either phone use did not affect the mediation model or that the mindfulness practice was not powerful enough to see a difference in the results. I additionally ran the analysis using state mindfulness as the independent variable to see if it was truly the recording condition not being powerful enough, or if phone condition was not a moderator in this model. After running the analyses, the indirect effect of state mindfulness on pro-environmental behaviors through connectedness to nature was not different across the phone use conditions. These results support two possible explanations, one that the mindfulness practice was not powerful enough. Second could be the positive affect that was incurred from utilizing the phone led to the minimal and no moderation effect of the phone use.

Limitations and Future Directions

Although there were a number of strengths in this study, such as the use of a mindfulness practice focused on the observing facet and the use of an active control in the study, there were a

number of limitations that should be addressed in future research. The first limitation of both Study 1 and Study 2 involved the sample of participants that participated in the studies. Participants in the both studies were recruited through convenience sampling using the Psychology subject pool at Western Washington University. The majority of the subject pool at WWU identified as female (76.42%) as well as White non-Hispanic (66.35%). This led to a biased sample that does not accurately reflect WWU as a whole, or any other population. Previous research has found that females are more likely to report higher levels of mindfulness, connectedness to nature, and pro-environmental behaviors (Capaldi et al., 2014). Another limitation regarding the sample at WWU, was that there were a number of participants who had experience with meditation and/or yoga. Originally, I planned on excluding the subjects prior to participating in the study, however I was only able to exclude participants once they had completed the study. This caused a large number of participants' data to be excluded from the results after the study had been completed. It is important to note that in both Study 1 and Study 2, participants who had previous experience with yoga and/or mediation reported higher levels of state mindfulness, connectedness to nature, and pro-environmental behaviors. However, there was not a statistically significant difference in reported connectedness to nature or pro-environmental behaviors between the recording conditions. For future research it is important to utilize a sample that is more reflective of the desired population.

The second limitation of the current study was possibly the type of mindfulness mediation that was practiced and the short induction period for both the mindfulness meditation and the progressive muscle relaxation. The mindfulness meditation that was utilized was specifically focused on the breath and continued to try to build awareness of the surroundings. In this study since connection to nature and pro-environmental behaviors stemmed from the two

concepts of non-material values and well-being and pro-social behavior, a loving-kindness meditation may have been more effective. Aspy and Proeve (2017), found that participants that engaged in loving-kindness meditation exhibited the same increase in connection to nature after the practice as participants in the observing mindfulness meditation. The short induction period for the mindfulness meditation was could have also been not powerful enough to cause any change in connection to nature or pro-environmental behaviors. Although the mindfulness meditation did increase state mindfulness, it follows the results of other research that a number of quality practices are needed in order to result in any significant change in desired behavior and a mindfulness induction could inhibited task motivation (Goldberg et al., 2014; Hafenbrack & Vohs, 2018). Future research could build off of this limitation and use either a longer duration of mindfulness practice or having participants practice mindfulness multiple times. Research should also include different types of mindfulness meditation such as loving-kindness mediation or practicing mindful observing during a nature walk to see if the effects of the mindfulness inductions change depending on the practice.

The last limitation that occurred during the course of the two studies, were some possible confounds that could have influenced the results. The first confound that was noticed was that the studies were conducted during the Amazon and Australian wildfires causing a possible history effect. Although it might not have directly impacted the study, it is possible that participants were more aware of their environmental impact and had a greater desire to change their behaviors due to the fires. Also, it is possible that participants that used their phones came across articles or photos of the fires during the middle of the study. It could be likely that these results may not generalize to other periods in history when wildfires are not happening and are less salient in people's minds. Another possible confound was the unintentional increase of

positive affect that occurred after participants were given their phone back. It was apparent that the increase in positive affect could have caused the results to differ and possibly account for the overall effect of phone use. For studies conducted in the future, it would be important to look more at aimless technology use such as scrolling through ads, rather than general phone use to possibly avoid participants seeing environmentally charged material or avoid an increase in positive affect.

Despite these limitations, this study lends a good starting point for future studies and experiments. In this study, it was apparent that a brief one-time mindfulness practice was not powerful enough to change participants' connectedness to nature and desire to engage in pro-environmental behaviors. Further research would need to be conducted to see how much mindfulness practice would be needed in order to change those variables in the state, as well as how long it would take to see a trait change in connection to nature and behavior. Another possible addition to future research would be having a behavioral measure for engagement in pro-environmental behaviors. This would be important to see if mindfulness does change behavior or if it only increases desire to change behavior.

