



THE HONORS PROGRAM

**The role of childhood environment and outdoor exposure
on connectedness to nature**

*An Honors Capstone Submitted in Partial Fulfillment of the Requirements for
Graduation with University Honors*

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Abstract

There may exist a relationship between the type of environment one is raised in, amount of exposure to the outdoors as a child and later connectedness to nature as an adult. This study attempts to identify childhood experiences, which may have an influence on adult tendency toward specific patterns of attachment, belief, behavior and emotions in relation to the natural world. Results show no significant relationship between childhood environment and preference of indoor or outdoor activities in this study sample. However, frequency of exposure through field trips has been found to have a significant impact on connectedness to nature. The implication of this research is it can be used in encouraging maximum exposure to the outdoor environment not only when people are children, but in adulthood as well. Limitations of this study include a relatively small sample size as well as a sample of convenience and issues of internal reliability of the measurements. Future research could study the link between a person's feelings of connectedness to nature and their mental or physical health; include more demographic data; expand the sample to include deaf, hard of hearing, and hearing participants; and further divide rural, suburban and urban environments into sub-categories.

Keywords: Nature-Deficit Disorder, biophobia, ecopsychology

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Introduction

On a global level, most people may not recognize a relationship between psychology and environmental science. Psychology focuses on the mind, and environmental science is the empirical study of the natural and constructed environment. However, more psychologists and environmental scientists see these two foci intertwine in subfields, such as architectural psychology, ecotherapy, and environmental psychology. Environmental psychology, also known as ecopsychology, bridges psychology and ecology with a focus on mental and physical health benefits of human interaction with nature. Scholars use the terms environmental psychology and ecopsychology interchangeably. A second focus concerns the need for promoting sustainability and interdependence between the earth and its occupants (Roszak, 2011).

The environment a person is exposed to as a child and as an adult is believed to have a profound impact on their development and mental health (Douglas, 2005; Grinde & Patil, 2009; Munoz, 2009). Environment in this context is defined as “the circumstances, objects, or conditions by which one is surrounded”, such as one might find out in the woods, or inside a building (Merriam-Webster, 2013). In the past few years, society has begun to incorporate understanding of the positive impact of the natural environment on everyday situations of constructed environments. For example, after studies showed recuperation of patients improved with an environment closer to nature, the design of hospital rooms changed from stark and clean white to more natural colors and the inclusion of plants (Rivlin, 1970; Ulrich, 1984; Edge, 2003; Park & Mattson, 2008). It is from ecopsychology we understand a child’s lack of experience in the natural

world may even contribute to various psychological and physical health problems such as attention deficit hyperactivity disorder (ADHD), depression, obesity, and eating disorders throughout life (Louv, 2006).

Psychologists can play an important role in helping to improve the health of our planet and encourage sustainability of the earth for future generations (Gifford, 2008). The intent of ecopsychology is to improve well-being and the development of preventative measures toward illness rather than reactive measures toward illness. Quality of life for the current and future populations is important and developers are researching into “greenspace” and how it improves the quality of life (Land Use Consultants, 2004). Attitudes toward the environment in relation to the economy seem to fare poorly on the environmental priority side. According to Gallup Polls, Americans rank economical priority above environmental priority, as has been the general trend for the last five years (Saad, 2013).

History of Ecopsychology

In 1911, Hellpach coined the term environmental psychology in his book *Geopsyché* (as cited in Pol, 2006). Hellpach studied urban crowding, overstimulation, continuous change, hurry, and alert state. He concluded perception of urban citizens is quite different than their rural counterparts. The urban environment appears to be ambivalent to people. This environment frees people, allowing for their independence, but on the other hand, it leads to isolation from other people and from the natural environment (as cited in Pol, 2006). Despite this early start, the particular concern with

aspects of the environment and how they impact human behavior did not gain attention until the second half of the twentieth century.

Research in environmental psychology in the 1950s through the 1970s focused on architectural psychology and the built environment, which consists of man-made surroundings, such as cities, villages and homes, and contrasts with the natural environment, or anything not man-made. In the 1960s, Rivlin studied the people/place relationship and how this impacts environmental consciousness (as cited in Pol, 2006). Rivlin studied the environmental psychology of psychiatric wards, and children's hospitals, homelessness and home-making, especially in urban settings. Emphasis of Rivlin's research was of the development of identity in relation to a neighborhood or even any larger place such as an institution, a town, region, state or country (2006).

