Evaluating the Role of Time Spent in Nature on Addiction Recovery

RaeJean Boyd

Professor Raul Lejano
Final Seminar: Explorations
MA in Environmental Conservation Education

New York University
Steinhardt School of Culture, Education, and Human Development
Department of Teaching & Learning
Contents
I. Abstract ........................................................................................................................................... 2
II. Introduction ..................................................................................................................................... 2
III. Literature Review ......................................................................................................................... 3  
a. With Nature in Mind: Stress, Eco-Psychology & the Brain ......................................................... 4  
b. The Brain on Drugs: Psychology and Neurotransmitters ............................................................... 6  
IV. Methods ......................................................................................................................................... 7  
a. Research Design ................................................................................................................................. 7  
b. Participants ....................................................................................................................................... 7  
c. Actions Taken by the Participants .................................................................................................... 8  
d. Survey Design .................................................................................................................................. 8  
e. Site Description ............................................................................................................................... 9  
f. Hypotheses ....................................................................................................................................... 10  
V. Results .............................................................................................................................................. 11  
a. Pre-Walk Survey ............................................................................................................................... 11  
b. Post-Walk Survey ............................................................................................................................. 11  
c. Two Week Post Survey .................................................................................................................... 12  
VI. Discussion ...................................................................................................................................... 13  
a. Stress .............................................................................................................................................. 13  
b. Spirituality ................................................................................................................................ ...... 13  
c. Meditation ....................................................................................................................................... 14  
VII. Conclusion ................................................................................................................................... 15  
VIII. References .................................................................................................................................. 16
I. Abstract

Environmental Education is an interdisciplinary field which addresses many issues but often overlooks substance addiction. This study explores the possibility of using nature to combat instances of relapse in recovering addicts. The experiment was designed as a four-part comparative study between two groups consisting of a pre-survey, an outdoors walk (nature or non-nature), a post-survey, and a two-week post survey. The metrics used to analyze the effectiveness of the walk as a tool for addressing substance addiction were: stress, meditation, and spirituality. The hypothesis of the study was that people who participated in the nature walk would have lower stress and higher spirituality following the walk than those who participated in the non-nature walk. The results of the study support the assertion that addicts who walk (regardless the type of walk) experience positive benefits on their stress. Using a two-tailed paired t test to compare the average means for stress levels before and after the walks it was found that there was a significant decrease in stress for all participants following the walks. Unfortunately, the data on meditation and spirituality did not definitively support this studies hypothesis. More studies are needed in order to better understand the correlations between nature, spirituality, meditation, and addiction recovery.

Keywords: Environmental Education, Nature, Spirituality, Meditation, Addiction, Relapse, Stress

II. Introduction

Environmental Education is a multidisciplinary field which “seeks to increase awareness and sensitivity to the environment” (United States Environmental Protection Agency, 2017). This paper will address an area of environmental education which has previously been overlooked: the impacts of environmental education and specifically, exposure to nature on the lives of people recovering from substance addiction. Since this topic has been largely ignored in the literature, the research in this paper is the first foray in attempting to ascertain the connection between environmental education, nature, and recovery. Specifically, the research that follows will attempt to assess how spending time in nature can help an addict lower stress, increase spirituality, and enhance their recovery. The hypothesis for this research is that spending time in nature impacts a recovering addict's sobriety by increasing their spirituality and lowering stress. Some factors that will be considered in this research include the amount of time spent in nature, individuals’ perception of their own spirituality, and their self-assessed levels of stress. The research questions for this study are as follows:

How does spending time in nature affect people recovering from substance abuse?

Specific Questions

1. Is there a correlation between spending more time in nature and more clean time? If so, how does spending more time in nature effect clean time?
2. How does frequent exposure to nature correlate with more time mediating or higher levels of spirituality?

The motivation behind this research is based on the fact that drug addiction is a problem that is running rampant in the United States. In fact, on Oct. 26, 2017, President Trump declared the opioid crisis in the country as a state of emergency. According to the government's reports on addiction, "it is common for a person to relapse, but relapse does not mean that treatment does
not work” (NIDA, 2016). With this in mind, it is important to look at what does work to reduce the incidence of relapse and enhance the recovery process.

The healing qualities of nature, have been recognized for years by wilderness programs that create nature experiences for a wide range of audiences (Benton, 2012). The primary literature on this topic indicates that there is biological evidence of a correlation between time spent in nature and overall wellbeing (Logan & Selhub, 2013). In fact, there is a clear connection between stress reduction and time spent in nature, which will be further discussed later in this report. It is worth noting that research on the benefits of nature can be traced back over several decades.

As far back as 1979, researchers such as Robert Ulrich, have found that experiencing "scenes of nature” leads to decreases in stress, anger, and aggression. In Japan, the practice of Forest Bathing or Shinrin-Yoku—which is the immersion of oneself in forests for one day or a few hours—has been found to "cultivate…transcendent experiences...of attunement to that outside the self” (Selhub & Logan, 2012). During Forest Bathing, it has also been found that "there is a decrease in hemoglobin in the prefrontal cortex…. [which] means the brain is taking a time out” (Selhub & Logan, 2012).