Conclusion

The current study utilized an experimental design to test the effect of mindfulness meditation and phone use on connectedness to nature and pro-environmental behaviors. The induction of mindfulness and an active control allowed for a new examination of the relationship between trait mindfulness, connectedness to nature, and pro-environmental behaviors. Additionally, the random assignment to phone use or no phone use allowed for a unique look into how technology may impact the effects of mindfulness immediately after a meditation practice. My results suggest that a 12-minute mindfulness practice was powerful enough to see

changes in state mindfulness but was not powerful enough to change connectedness to nature or desire to engage in pro-environmental behaviors. Additionally, these results indicate that it is overall higher state mindfulness that is related to increased connectedness to nature and pro-environmental behaviors. The results also showed that utilizing a phone after mindfulness practice led to an increase in connection to nature and pro-environmental behaviors. However, this could be explained by the increase in positive affect that occurred when participants were able to use their phone. Future research should continue to investigate the effect of mindfulness practice on connectedness to nature and pro-environmental behaviors through prolonged mindfulness meditation practice. Furthermore, research should continue to look at the impact that technology use has on mindfulness practice by looking more at the aimless use of technology.

References

Amel, E. L., Manning, C. M., & Scott, B. A. (2009). Mindfulness and sustainable behavior: pondering attention and awareness as means for increasing green behavior. *Ecopsychology*, 1, 14–25.

Aspy, D. J., & Proeve, M. (2017). Mindfulness and Loving-Kindness Meditation. *Psychological Reports,120*(1), 102-117. doi:10.1177/0033294116685867

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, 13, 27–45.

Barbaro, N., & Pickett, S. M. (2015). Mindfully green: Examining the effect of connectedness to nature on the relationship between mindfulness and engagement in pro-environmental behavior. *Personality and Individual Differences,93*, 137-142. doi:10.1016/j.paid.2015.05.026

Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist,* 54, 462–479.

Bayer, J. B., Dal Cin, S., Campbell, S. W., & Panek, E. (2015). Consciousness and self-regulation in mobile communication. *Human Communication Research, 42*, 71-97. doi:10.1111/hcre.12067

Bratanova, B., Loughnan, S., & Gatersleben, B. (2012). The moral circle as a common motivational cause of cross-situational pro-environmentalism. *European Journal of Social Psychology*, 42, 539–545.

Brown, K. W., & Kasser, T. (2005). Are psychological and ecological well-being compatible? The role of values, mindfulness, and lifestyle. *Social Indicators Research*, 74, 349–368.

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, 84, 822–848.

Burroughs, J., Rindfleisch, A. (2002). Materialism and Well-Being: A Conflicting Values Perspective. *Journal of Consumer Research, 29*, 348–370.

Capaldi, C. A., Dopko, R. L., & Zelenski, J. M. (2014). The relationship between nature connectedness and happiness: a meta-analysis. *Frontiers in psychology*, *5*, 976.

Carson, J. W., Carson, K. M., Gil, K. M., Baucom, D. H. (2004) Mindfulness-based relationship enhancement. *Behavior Therapy 35*, 471–494.

Chatzisarantis, N. L. D., & Hagger, M. S. (2007). Mindfulness and intention–behavior relationship within the theory of planned behavior. *Personality and Social Psychology Bulletin, 33*, 663–676.

Climate Change Indicators in the United States. (2017, June 22). Retrieved from https://www.epa.gov/climate-indicators

David, D. M. (2016). The effects of mindfulness meditation on attention and rumination (Master's thesis). Retrieved from https://cedar.wwu.edu/cgi/viewcontent.cgi?article=1519&context=wwuet

Ericson, T., Kjønstad, B.G., Barstad, A. (2014). Mindfulness and sustainability. *Ecological Economics, 104*, 73–79.

Fischer, D., Stanszus, L., Geiger, S., Grossman, P., & Schrader, U. (2017). Mindfulness and sustainable consumption: A systematic literature review of research approaches and findings. *Journal of Cleaner Production, 162*, 544-558. doi:10.1016/j.jclepro.2017.06.007

Frantz, C., Mayer, F. S., Norton, C., Rock, M. (2005) There is no 'I' in nature: The influence of self-awareness on connectedness to nature. *Journal of Environmental Psychology, 25*, 427–436.

Goldberg, S. B., Del Re, A. C., Hoyt, W. T., & Davis, J. M. (2014). The secret ingredient in mindfulness interventions? A case for practice quality over quantity. *Journal of Counseling Psychology*, *61*(3), 491.

Gronhoj, A., & Thogersen, J. (2012). Action speaks louder than words: the effect of person- al and family norms on adolescents' pro-environmental behaviour. *Journal of Economic Psychology, 33*, 292–302.

Grossman, P., Niemann, L., Schmidt, S., Walach, H. (2004). Mindfulness-based stress reduction and health benefits. *Journal of psychosomatic research, 57*, 35–43.

Hafenbrack, A. C., & Vohs, K. D. (2018). Mindfulness meditation impairs task motivation but not performance. *Organizational Behavior and Human Decision Processes*, *147*, 1-15.

Howell, A. J., Dopko, R. L., Passmore, H., & Buro, K. (2011). Nature connectedness: associations with well-being and mindfulness. *Personality and Individual Differences, 51,* 166–171.