In the 1970s, environmental psychology is said to have evolved into a "psychology of sustainability" (Steg, 2012). In the 1980s and 1990s, the concept of a green perspective on attitude and behaviors emerged and continues today. This value of sustainability today particularly focuses on human behavior as the leading cause of environmental problems. Researchers are working on ways to change attitudes and behavior in society on a global level to reduce environmental problems and foster sustainability (Dwyer, et al., 1993; Gardner & Stern, 1996; Levy-Leboyer & Dvon, 1991). This part of the field focuses on the impact of human behavior on the environment and equally important is the study of the impact of the environment on human mental and physical well-being.

Mental Health and Environment

In studying the impact of environment on well-being, researchers have included study of urban, suburban and rural environments. Researchers evaluated urban greenspace for connections to mental health in the UK and found natural vegetation within urban environments reduces stress, anger, and fatigue (Douglas, 2005). Access to greenspace, even as simple as trees on a sidewalk, encourages healthy blood pressure and a better emotional state of being (2005). Plants in rooms have been shown to provide definite positive health effects in study groups; they also improve the aroma and air quality (Grinde & Patil, 2009). Colors that mimic the natural environment also play a positive healing role compared to stark white or unnatural colors. Warm or cheerful colors on the walls in a hospital patient's room can impact healing positively and shorten a patient's stay (Edge, 2003). A Dutch study on adult health and the percentage of green and blue in the outside environment showed a positive relationship between environment and higher scores on health indicators. These indicators included the number of symptoms experienced in 14 days, perceived general health, and the score received on the Dutch version of the General Health Questionnaire designed by Goldberg (Vries, Verheij, Groenewegen & Spreeuwenberg, 2003). These studies comprise a small sampling of the large body of research on the interaction of environment and health/well being for adults supports the benefits of certain environments.

Children and Environment

Another group of studies, concerned with the impact of environment on health, focuses on children (Munoz, 2009). For example, taking a walk in the park appears to improve attention in children suffering from attention deficits (Taylor and Kuo, 2009).

Nature relieves some issues related to cognition and symptoms of mental illnesses in children. For example, one study found children born into low socio-economic environments with poor housing quality, overcrowded schools and the higher levels of crime experienced great improvements in cognitive functioning when they were relocated from urban slums to rural, and environmentally involved homes (Wells, 2000). Children developed more behavioral, attention and physical health problems when compared to children who are living in greener, healthier environments (Wells, 2000). Once they moved, their overall functioning also improved. Yet children of many socio-economic status types are affected by their exposure to natural settings, not just those raised in poverty or urban slum environments.

Children living in rural areas, even impoverished children, seem to benefit from natural environments which serve as a buffer against life stressors, such as stress caused by social relationships or traumatic events (Wells and Evans, 2003). Children with high amounts of nearby natural areas experienced less life stress compared to children with a fewer natural areas nearby and similar stress triggers. For the most vulnerable of children categorized as those experiencing the most life stressors, the presence of a natural environment nearby had the greatest effect in moderating their stress. With such positive results in children from interacting with the outdoors, many parents and other adults worry over the safety of children and as a result, many children are kept inside.

Culture of Fear

Many parents report having had more freedom and outdoor exposure as children, than they allow their children presently. In a study on the status of outdoor play and children (Clements, 2004), 85 percent of the mothers agreed today's children play

outdoors less often than children did a few years ago and still less than the mothers did as children. Seventy percent of the mothers reported playing outdoors every day as a child, compared with only 31 percent of their children. When the mothers played outdoors, 56 percent remained outdoors for three hours at a time or longer, compared with only 22 percent of their children (Clements, 2004). Recently, playing out in the streets unsupervised has been replaced by playing in the house under the watchful eye of a parent (England Marketing, 2009). Many youngsters are not permitted to go outdoors and the majority of parents do not allow their children to walk alone to school (Furedi, 2008).

Bandura's Social Learning Theory proposes a highly reactive parent can influence their child to adopt similar reactivity through social modeling of behavior the child will then learn their parent's negative or absent-minded behaviors in relationship to the environment can also be passed to their children through modeling (Bandura, Ross & Ross, 1961). The downside of this type of parenting is it encourages a child to possess anxiety, disregard and avoidance toward the natural environment or specific inhabitants of the natural environment, also known as biophobia (Kellert & Wilson, 1993).