When looking at this information, we hypothesize that the beneficial effects of nature might be directly applicable to the area of substance addiction. Specifically, we propose that spending time in nature can positively impact an individual’s recovery from substance addiction. Eva Selhub, a proponent of the restorative effects of nature, has suggested that impulsivity is a factor in "drug addiction [, relapse], suicide, and violence." She posits that time spent in nature can increase a person's ability to exercise self-control because it impacts the frontal lobe of the brain. Selhub’s position—that spending time in nature increases self-control—can be connected to the idea of mediation and spirituality (Logan & Selhub, 2013). Coincidently, meditation and spirituality are already being used to prevent incidences of relapse, in fact these tenets are emphasized in the Narcotics Anonymous Basic Text. According to the Basic Text, addicts attain a closer relationship with their higher power through prayer and meditation, (Narcotics Anonymous Fellowship, 1983).

In the literature review that follows, this report will detail the history and science behind natures impacts on spirituality and stress. In addition, the literature review below will explain how increases in spirituality and decreases in stress enhance recovery and prevent relapse.

III. Literature Review

In 1899, physician Juan Brena developed the theory that forests could have "calming and invigorating health benefits," yet the theory went for many years without substantiation (Logan & Selhub, 2013). In the 1990’s terms such as ecopsychology, nature therapy, and ecotherapy began to gain notoriety in the health community (Fletcher, 2012). There was pushback from the scientific community because the practice of treating people's ailments with nature—until recently—was viewed as a pseudo-science due to its lack of “standards of practice and licensing requirements” (Hamblin, 2015). Robert Ulrich, in 1979, looked at the mental influences of nature scenes on stressed students using an EEG—electroencephalography, a machine which is used to view the electrical behavior in the brain—to see if decreased stress was observed (Logan & Selhub, 2013). It was not until 1999 that researchers used fMRIs, functional magnetic resonance imaging, to look at the brain on nature (Logan & Selhub, 2013). The results of both studies confirmed Brena’s theory and opened the field of ecotherapy and ecopsychology to further exploration.
a. With Nature in Mind: Stress, Eco-Psychology & the Brain

In the last decade, researchers have agreed that spending time in nature can lower stress (Logan & Selhub, 2013). In the last five years, scientists have begun to study how nature affects the human brain, looking specifically at how spending time outdoors impacts people psychological and physiological state (Logan & Selhub, 2013). The three neurological chemicals associated with the healing benefits of nature are serotonin, oxytocin, and dopamine (Nguyen, 2014).

Figure 1: Impact of Nature on Stress

Serotonin

As mentioned above, Robert Ulrich looked at the impact of nature scenes on the brain. His focus was on stress, and the results of his research using an EEG, indicated that nature impacts alpha waves and beta waves in the brain (Logan & Selhub, 2013). Viewing nature scenes caused higher alpha wave amplitudes, indicating increased serotonin, also known as the "happy chemical" in the brain (Logan & Selhub, 2013). This data was significant because it also showed that viewing nature scenes decreased anxiety. Lower alpha wave activity and higher beta wave activity categorize anxiety when looking at EEG results (Logan & Selhub, 2013).

Ulrich’s research has direct implications on recovery from addiction. Serotonin deficits in recovering addicts has been proven to “trigger drug-seeking and [increase] vulnerability to relapse” (Kirby, Zeeb, & Winstanley, 2011). Ulrich’s research suggests that exposing recovering addicts to natural scenes increases serotonin production in the brain, therefore preventing the serotonin deficits which often lead to relapse. The benefits above are in addition to the fact that serotonin contributes to improving overall happiness and decreasing stress.

---

1 Serotonin is a chemical that operates within the nervous system and can affect “the way you feel, for example, making you feel happier, calmer, or less hungry.” (Advanced English Dictionary)
Oxytocin

In a similar study to the one conducted by Robert Ulrich, researchers from the Common Wealth University of Virginia used EEG’s to look at the effects of nature and animals—specifically dogs—on people who were stressed (Logan & Selhub, 2013). They wanted to see if these influences would impact cortisol levels in people dealing with stress. During their study, the researchers discovered that oxytocin levels increased when exposed to those types of stimulants and cortisol levels decreased (Logan & Selhub, 2013). According to Logan and Selhub, oxytocin is a hormone-like peptide produced in the brain, [and] is in many ways the elixir of positive psychology. It has been shown to facilitate social bonding, prosocial behavior, and empathy; decrease stress; improve mental outlook; turn down the dial on activity in the fear centers of the brain; enhance a sense of security, trust, and pleasure; and lower the production of stress hormones (2013).

Oxytocin increases pleasure and reduces anxiety for individuals coping with difficult circumstances and trauma (Logan & Selhub, 2013). The emotional benefits of oxytocin for individuals exposed to nature is relevant when considering its applications for people recovering from drug addiction. According to a study conducted by the National Institutes of Health, oxytocin can have a “stress buffering effect...[and]...be beneficial in addiction treatment” (Lee, Rohn, Tanda, & Leggio, 2016). It is worth noting that the benefits of oxytocin are similar to the benefits of dopamine which can also lower stress and help with social bonding.