Jiang, B., Schmillen, R., & Sullivan, W. C. (2018). How to Waste a Break: Using Portable Electronic Devices Substantially Counteracts Attention Enhancement Effects of Green Spaces. *Environment and Behavior*. doi:10.1177/0013916518788603

Kabat-Zinn, J. (1990). Full Catastrophe Living: Using the Wisdom of your Mind to Face Stress, Pain and Illness. New York: Dell Publishing.

Kasser, T., Rosenblum, K.L., Sameroff, A.J., Deci, E.L., Niemiec, C.P., Ryan, R.M., … Hawks, S. (2014). Changes in materialism, changes in psychological well-being. Evidence from three longitudinal studies and an intervention experiment. *Motiv Emot, 38*, 1–22.

Kaza, S. (2018). *What a waste 2.0: A global snapshot of solid waste management to 2050*. Washington, DC: World Bank Group.

Keng, S., Smoski, M. J., & Robins, C. J. (2011). Effects of mindfulness on psychological health: A review of empirical studies. *Clinical Psychology Review, 31*, 1041-1056. doi:10.1016/j.cpr.2011.04.006

Kiken, L. G., Garland, E. L., Bluth, K., Palsson, O. S., & Gaylord, S. A. (2015). From a state to a trait: Trajectories of state mindfulness in meditation during intervention predict changes in trait mindfulness. *Personality and Individual Differences*, *81,* 41–46. doi:10.1016/j.paid.2014.12.044

Kim, S., Park, M. H., Han, S., Na, H. R., Cho, S., Choi, M. S., . . . Park, K. W. (2011). Validation Analysis of the Attention Questionnaire Scale. *Journal of Alzheimer's Disease, 24*, 393-402. doi:10.3233/jad-2011-100660

Kollmuss, A., & Agyeman, J. (2002). Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research, 8,* 239–260.

Kristeller, J. L., Johnson, T. (2005) Cultivating loving kindness: A two-stage model of the effects of meditation on empathy, compassion, and altruism. *Zygon, 40*, 391–408.

La Rose, R., Lin, C. A., & Eastin, M. S. (2003). Unregulated internet usage: Addiction, habit, or deficient self-regulation, *Media Psychology, 5,* 225-253.

Lim, D., Condon, P., DeSteno, D. (2015). Mindfulness and compassion: an examination of mechanism and scalability. *PloS one 10*, 118-221.

Mayer, F. S., & Frantz, C. M. (2004). The connectedness to nature scale: a measure of individual feeling in community with nature. *Journal of Environmental Psychology, 24,* 503–515.

Miao, L., & Wei, W. (2013). Consumers' pro-environmental behavior and the underlying motivations: a comparison between household and hotel settings. *International Journal of Hospitality Management, 32*, 102–112.

Neal, D. T., Wood, W., & Quinn, J. M. (2006). Habits—A repeat performance. *Current Directions in Psychological Science*, *15*, 198-202.

Pfattheicher, S., Sassenrath, C., Schindler, S. (2016). Feelings for the suffering of 0thers and the environment. Compassion Fosters Proenvironmental Tendencies. *Environment and Behavior 48*, 929–945.

Richardson, M., Hussain, Z., & Griffiths, M. D. (2018). Problematic smartphone use, nature connectedness, and anxiety. *Journal of Behavioral Addictions, 7*, 109-116. doi:10.1556/2006.7.2018.10

Rosenberg, E.L., (2005). Mindfulness and consumerism, in: Kasser, T., Kanner, A.D. (Eds.), Psychology and consumer culture. The struggle for a good life in a materialistic world. American Psychological Assoc, Washington, DC, pp. 107–125.

Schultz, P. W. (2002). Inclusion with nature: the psychology of human-nature relations, in P. Schmuck, & W. P. Schultz (Eds.), Psychology of Sustainable Development. Dor- drecht: Kluwer Academic Publishers.

Shea, M., & Scollon, C. N. (2019, June). *Engaging in pro-environmental behaviors through mindfulness and connectedness to nature*. Poster session presented at Western Washington University Psychfest, Bellingham, WA.

Terry, C. P., & Terry, D. L. (2014). Cell Phone-Related Near Accidents Among Young Drivers: Associations With Mindfulness. *The Journal of Psychology, 149*, 665-683. doi:10.1080/00223980.2014.964166

Turkle, S. (2016). *Reclaiming conversation: The power of talk in a digital age*. NY, NY: Penguin Books.

Watson, D., Clark, L. A., Tellegen, A. (1988) Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*, 1063–1070.