Biophobia and Nature Deficit Disorder

Biophobia is the fear or revulsion of nature or the outdoors (Kellert & Wilson, 1993), and Nature Deficit Disorder is defined as behavioral, mental and physical deficits as a result of a loss of exposure to the natural environment (Louv, 2006). Neither term is classified as a medical term, nor is it within diagnostic categories in the Diagnostic and Statistical Manual of Mental Disorders, the current edition otherwise known as DSM-V. The DSM-V is a handbook developed by the American Psychiatric Association, to be used by professional psychologists and psychiatrists in diagnosis of disorders (American

Psychiatric Association, 2014). The manual describes detailed symptoms of disorders and criteria for diagnosis of all professionally recognized psychological disorders. The DSM is periodically reviewed and revised as technology and research gains further insight into disorders (2014). Ecopsychologists have begun to make the case to support nature deficiency as a real disorder (Louv, 2006; Roznak, 2001; Roznak, Gomer & Kanner, 1995).

Existential Anxiety

One factor in biophobia might be existential anxiety. The fear of potential death or injury offers ample reason for many people never to try a new activity such as rock climbing (despite the relative safety with proper gear and training) or camping under the stars. Studies report a correlation between thoughts of death and time spent in the wilderness (Koole & Van den Berg, 2005). It seems people experience stronger emotions when in the wild, not just of fear or anxiety, but also of happiness and sublimity. As for negative emotions, the wilderness can overwhelm people with their own vulnerability as a small, mortal human (2005). People typically give four reasons for avoiding the outdoors. These consist of the fear of close encounters with wild animals; forces of nature such as storms; overwhelming situations such as standing on a large mountaintop or in the middle of a huge forest; and disorientating situations such as finding oneself alone and lost in the woods (2005).

This unwelcome reminder of a person's physical mortality and vulnerability may cause biophobic attitudes to develop. In this instance, a terror management process (management and dissolution of feelings of fear or sheer terror) results in distancing oneself from nature in order to reduce the stress of potential risk of death or injury (Koole

& Van den Berg, 2005). Yet the chronic distancing of the self from nature to relieve existential anxiety is not a solution since mere avoidance cannot dissipate fear; it remains undigested. For this reason, biophobia is maladaptive and cannot foster healthy patterns of behavior (2005).

Richard Louv coined the term of Nature-Deficit Disorder in his book, *Last Child in the Woods: Saving Our Children From Nature-Deficit Disorder* (2006). He described this disorder as due to lack of contact with nature and results in a number of behavioral, psychological and physical health issues experienced by children, and even adults. The lack of contact is said to be the result of parental fear, restricted access to natural areas, and the lure of electronics and technology. Louv's theory of Nature Deficit Disorder does not yet have strong empirically gathered research support. Researchers are beginning to study the health effects of lack of contact with nature, although they do not always use this name for issues with attachment to nature.

In addition to the mental or physical effects of lack of contact, psychologists are studying how a child's relation to nature affects their later involvement with environmentalism (Wells & Lekies, 2006). Understanding this relationship can help with therapeutic interventions to cultivate an environmentally friendly attitude in their adult life.

Measurements of Connection to Nature

Measurements have also been developed in order to test a person's connection and eco-friendly behaviors to nature, such as the Connectedness to Nature Scale (CNS) (Mayer and Frantz, 2004), and the Nature Relatedness Scale (NR) (Nisbet, et al., 2009).

A study by Mayer and Frantz was conducted to test the Connectedness to Nature Scale (CNS) for reliability and validity as a measurement tool (2004). The five sub-studies within this study looked at the connectedness to nature impact on personal well-being, identity, perspective and ecological behavior. Their findings show a moderately strong positive relationship between the CNS and eco-friendly behavior (Mayer & Franz, 2004). The researchers mentioned the CNS could be used to create interventions with the purpose of increasing contact of children and adults with nature. Such contacts with nature actually may increase their sense of feeling connected to nature” (2004).

In a previous study by Nisbet, Zelenski and Murphy (2011), the NR was tested in relationship to the well-being of young and older adults. This study utilized a Psychological Well-Being Survey, a Positive and Negative Affective Schedule, and a Satisfaction with Life Scale in relation to the NR. The researchers tested all four instruments on three groups: one group of random students who were not enrolled in an environmental course, working adults, and then a different group of students who were taking an environmental class. The first two groups functioned as comparisons to the last group. This last group formed a longitudinal, quasi-experimental study following students before, during, and after they took the environmental course. The researchers tested these students throughout the fall semester, looking for changes in well-being associated with changes in NR scores as the semester progressed. The increase of environmental education in schooling could improve connectedness; this offers a promising alternative for those who may be low in nature relatedness as a result of nature deprivation in childhood (Nisbet, Zelenski and Murphy, 2011). The results showed the course increased

nature relatedness, although not significantly. On the other hand, those who did not take the course experienced a significant decrease in nature relatedness (2011).