Dopamine

During the studies on nature and wellness conducted in 1999, the fMRI was used to assess which parts of the brain were stimulated when observing natural scenes and environments (Logan & Selhub, 2013). From their findings, it was revealed that the anterior of the para-hippocampal gyrus is activated when people experience nature; this part of the brain is connected to the dopamine reward system and can lower stress and increase the ability of an individual to form emotional bonds (Logan & Selhub, 2013). These behaviors are due to opioid receptors in the para-hippocampal gyrus of the brain. When that portion of the brain is activated, people are more likely to feel well, in general, and tend to have more motivation to make positive changes in their lives (Logan & Selhub, 2013). Making positive choices throughout the recovery process is essential for most addicts, because it helps to circumvent many negative influences and removes unnecessary stressors. (Majer, Droge, & Jason, 2012)

In a 1999, study on the role of stress in alcohol and drug use it was found that “stress is considered a major contributor to the initiation and continuation of [alcohol and other drug] use

---

2 “Oxytocin is a peptide hormone integral in parturition, milk let-down, and maternal behaviors that has been demonstrated in animal studies to be important in the formation of pair bonds and in social behaviors. This hormone is increasingly recognized as an important regulator of human social behaviors, including social decision making, evaluating, and responding to social stimuli, mediating social interactions, and forming social memories” (Cochran, Fallon, Hill, & Frazier, 2013)

3 Cortisol is a stress hormone. (Bergland, 2013)
as well as to relapse” (Brady & Sonnie, 1999). The study “indicate[d] that treatment techniques which foster coping skills, [and] problem-solving skills...play a pivotal role in successful treatment” (Brady & Sonnie, 1999). Therefore, by decreasing stress, through specialized treatment programs it is possible to improve self-control and reduce the risk of relapse. These findings are significant when contrasting the effects of nature on the “normal” brain with the brain of a person who is addicted to drugs and alcohol.

b. The Brain on Drugs: Psychology and Neurotransmitters

Drug use can impact the way the brain functions, altering the way chemicals and neurotransmitters operate. In a study conducted by Harvard Medical School, it was found that “the flood of intoxicating brain chemicals called neurotransmitters (chiefly dopamine) during drug use makes the brain relatively insensitive to “normal” sources of pleasure — say, a good conversation with a friend or a beautiful sunset” (Bierer, 2017). According to a report by Kimberly Martin, a contributing writer from the National Institute on Drug Abuse, low levels of dopamine puts individuals at greater risk for addiction and substance abuse (Martin, 2003). Thus, when recovering addicts lose their constant supply of dopamine, it puts them at risk of relapse. When considering this information, it is clear that spending time in nature can have a tremendous impact on addicts recovering from substance abuse.

As a result of the biological and chemical changes that occur in the brain when exposed to natural environments, spending time in nature can lead to “an overall sense of wellbeing” (Logan & Selhub, 2013). When recovering addicts spend time in nature the individual experiences increases in dopamine, serotonin, and oxytocin levels. Since each of those chemicals have been associated with decreases in stress levels—a major contributor to relapse—it could indicate that there is a causal relationship between spending time in nature, decreased stressful and reduced instances of relapse during recovery. Another factor which has been linked to reduced stress is spirituality.


Nature and Spirituality

The theory that nature increases spirituality has been supported over the years by several empirical studies. In 1999, a study was conducted by Sarah Trainor and Richard Norgaard, looking at Recreation Fees in the Context of Wilderness Values (Trainor & Norgaard, 1999). Out of this study, data was released which indicated that 69 percent of visitors to California's Eldorado National Forest associated time in the wilderness with spiritual worth; this association was valuable enough that many visitors indicated they would be willing to pay a fee for the experience (Trainor & Norgaard, 1999).

In 2002, a study was published by Michael Rule and Edward Udd, entitled Resident Camp Directors, Spirituality, and Wilderness. The results of this study indicated that out of 125 camp directors across the United States, 112 believed that wilderness experiences provided spiritual value (Rule & Udd, 2002). Of the camp directors surveyed, 108, responded that they believed wilderness experiences played a role in individuals spiritual health (Rule & Udd, 2002). Considering this, it is worth exploring why nature impacts spiritual health.

In 2016, researchers from Duke University, surveyed men to evaluate the relationship between oxytocin and spiritual connectedness (Cappellen, Way, Isgett, & Fredrickson, 2016). The researchers chose to focus on oxytocin, because it can “affect how we perceive the world and what we believe” (Cappellen, Way, Isgett, & Fredrickson, 2016). During their experiment
they gave one group of men an intranasal dose of oxytocin and the other group a placebo. The results of their study indicated that “those who received oxytocin were more likely to say afterward that spirituality was important in their lives and that life has ‘meaning and purpose’” (Cappellen, Way, Isgett, & Fredrickson, 2016).

Since nature can increase oxytocin levels and has been proven to foster spirituality, it stands to reason that spending time in nature can increase spirituality. Spirituality has been connected with longer sobriety, and decreased chances of relapse.

**Spirituality and Recovery**

According to Betty Jarusiewicz, a substance abuse counselor, spirituality plays in role in reducing stress (Jarusiewicz, 2000). Jarusiewicz states that spirituality adds “richness, dimensions, and depth to living,” which can help individuals deal with suffering in their lives caused by issues such as illness and emotional turmoil (Jarusiewicz, 2000). Her research also found that people who maintained sobriety for two or more years showed “significantly greater levels of spirituality” than those who relapsed (Jarusiewicz, 2000).

Within the basic text of all Narcotic Anonymous programs spirituality is emphasized to “give [individuals] new ways through which [they] can experience reality” (Sewell, 1998). One of the ways individuals who “consciously seek to attain higher levels of spirituality” experience life differently is by learning to deal with stress in a more productive way (Sewell, 1998). Since the connection between spirituality and recovery from substance abuse has been well documented through research, it is vital that programs which support spirituality be created and properly funded.