Whitmarsh, L., & O'Neill, S. (2010). Green identity, green living? The role of pro-environmental self-identity in determining consistency across diverse pro-environmental behaviours. *Journal of Environmental Psychology, 30*, 305-314. doi:10.1016/j.jenvp.2010.01.003

Yang, X., Zhou, Z., Liu, Q., & Fan, C. (2019) Mobile phone addiction and adolescents' anxiety and depression: the moderating role of mindfulness. *Journal of Child and Family Studies*, *28*, 822-830. doi: 10.1007/s10826-018-01323-2

Tables

Table 1

Zero-order correlations and descriptive statistics for study variables: Study 1.

Variable	1	2	3	4
1. MAAS	-			
2. FFMQO	0.02	-		
3. CNS	-0.09	0.30**	-	
4. PEB	0.04	0.32**	0.39**	-
Mean	1.67	4.49	4.17	2.92
SD	0.39	1.26	1.02	0.49

Note. MAAS = Mindfulness Attention and Awareness Scale. FFMQO = Five Facet Mindfulness Questionnaire - Observe. CNS = Connectedness to Nature. PEB = Pro-Environmental Behaviors. * $p < .05$, ** $p < .01$.

Table 2

Two-way analysis of variance of recording condition and phone condition for connection to nature.

Source	*df*	MS	*F*	*p*	Effect Size
Phone	1	6.59	6.50	0.01	0.05
Recording	1	0.61	0.60	0.44	0.00
Phone X Recording	1	0.92	0.91	0.34	0.01
Error	134	1.01			

Table 3

Two-way analysis of variance of recording condition and phone condition for pro-environmental behaviors.

Source	*df*	MS	*F*	*p*	Effect Size
Phone	1	1.45	6.01	0.02	0.05
Recording	1	0.01	0.06	0.81	0.00
Phone X Recording	1	0.11	0.44	0.51	0.00
Error	134	.24			

Table 4

Multiple regression analyses: State mindfulness and phone condition predicting connectedness to nature.

Variable	β	t
Mindfulness	0.28	3.40***
Phone Condition	0.17	2.04*
Phone X Mindfulness	0.46	1.38

Note. β = standardized beta coefficient.

* $p < .05$, ** $p < .01$, ***$p < .001$.

Table 5

Multiple regression analyses: State mindfulness and phone condition predicting pro-environmental behaviors.

Variable	β	t
Mindfulness	0.29	3.58***
Phone Condition	0.16	1.99*
Phone X Mindfulness	0.24	0.73

Note. β = standardized beta coefficient.

* $p < .05$, ** $p < .01$.

Table 6

Inference for the conditional direct and indirect effects of the phone condition: Condition 1 and 2. Utilizing recording condition as the predictor.

	Indirect Effect		Direct Effect		
Phone Condition	Effect	95% Bootstrap CI	Effect	*SE*	*p*
1	.005	-0.071 to 0.093	0.071	0.108	0.512
2	-.052	-0.141 to 0.041	0.018	0.114	0.878

Note. CI = Confidence Interval. Phone Condition 1 = participants used phones. Phone Condition 2 = participants did not use phones.

Table 7

Inference for the conditional direct and indirect effects of the phone condition: Condition 1 and 2. Utilizing state mindfulness as the predictor.

	Indirect Effect		Direct Effect		
Phone Condition	Effect	95% Bootstrap CI	Effect	*SE*	*p*
1	0.022	-0.000 to 0.052	0.073	0.041	0.079
2	0.049	0.012 to 0.098	0.093	0.049	0.057

Note. CI = Confidence Interval. Phone Condition 1 = participants used phones. Phone Condition 2 = participants did not use phones.

Table 8

Zero-order correlations and descriptive statistics for study variables: Study 2.

Variable	1	2	3	4
1. MAAS	-			
2. FFMQO	0.01	-		
3. CNS	0.22*	0.36**	-	
4. PEB	-0.17	0.29**	0.60**	-
Mean	2.88	4.38	4.25	2.85
SD	1.11	1.12	1.09	0.53

Note. MAAS = Mindfulness Attention and Awareness Scale. FFMQO = Five Facet Mindfulness Questionnaire - Observe. CNS = Connectedness to Nature. PEB = Pro-Environmental Behaviors. * $p < .05$, ** $p < .01$.

Figures

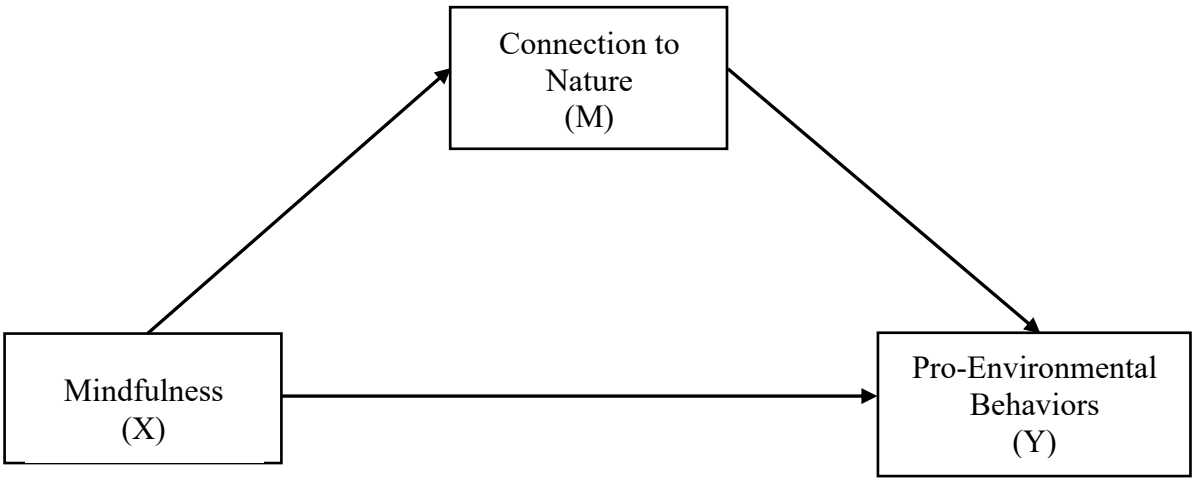

Figure 1. Hypothesized mediation model of mindfulness and pro-environmental behaviors with causal pathways.

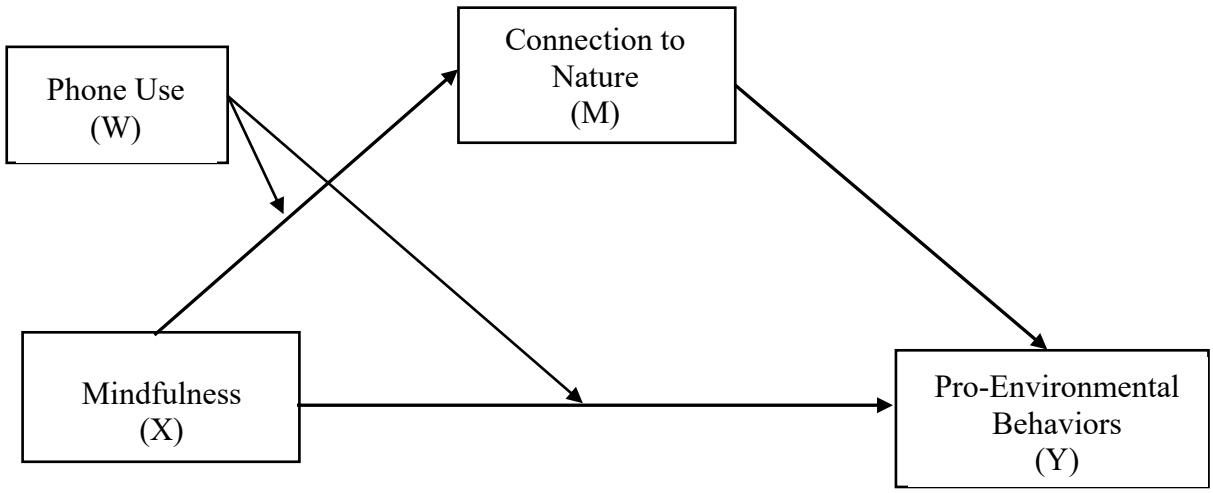

Figure 2. Hypothesized moderated mediation model of phone use, mindfulness, and pro-environmental behaviors with causal pathways.

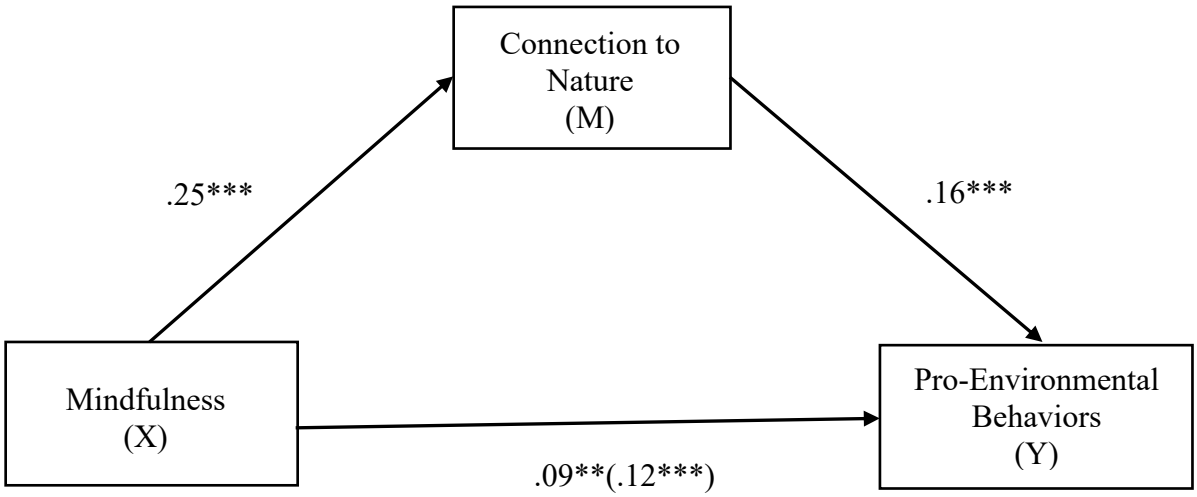

Figure 3. Study 1: Standardized regression coefficients for the relationship between state mindfulness and pro-environmental behaviors as partially mediates by connectedness to nature. *$p < .05$, **$p < .01$, ***$p < .001$.