For this reason, substance abuse organizations and counselors should consider incorporating nature into their treatment plans. Nature programs, as mentioned above, have been linked to feelings of increased spirituality in participants in more than one study. As a result, nature walks are an example of the types of programming which could be used by rehabs and other treatment programs to facilitate recovery, particularly for addicts who are coping with stress. With this information in mind, my experiment was designed to address the question: “How does spending time in nature affect people recovering from substance abuse?” In the section that follows I will describe the methods used in my experiment.

**IV. Methods**

**a. Research Design**

In order to test my hypotheses regarding the effects of nature on people recovering from substance abuse, I designed a 4-part comparative research procedure which included surveys and a walk. Participants were divided into two groups, Group A, and Group B, to assess the impacts of a nature experience on stress, and spirituality. Group A participants were in the experimental group; individuals in the experimental group participated in a nature walk. The people in group B acted as the control for the experiment. To ensure that the data for the nature walk was due primarily to the impacts of nature and not confounding factors, individuals in group B were asked to go on a non-nature walk.

**b. Participants**

The sample size for the experiment was N=8. Participants for the surveys and walks were recruited from the "The Journey Continues” Narcotic Anonymous meeting which takes
place on Saturdays in New Jersey between 12:30pm and 2:00pm. All of the participants who participated in the study were recovering addicts, who attended the meeting on November 11th. In order to protect the anonymity of the participants, the town in which the meeting took place will not be disclosed. Participants were volunteers who were willing to stay for 30 to 45 minutes after the meeting ended. Of those who chose to volunteer, four were men and four were women. Group A was comprised of four women and two men and Group B was comprised of two men. The groups were intended to be split evenly—two women and two men in each group—however, two of the women who were meant to go on the non-nature walk, chose to go on the nature walk instead. Each of the participants were in different points of their recovery; the person with the least amount of clean time had only 2 weeks, while the person with the most clean time had 30 years.

c. Actions Taken by the Participants

The design of the research experiment included 4 parts: the surveys (pre-, post-, and two weeks post) and a walk to test the theory that time spent in nature can decrease stress and increase spirituality. Within the experimental design all participants were all asked to complete the same pre-walk and post-walk survey. The two-week post survey was optional but was the same for all participants. Examples for each of the surveys can be found in the appendix.

d. Survey Design

My surveys were composed using qualitative and quantitative questions. The pre-survey consisted of 12 questions, 11 of which were multiple choice. The goal of the pre-survey was to establish a baseline against which the post nature walk results would be compared. Within the pre-survey five of the 12 questions discussed stress, while four of the questions addressed meditation and spirituality. The remaining three questions on the pre-survey addressed the participants relationship with nature and the outdoors. Within the pre-survey seven of the 12 questions were Likert scales, one question was open-ended, and the remaining questions were multiple choice. One of the Likert Scale stress questions—“In the last month, how often have you felt nervous and “stressed?”—was taken from a 1994 Perceived Stress Scale study conducted by researcher Sheldon Cohen. This question was used because the “Perceived Stress Scale (PSS) is the most widely used psychological instrument for measuring the perception of stress” (Cohen, 1994).

The post-survey was composed of five questions which were designed to ascertain changes in stress and spirituality following the nature walk. The first two questions of the post-survey discussed changes in stress, while the following two questions attempted to ascertain changes in spirituality and meditation. The last question attempts to address the participants perception of how nature has affected their recovery. Four out of five of the post-survey questions utilized a Likert scale. The final survey question was a multiple-choice question.

The two weeks post walk survey—which was administered to see if the participants increased their time spent in nature following the walk—consisted of six questions and was optional. Participants who indicated interest in contributing in this survey were given an option of taking the survey over the phone or through email. The logic behind administering this survey was based on research which indicated that people who spend time in nature, experience increases in dopamine, which can lead to individuals having more motivation to make positive

---

5 Clean time refers to the amount of time the individual has been sober.
changes in their lives. When developing the two-week post survey, it was expected that the individuals who participated in the survey would have begun to make more time to spend in nature following the walk and that they would have experienced an overall sense of well-being indicated by increased positive emotion following the walk.

e. Site Description

Experimental Path

The trail that was used for the nature walk, was adjacent to the meeting where I solicited participants, and was a part of a large golf course (see Image 1). The path was lined on both sides by green grass; near the beginning of the path, the road could be seen slightly through the trees which were planted along the street. Additionally, there was a jungle gym for children along the beginning of the path as well as a baseball field. However, these additions were only visible for the first five minutes of the walk. After five minutes, the path took the participants across a short foot bridge which crossed a small stream before leading participants to an area surrounded on both sides by grass and trees. Once the stream was crossed participants could not see or hear the road and traffic. The remaining portion of the walk took the participants in a circle—still lined with trees and grass— which brought the participants back to the parking lot next to the meeting. The walk took approximately 15 to 20 minutes to complete from start to finish.