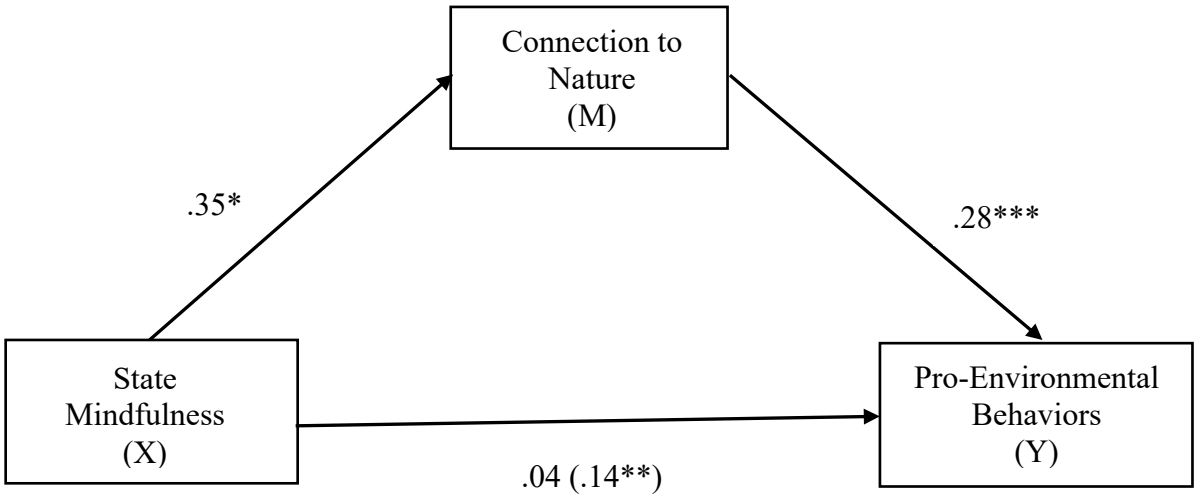

Figure 4. Study 2: Standardized regression coefficients for the relationship between state mindfulness and pro-environmental behaviors as partially mediates by connectedness to nature. *$p < .05$, **$p < .01$, ***$p < .001$.

Appendix A

Mindful Breathing “Calm Mind” Script

Start by settling into a comfortable position and allow your eyes to close or keep them open with a softened gaze. Begin by taking several long slow deep breaths breathing in fully and exhaling fully. Breathe in through your nose and out through your nose or mouth. Allow your breath to find its own natural rhythm. Bring your full attention to noticing each in-breath as it enters your nostrils, travels down to your lungs and causes your belly to expand. And notice each out-breath as your belly contracts and air moves up through the lungs back up through the nostrils or mouth. Invite your full attention to flow with your breath.

(pause)

Notice how the inhale is different from the exhale. You may experience the air as cool as it enters your nose and warm as you exhale. As you turn more deeply inward, begin to let go of noises around you. If you are distracted by sounds in the room, simply notice them and then bring your intention back to your breath. Simply breathe as you breathe, not striving to change anything about your breath. Don't try to control your breath in any way. Observe and accept your experience in this moment without judgment, paying attention to each inhale and exhale.

If your mind wanders to thoughts, plans or problems, simply notice your mind wandering. Watch the thought as it enters your awareness as neutrally as possible. Then practice letting go of the thought as if it were a leaf floating down a stream. In your mind, place each thought that arises on a leaf and watch as it floats out of sight down the stream. Then bring your attention back to your breath. Your breath is an anchor you can return to over and over again when you become distracted by thoughts.

(pause)

Notice when your mind has wandered. Observe the types of thoughts that hook or distract you. Noticing is the richest part of learning. With this knowledge you can strengthen your ability to detach from thoughts and mindfully focus your awareness back on the qualities of your breath. Practice coming home to the breath with your full attention. Watching the gentle rise of your stomach on the in-breath and the relaxing, letting go on the out-breath. Allow yourself to be completely with your breath as it flows in and out.

(pause)

You might become distracted by pain or discomfort in the body or twitching or itching sensations that draw your attention away from the breath. You may also notice feelings arising, perhaps sadness or happiness, frustration or contentment. Acknowledge whatever comes up including thoughts or stories about your experience. Simply notice where your mind went without judging it, pushing it away, clinging to it or wishing it were different and simply refocus your mind and guide your attention back to your breath.

(pause)

Breathe in and breathe out. Follow the air all the way in and all the way out. Mindfully be present moment by moment with your breath. If your mind wanders away from your breath, just notice without judging it – be it a thought, emotion, or sensation that hooks your attention and gently guide your awareness back to your breathing.

(pause)

As this practice comes to an end, slowly allow your attention to expand and notice your entire body and then beyond your body to the room you are in. When you're ready, open your eyes and come back fully alert and awake. The breath is always with you as a refocusing tool to

bring you back to the present moment. Set your intention to use this practice throughout your day to help cultivate and strengthen attention.

Appendix B

Progressive Muscle Relaxation "Simple Relaxation" Script

During this exercise, each muscle should be tensed, but not to the point of strain. If you have any injuries or pain, you can skip the affected areas. Pay special attention to the feeling of releasing tension in each muscle and the resulting feeling of relaxation. Let's begin.

Sit back or lie down in a comfortable position. Shut your eyes if you're comfortable doing so. Begin by taking a deep breath and noticing the feeling of air filling your lungs. Hold your breath for a few seconds.

(brief pause)

Release the breath slowly and let the tension leave your body. Take in another deep breath and hold it.

(brief pause)

Again, slowly release the air. Even slower now, take another breath. Fill your lungs and hold the air.

(brief pause)

Slowly release the breath and imagine the feeling of tension leaving your body. Now, move your attention to your feet. Begin to tense your feet by curling your toes and the arch of your foot. Hold onto the tension and notice what it feels like.

(pause)

Release the tension in your foot. Notice the new feeling of relaxation. Next, begin to focus on your lower leg. Tense the muscles in your calves. Hold them tightly and pay attention to the feeling of tension.

(pause)

Release the tension from your lower legs. Again, notice the feeling of relaxation. Remember to continue taking deep breaths. Next, tense the muscles of your upper leg and pelvis. You can do this by tightly squeezing your thighs together. Make sure you feel tenseness without going to the point of strain.

(pause)

And release. Feel the tension leave your muscles. Begin to tense your stomach and chest. You can do this by sucking your stomach in. Squeeze harder and hold the tension. A little bit longer.

(pause)

Release the tension. Allow your body to go limp. Let yourself notice the feeling of relaxation. Continue taking deep breaths. Breathe in slowly, noticing the air fill your lungs, and hold it.

(pause)

Release the air slowly. Feel it leaving your lungs. Next, tense the muscles in your back by bringing your shoulders together behind you. Hold them tightly. Tense them as hard as you can without straining and keep holding.

(pause)

Release the tension from your back. Feel the tension slowly leaving your body, and the new feeling of relaxation. Notice how different your body feels when you allow it to relax. Tense your arms all the way from your hands to your shoulders. Make a fist and squeeze all the way up your arm. Hold it.

(pause)

Release the tension from your arms and shoulders. Notice the feeling of relaxation in your fingers, hands, arms, and shoulders. Notice how your arms feel limp and at ease. Move up to

your neck and your head. Tense your face and your neck by distorting the muscles around your eyes and mouth.

(pause)

Release the tension. Again, notice the new feeling of relaxation. Finally, tense your entire body. Tense your feet, legs, stomach, chest, arms, head, and neck. Tense harder, without straining. Hold the tension.

(pause)

Now release. Allow your whole body to go limp. Pay attention to the feeling of relaxation, and how different it is from the feeling of tension. Begin to wake your body up by slowly moving your muscles. Adjust your arms and legs. Stretch your muscles and open your eyes when you're ready.

Appendix C

Mindful Attention Awareness Scale (MAAS) – State

(Brown & Ryan, 2003)

Instructions: Using the 0-6 scale shown, please indicate to what degree were you having each experience described below in the last 15 minutes. Please answer according to what really reflected your experience rather than what you think your experience should have been.

0	1	2	3	4	5	6
Not at all			Somewhat			Very much

_____ 1. I was finding it difficult to stay focused on what was happening.

_____ 2. I was doing something without paying attention.

_____ 3. I was preoccupied with the future or the past.

_____ 4. I was doing something automatically, without being aware of what I was doing.

_____ 5. I was rushing through something without being really attentive to it.

Scoring: To have high scores reflect higher state mindfulness, reverse score all items then average all 5 values.

Appendix D

Five Facet Mindfulness Questionnaire – State Observing Subscale (FFMQ Observe)

(Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L., 2006)

Instructions: Using the 0-6 scale shown, please indicate to what degree were you having each experience described below in the last 15 minutes. Please answer according to what really reflected your experience rather than what you think your experience should have been.