Image 1: Nature Path (Entrance)

The image above depicts the beginning of the experimental (nature) path used by Group A

Image 2: Nature Path (Stream)

The image above depicts the foot bridge crossing the stream along the nature path used by Group A

Control Path

The trail that was used for the non-nature walk was along a street (see Image 3). While there were street trees planted sporadically along the right side of the path, the left side of the path had sand from the golf course instead of grass. The trees which were located off the left
side of the trail were dying or defoliated. For the entire length of the path, participants could see and hear traffic on the road. Moreover, the majority of the greenery along the nonmature trail was from the street trees. Unlike the nature path there were more man-made structure along the non-nature path such as benches, signs, and land posts from the golf course. Across the street from the non-nature path were homes, and fences. This walk also took approximately 15 minutes to complete.

Image 3: Non-Nature Path

*The image above shows the entrance to the control (non-nature) path [left], and the view of the path from across the street [right].*

f. Hypotheses

As mentioned above, three metrics were measured before and after the walks: stress, spirituality, and meditation. Those factors were used to assesses the benefits of nature—specifically nature walks—for people in recovery. The results were analyzed through a comparison of Groups A and B for the pre-and post-surveys. A statistical analysis, the paired two-tailed t test, was used to analyze stress levels before and after the walk.

The hypothesis for the walk experiments was that the individuals who participated in the nature walk would have lower stress and higher spirituality following the walk. Conversely, it was expected that the individuals who participated in the non-nature walk would see no change in their stress and spirituality levels or would have less significant changes in both areas than their counterparts on the nature walk. Regarding the two-week post survey, the hypothesis was that people who participated would describe the nature walk as having had having positive effects (such as less stress, more meditation, and higher spirituality) on their lives in the two weeks following the walk. The hypotheses for the experimental part of my research was formed based on the literature mentioned above which indicated that time spent in nature positively correlates with lower stress and higher spirituality. In the section that follows, this paper will discuss the results of the experiment.
V. Results

a. Pre-Walk Survey

To begin the pre-walk survey, the first question asked was “How do you explain your current relationship with nature”. Of the 8 participants who participated in the walks, 7 out of 8 individuals indicated that they had a relationship with nature prior to the walk. In fact, one participant (P5) stated that “We can’t live without nature. Nature has a great way to teach us about life and self. Nature is spiritual. Nature is beautiful, it’s a connection to my higher power.” While not all of the participants who responded to the question were as eloquent, all of the participants who indicated that had a relationship with nature described it as being positive. Moreover, 6 out of 8 participants stated that they consciously made time to be in nature on a regular basis, while the remaining participants indicated that the spent time in nature occasionally.

Regarding the relationship between nature and stress, 50 percent of participants ranked the following statement as very true: “Making time to be outdoors helps me deal with stress.” Of the remaining participants, 2 participants ranked the statement as partially true or mostly true, 1 participant ranked the statement as not true and the 8th participant abstained from answering the question. Within group B, 1 participant ranked the statement as very true while the other ranked the statement as partially true.

Additionally, when participants were asked to self-assess their stress levels on the day of the walk, half of the participants indicated that they were moderately stressed, 2 participants indicated that they were less stressed than normal, and 1 participant indicated that they were experiencing no stress prior to the walk; the 8th person in the group indicated that they were highly stressed prior to the walk. Within the control group specifically, one individual indicated that they were moderately stressed, while the other person indicated that they were experiencing low stress.

When assessing the role of mediation in the lives of the participants, 7 out 8 people indicated that they meditated at least 4 times a week and one individual marked that she meditated more than 7 times a week. The one person who meditated less than 4 times per week stated that they only meditated once a week. Regarding the role meditation has on stress, participants were asked to respond to the question “to what extent do you believe mediation impacts your stress levels?”. While one person abstained from answering the question, 71 percent of the participants who responded indicated the mediation had a strong positive impact on their stress levels; 14 percent of participants indicated that mediation had a moderately positive impact on their stress levels, and another 14 percent of participants indicated that meditation had no impact on their stress level. The results were the same for the question “To what extent do you believe spending time outdoors impacts your spirituality?”. When volunteers were asked to indicate the places where they meditate only four participants indicated that they meditated outdoors; Both individuals in group B indicated that they meditated outside.

Finally, when asked to self-assess their spirituality levels, 5 out 8 people rated themselves as very spiritual, 2 out of 8 people indicated they were mostly spiritual, and 1 person refrained from answering the question. For most of the questions the outlier was a nature walk participant (P2).

b. Post-Walk Survey

Following the walk 5 out of 8 participants indicated that they felt no stress, 1 individual specified they felt low stress and 2 people marked that they felt normal stress. This is significant
because all of the participants—regardless of which path they took—specified that they felt the same level of stress or less stressed after the walk. The individual with the greatest change in stress levels was P7, he was in Group A (see Figure 2).

Figure 2: Pre- and Post- Walk Stress Levels for Groups A and B

![Impact of Walks on Stress Chart]

This chart depicts the pre-and post-walk stress levels for all 8 participants. Participants are identified by numbers (i.e. P1, P2) in order to protect their anonymity. Group A participants include (P1, P2, P3, P4, P7 and P8). Group B participants are P5, and P6.

When participants were asked to assess the impact spending time outdoors has on stress, all participants indicated that spending time outdoors had a positive impact on their stress levels, with 62 percent of individuals stating that the impact was strong. Additionally, 100 percent of participants believed there was a connection between spirituality and meditation. It is worth noting that there was no difference between the pre-and post-walk survey results for spirituality ratings. Finally, 87 percent of participants felt that there was a significant connection between their clean time and spending time outdoors, one person chose not to respond for the question.

When comparing the pre-and post-walk survey results for Groups A and B there was no significant difference between the answers provided by nature walk participants and the non-nature walk participants on any of the survey questions.

c. Two Week Post Survey

While the two-week post walk survey was optional, 4 people responded (3 nature walk participants, 1 non-nature walk participant). Of the four participants who responded to the 3 out of 4 participants indicated that the nature walk changed their relationship with nature. The 1 participant who indicated that there had been no change in their relationship with nature was a part of the nature walk group. Furthermore, 3 out of 4 individuals who responded indicated that they spent more time outside following the walks; the fourth participant (someone who went on the nature walk) indicated that they spent the same amount of time outdoors.

Following the walk, all participants (both the nature and the non-nature path walkers) indicated that they were able to handle stress better. In fact, one participant stated that since the
walk she has remembered “not to sweat the little stuff”. Another participant from Group A stated in his interview that he has begun walking 4 times a week because it helps him remain calm and stress free. When asked to identify the emotions they felt when walking, all of the participants listed positive emotions. In addition, all participants, including the non-nature walk participant, indicated improved spirituality following the walk. Some of the phrases used when responding to the question “what differences in your recovery or spirituality have you noticed since the nature walk?” include “enhanced spirituality, closer relationship to God, and higher power.” Finally, all participants indicated that making time to go on weekly or monthly nature walks could benefit their recovery.

VI. Discussion

a. Stress

Based on the results of the survey it can be concluded that there was a significant difference in stress levels for all participants following the walks. This statement is based on a comparison of the average stress levels indicated in the pre- and post- walk surveys. The average level of stress for all participants individuals prior to the walk was 2.63. Following the walk, the average stress level for all participants was 1.63. The difference in the stress levels before and after the walks was 1.0. Using a paired two-tail t test I compared the stress level data for all 8 participants (Group A and Group B), and the p value was .0499, which indicated that the confidence level was 95.1 percent. For the purposes of this study 95% was the confidence interval. Conversely, there was no significant difference between the stress levels for individuals who participated in the nature walk as opposed to the non-nature walk. The data indicates my hypothesis was wrong and that individuals who participated in the nature walk did not have lower stress following the walk than individuals who participated in the non-nature walk. Based on this information it could be concluded that walks of any kind can have a positive impact on stress levels.

However, there were confounding factors during the walks that I did not anticipate, such as one of the participants in Group B (P6) bringing his dogs with him while walking. As indicated in the literature review (see page 4), exposure to dogs can increase oxytocin levels in individuals thereby reducing stress. Additionally, one of the nature walk participants (P7) listened to music while walking, which could have affected his results. For example, music can have therapeutic effects on people who are stressed (Knight & Richard, 2001). While P7 indicated that he was highly stressed prior to the walk, and had no stress following the walk, it is impossible to ascertain how much of the stress reduction was due to nature, and how much was due to the music he was listening too. In future iterations of this research, participants should be asked to leave their phones behind.

b. Spirituality

Regarding spirituality, there was no change in spirituality rankings before and after the walk for any of the participants. This lack of change is because most participants indicated a high level of spirituality prior to the walk, which left them without the ability to raise their spirituality rankings following the walks. Additionally, there was no significant difference in spirituality between nature and non-nature walk participants noted in the post survey. While it could be deduced that spirituality is not directly impacted by walking in nature, there were limitations within the study. For instance, during this study, spirituality was self-assessed. Because participants could apply their own definitions to the term spiritual, their rankings were
subjective. For future studies on spirituality it would behoove researchers to provide a definition for spirituality in order to establish a baseline against which to compare participants.

c. Meditation

When assessing the responses to questions on meditation, it was surprising to discover that although 75 percent of participants consciously make time to be outdoors, only 50 percent spend their time outdoors meditating. This indicates that not all individuals who make time to be outdoors do so to pray or relax. It was also interesting to note that although 50 percent of the addicts surveyed do not meditate outside, majority of participants (87.5 percent) meditate on a regular basis. The fact that most addicts do not associate mediation with spending time outdoors, could be indicative of a lack of spiritual connection with the nature. However, in the post walk survey 87.5 percent of volunteers indicated that they believed there was a strong or significant connection between meditation and spirituality. The disconnect between the quantitative survey results and actions described by the participants makes it difficult to ascertain the correlation between meditation, nature, and sobriety.

Yet, from the data collected regarding meditation, I am able to answer one of my original questions which was “How does frequent exposure to nature correlate with more time mediating or higher levels of spirituality?” Based on the data described in the preceding paragraph, it can be concluded that frequent exposure to nature does not correlate with more time mediating. Although 7 out 8 participants made time to be outside regularly, there is no causal relationships between the two facets. However, this data does not mean that spending time in nature could not lead to more time meditating. In fact, it is possible that my data is inaccurate due to poor wording in the questions. For the purposes of this survey, the terms meditation and prayer were frequently used interchangeably, which is an inaccurate comparison. The conflation of the two terms could have skewed the results for the experiment. If this survey were to be conducted again, researchers should clearly define meditation in order to prevent misconceptions.

d. Additional Confounding Factors

While this experiment was designed with consideration for factors such as varying perceptions of stress, there were several factors which were not anticipated that could have impacted the data. For example, the walk took place following a narcotics anonymous meeting, which likely impacted the volunteers stress levels prior to the experiment.