0	1	2	3	4	5	6
Not at all			Somewhat			Very much

_____ 1. I deliberately noticed the sensations of my body's position or my body moving.

_____ 2. I deliberately noticed the feeling of air on my skin.

_____ 3. I noticed the different sounds in the room I am in.

_____ 4. I paid attention to how my emotions affected my thoughts.

Appendix E

The State Connection to Nature Scale (CNS)

(Mayer & Frantz, 2004)

Please answer each of these questions in terms of the way you are *currently feeling*. 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	6	7
Strongly Disagree			Neutral			Strongly Agree

_____ 1. Right now, I'm feeling a sense of oneness with the natural world around me.

_____ 2. At the moment, I'm feeling that the natural world is a community to which I belong.

_____ 3. I presently recognize and appreciate the intelligence of other living organisms.

_____ 4. At the present moment, I don't feel connected to nature.

_____ 5. At the moment, I can imagine myself as part of the larger cyclical process of living.

_____ 6. At this moment, I'm feeling a kinship with animals and plants.

_____ 7. Right now, I feel as though I belong to the earth just as much as it belongs to me.

_____ 8. Right now, I am feeling deeply aware of how my actions affect the natural world.

_____ 9. Presently, I feel like I am part of the web of life.

_____ 10. Right now, I feel that all inhabitants of earth, human and nonhuman, share a common life force.

_____ 11. At the moment, I am feeling embedded within the broader natural world, like a tree in a forest.

_____ 12. When I think of humans' place on earth right now, I consider them to be the most valuable species in nature.

_____ 13. At this moment, I am feeling like I am only a 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.

Scoring: To have high scores reflect higher state connection to nature, reverse score items 4 and 12, then average all 13 values.

Appendix F

Pro-Environmental Behavior Scale

(Whitmarsh & Oniell, 2010)

Please indicate your desire to engage in each action.

0	1	2	3
Never	Occasionally	Often	Always

_____ 1. Turn off lights you're not using

_____ 2. Drive economically (e.g., braking or accelerating gently)

_____ 3. Walk, cycle or take public transport for short journeys (i.e., trips of less than 3 miles)

_____ 4. Use an alternative to traveling (e.g., shopping online)

_____ 5. Share a car journey with someone else

_____ 6. Cut down on the amount you fly

_____ 7. Buy environmentally-friendly products

_____ 8. Eat food, which is organic, locally-grown or in season

_____ 9. Avoid eating meat

_____ 10. Buy products with less packaging

_____ 11. Reuse or repair items instead of throwing them away

_____ 12. Recycle

_____ 13. Compost your kitchen waste

_____ 14. Save water by taking shorter showers

_____ 15. Turn off the tap while brushing your teeth

_____ 16. Write to your representatives about an environmental issue

_____ 17. Take part in a protest about an environmental issue

Scoring: To have high scores reflect a greater desire to engage in pro-environmental behaviors, scores are averaged across all items.

Appendix G

The Positive and Negative Affect Schedule (PANAS)

(Watson, Clark, & Tellegen, 1988)

Indicate the extent you feel this way in the present moment

1	2	3	4	5
Very slightly or not at all	A little	Moderately	Quite a bit	Extremely

_____ 1. Interested

_____ 2. Distressed

_____ 3. Excited

_____ 4. Upset

_____ 5. Strong

_____ 6. Guilty

_____ 7. Scared

_____ 8. Hostile

_____ 9. Enthusiastic

_____ 10. Proud

_____ 11. Irritable

_____ 12. Alert

_____ 13. Ashamed

_____ 14. Inspired

_____ 15. Nervous

_____ 16. Determined

_____ 17. Attentive

_____ 18. Jittery

_____ 19. Active

_____ 20. Afraid

Scoring: Scoring will not be used for this scale as it is used as a distractor and to keep with the cover story.

Appendix H

The Attention Questionnaire Scale (AQS)

(Kim et al., 2010)

Please rate for each item how often the behavior occurs or how much you agree with the statement in your everyday life.

0	1	2
Never or none		Many or always

_____ 1. Do you easily become inattentive?

_____ 2. Do you forget to lock the front door when going out?

_____ 3. Do you have difficulty finding stuff in your house?

_____ 4. Do you have trouble performing a task?

_____ 5. Are you often distracted from the topic when engaged in a long conversation?

_____ 6. Do you easily get confused in a crowed place?

_____ 7. Do you get lost in a familiar place?

_____ 8. Do you often feel tired or sleepy during a conversation or daily activity?

_____ 9. Are you good at concentrating on one thing?

_____ 10. Do you show interest in what is happening around you?

_____ 11. Do you try to do things for yourself?

_____ 12. Do you still have a hobby that you took up in the past?

_____ 13. Do you show interest in new subjects?

_____ 14. Can you keep a conversation going during a meal?

_____ 15. Are you good at concentrating on a show you are watching on TV?

Scoring: Scoring will not be used for this scale as it is used as a distractor and to keep with the cover story.