Furthermore, on the day of the survey (November 11th) the weather was cold, and several participants expressed their displeasure. Since some of the participants were rushing to finish the surveys so that they could leave, questions were inadvertently skipped, which led to incomplete data sets. In the future, researchers should consider conducting the survey in the spring or early fall, when the weather is more pleasant, and trees are not defoliated.

Additionally, on the nature walk some people walked in groups while others walked alone, by not specifying that participants were supposed to walk alone, it created discrepancies in the data collection. Talking with friends can have varying effects on stress levels depending on the individual; in order to avoid issues, it should be made clear from the beginning that participants are to walk alone, and abstain from using technology.

Finally, it is possible that because all of the participants were different ages and at different stages in their recovery the results are not appropriate for comparison. For instance, people who are further in their recovery likely have an easier time dealing with stress and while people who are just beginning their recovery (such as P7) may be more susceptible to stress.
Overall, while I do believe that the confounding factors listed above impacted the results of the study I also believe that the study data is still significant, and worth being explored further.

VII. Conclusion

To reiterate the original hypothesis of this study, it is believed that spending time in nature can positively impact an individual’s recovery from substance addiction. Having conducted this experiment and analyzed the data, it is evident the spending time in nature can positively impact an individual’s recovery, specifically when considering factors such as stress. While the data pertaining to spirituality and meditation were less decisive in regard to my original hypothesis the data is still significant, and the implications are innumerable.

With the knowledge that nature can lower stress by increasing production of hormones such as serotonin, oxytocin, and dopamine, rehabs and treatment programs can and should begin incorporating nature focused programing to reduce instances of relapse amongst the newly sober. Moreover, the results of the study provide evidence on the benefits of walks (both nature and non-nature) in relation to improved well-being, in individuals recovering from substance abuse.

When considering this information it is clear that there are opportunities, particularly in New York for the State government to support rehabilitation. One of the ways in which the government can support substance abuse treatment is by providing funding for its subsidiaries such as the Parks Department to host walks specifically for people in recovery. Currently, the Parks Department already hosts a number of walks and exercise classes for New York residents free of charge. The only change that would be required by organizations such as the Parks Department is creating targeted marketing to people struggling with addiction. The role Environmental Educators would play in these new programs would be as program coordinators, facilitators, developers, and leaders. In truth, EE teachers would be uniquely positioned to not only run nature programs for people recovering from addiction, but also to shape policies surrounding the topic. With the opioid crisis showing no signs of slowing down, policy makers will soon be looking for solutions to invest in. Now that this study has established a foundation for future investigations into the topic of nature as a substance abuse treatment tool, nature could be one of the solutions considered.

Prior to this study, using nature to address substance addiction, was an area of Environmental Education which had never been addressed in EE literature. Yet, now that there is data indicating that Environmental Education could be used to combat the pervasive addiction problem devastating our country, the question is whether or not environmental educators will utilize the information to make a difference in their communities.
VIII. References


IX. Appendix

Figure 1: Pre-Survey

Steinhardt School of Culture, Education, and Human Development
I am a graduate student at New York University and I am conducting a short survey. I will simply ask a series of questions. If you do not want to continue the survey at any time, just let me know, and we will stop. If you have any questions after the survey, you can contact me by email RaeJean Boyd (rjb580@nyu.edu) or Prof. Raul Lejano (lejano@nyu.edu).
-Thanks

Pre-Survey
First name & Last Initial ________________________________
Gender (Circle): M F Age__________________
Clean Time ________________________________

1. Spending time in nature can take many different forms, such as walking your dog, mowing the lawn, planting a garden, or sitting in a park. How would you explain your current relationship with nature?
______________________________________________________________________________

2. Which of these statements best describes you?
a. I consciously make time to be in nature regularly
b. I spend time outdoors occasionally
c. I enjoy spending time outside but rarely have time
d. I avoid spending time outdoors

3. Rate the following statement on a scale of one to five.
Making time to be in the outdoors helps me deal with stress.

\[
\begin{array}{ccccc}
1 & 2 & 3 & 4 & 5 \\
& (1 = not true, 3= partially true, 5 = very true)
\end{array}
\]

4. Rate your stress level on a scale of 1-5 based on the descriptions below
1 – No Stress
2 – Low Stress
3 – Normal/Moderate Stress
4 - High stressed
5 – Extreme Stressed

5. In the last month, how often have you felt nervous and “stressed”? (circle one)
6. Complete the following statement by filling in the blank:  After spending time outdoors I usually feel ________________ stressed.

7. Do you meditate? If so, how many times a week do you meditate? (circle one)
   1  2  3  4  5  6  7  7+

8. Where do you usually meditate/pray/talk to your higher power? Circle all that apply or fill in the line that says other.

<table>
<thead>
<tr>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home</td>
</tr>
<tr>
<td>Car</td>
</tr>
<tr>
<td>Outside</td>
</tr>
<tr>
<td>Work</td>
</tr>
<tr>
<td>Coffee house</td>
</tr>
<tr>
<td>House of Worship</td>
</tr>
<tr>
<td>School</td>
</tr>
<tr>
<td>Gym</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

9. To what extent do you believe meditation impacts your stress levels?

<table>
<thead>
<tr>
<th>Impact Level</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>+1</th>
<th>+2</th>
<th>+3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong</td>
<td>Moderate Negative Positive</td>
<td>Slight Negative Impact</td>
<td>No impact</td>
<td>Slight Positive Impact</td>
<td>Moderate Positive Impact</td>
<td>Strong Positive Impact</td>
<td></td>
</tr>
</tbody>
</table>

10. To what extent do you believe spending time outdoors impacts your spirituality?

<table>
<thead>
<tr>
<th>Impact Level</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>+1</th>
<th>+2</th>
<th>+3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong</td>
<td>Moderate Negative Positive</td>
<td>Slight Negative Impact</td>
<td>No impact</td>
<td>Slight Positive Impact</td>
<td>Moderate Positive Impact</td>
<td>Strong Positive Impact</td>
<td></td>
</tr>
</tbody>
</table>

11. Circle the statement that you most identify with.
   - I do not believe there is a connection between my clean time and spending time outdoors
   - There is a small connection between my clean time and spending time outdoors
   - I do not spend time outdoors
   - I believe there is a significant connection between my clean time and spending time outdoors
12. Please rate the extent to which you feel you are spiritual on a scale of 1 to 5, where “1” is “not spiritual” and “5” is “very spiritual”:
   o 1 – Not Spiritual
   o 2
   o 3
   o 4
   • 5 – Very Spiritual

Figure 2: Post Survey

Steinhardt School of Culture, Education, and Human Development
I am a graduate student at New York University and I am conducting a short survey. I will simply ask a series of questions. If you don't feel like continuing the survey at any time, just let me know, and we will stop. If you have any questions after the survey, you can contact me by email RaeJean Boyd (rjb580@nyu.edu) or Prof. Raul Lejano (lejano@nyu.edu).
--Thanks

First name & Last Initial __________________________________
Post Walk Survey
1. Rate your stress level on a scale of 1-5 based on the descriptions below (Circle one).

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Stress</td>
<td>Low Stress</td>
<td>Normal Stress</td>
<td>High Stress</td>
<td>Extreme Stress</td>
<td></td>
</tr>
</tbody>
</table>

2. To what extend do you believe spending time outdoors has impacted your stress levels?

<table>
<thead>
<tr>
<th></th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>+1</th>
<th>+2</th>
<th>+3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong Negative Impact</td>
<td>Moderate Positive Impact</td>
<td>Slight Negative Impact</td>
<td>No impact</td>
<td>Slight Positive Impact</td>
<td>Moderate Positive impact</td>
<td>Strong Positive Impact</td>
<td></td>
</tr>
</tbody>
</table>
3. How strong do you believe the connection is between spirituality and mediation? (Circle one)

O O O O O O
No small medium strong significant
connection connection connection connection connection connection

4. Please rate the extent to which you feel you are spiritual on a scale of 1 to 5, where “1” is “not spiritual” and “5” is “very spiritual”:

   o 1 – Not Spiritual
   o 2
   o 3 Moderately Spiritual
   o 4
   o 5 – Very Spiritual

5. Circle the statement that you most identify with.

   - I do not believe there is a connection between my clean time and spending time outdoors
   - There is a small connection between my clean time and spending time outdoors
   - I do not spend time outdoors
   - I believe there is a significant connection between my clean time and spending time outdoors

Would you be willing to participate in a follow up survey in two weeks? This survey could be completed over the phone or by email. If you would be willing to participate please include your phone number or email below

Phone_______________________________
Email_________________________________________________
---------------------------------------------------------------------------------------------------------------------

Figure 3: Two Week Post Survey

Steinhardt School of Culture, Education, and Human Development
I am a graduate student at New York University and I am conducting a short survey. I will simply ask a series of questions. If you don't feel like continuing the survey at any time, just let me know, and we will stop. If you have any questions after the survey, you can contact me by email RaeJean Boyd (rjb580@nyu.edu) or Prof. Raul Lejano (lejano@nyu.edu).
--Thanks
Two Weeks Post Survey Questions

1. Since the nature walk how has your relationship with nature changed?

______________________________________________________________________________
______________________________________________________________________________

2. What emotions did you experience during the walk? Circle all that apply

<table>
<thead>
<tr>
<th>OPEN</th>
<th>STRESSED</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOVING</td>
<td>ANGRY</td>
</tr>
<tr>
<td>HAPPY</td>
<td>DEPRESSED</td>
</tr>
<tr>
<td>INTERESTED</td>
<td>CONFUSED</td>
</tr>
<tr>
<td>ALIVE</td>
<td>HELPLESS</td>
</tr>
<tr>
<td>POSITIVE</td>
<td>INDIFFERENT</td>
</tr>
<tr>
<td>PEACEFUL</td>
<td>AFRAID</td>
</tr>
<tr>
<td>STRONG</td>
<td>HURT</td>
</tr>
<tr>
<td>RELAXED</td>
<td>SAD</td>
</tr>
</tbody>
</table>

3. Which statement best fits your current situation?
   a. I make more time to be outside
   b. I spend the same amount of time outside as I did before the walk
   c. I spend less time outside than I did before

4. In what ways has your ability to handle stress changed since the nature walk?

______________________________________________________________________________
______________________________________________________________________________

5. What differences in your recovery or spirituality have you noticed since the nature walk?

______________________________________________________________________________
______________________________________________________________________________

6. How could making time to go on weekly or monthly nature walks impact your recovery?

______________________________________________________________________________
______________________________________________________________________________