A study by Tauber (2011) used NR and a set of demographic questions to explore the relationship between relatedness to nature, life satisfaction/quality and mental health. The demographic questions included standard questions related to age, sex, ethnicity, and religious affiliation, while also including current employed status, parents combined income, the extent to which spirituality influences daily life, exercise habits, and pet ownership. Tauber found that people of rural environments had higher scores of connectedness to nature, compared to those who were from urban and suburban environments. Tauber admitted that further exploration of environment and connection to nature would be useful (2011). Tauber's study was a model for the development of this study, in order to further understand the connections between environment and connection to nature, as well as the frequency of exposure to nature.

Study Purpose

This study attempts to address childhood environment and frequency of exposure to nature, and later connection to nature. This study incorporates the CNS test as one portion of the entire survey, alongside the NR, and demographics. Furthermore, this study is the first to combine the NR with the CNS to provide more information relating to a person's connection to nature. The NR tested relatedness by focusing on a broad range of behaviors, beliefs, feelings, and sense of place in nature (such as humans at the top or as part of the ecological system). The CNS added deeper insight into feelings about sense of place in nature. While the focus of the CNS is on sense of connection and place in the

environment, the other aspects of eco-friendliness were important as well, thus the inclusion of the NR.

The collection of demographic information allowed the opportunity to see if differences of age, gender, ethnicity, religious affiliation played a role in attachment to nature. The demographic questions in this study were modeled from Tauber's study, yet modified in an attempt to be more flexible in response options. For example, gender was not limited to two responses of male or female, but others as well for persons who do not identify as either male or female, regardless of physical anatomy. Some of Tauber's questions were irrelevant to the hypotheses of this study and removed, such as parental income, current employment status, exercise habits and whether one owned a dog. It was felt that these questions did not help identify a relationship between ones childhood experience of rural, suburban or urban environments, nor ones frequency of exposure to nature, therefore such questions were excluded. Surveys on mental health or life satisfaction for the same reason were removed. Questions Tauber did not include were given, specifically related to frequency of field trips to natural areas, frequent visits to natural area near the home as a child, and the preference for indoor or outdoor environments as a child.

This study is not concerned with the current presence of nature on mental or physical health, nor on interventions of any kind to increase connectedness, as past studies have been. This study is not necessarily measuring how intervention or the provision of increased natural experience will change the feelings of connection to nature.

Rather, this study looks the root of the connection towards nature and the triggers of the environment or childhood upbringing on a person's connection to nature. If researchers study childhood exposure to nature and how it relates to later emotions, beliefs and behavior about nature, it may be possible to identify a common influencing environment or frequency of exposure in people with a severe disconnect to the natural world, or, conversely, an extremely close connection to the natural world.

Hypotheses

One hypothesis was levels of connectedness to nature are strongly influenced by the person's living environment (urban, suburban or rural). In particular, the following outcomes were expected in three sub-hypotheses: People of rural environments were expected to have a higher feeling of affinity with nature. People of a suburban environment were expected to have higher feelings of affinity with nature than people of urban environments, but not as much connection as people of rural environments. People of urban environments were expected to have the least amount of connection to nature compared to their rural or suburban peers.

The second hypothesis was that people who have had increasingly more frequent exposure to natural areas as a child would be more connected to nature. In particular, the following outcomes were expected in three sub-hypotheses: People who always went on field trips as a child were expected to have the highest connection to nature. People who sometimes went on field trips as a child were expected to have less of a connection to

nature than those who went often. People who rarely went on field trips as a child were expected to have the least amount of connection to the natural world.

Methodology

Participants

The participants of this study were collected from the Gallaudet University population during the fall of 2013. While 100 responses were initially collected, 15 were excluded due to providing a vague identification of their environment as a child.

Participants (N: 85) were in the age ranges of 18-24 (n: 44), 25-34 (n: 15), 35-44 (n: 12), 45-54 (n: 4), and 55-64 (n: 10). Of the participants, there were 35 males and 50 females. Race of participants were overwhelmingly Caucasian (n: 50), and black (n: 16). Other races included Latino (n: 9), Asian (n: 5), Native Alaskan/American (n: 2), and Other (n: 3). No one of Pacific Islander descent completed the survey. Participants identified their childhood environment as urban (n: 31), suburban (n: 39), or rural (n: 15). Participants also identified their frequency of trips, as “always” (n: 45), “sometimes” (n: 32), or “rarely” (n: 8). Table 1 and 2 are included in the following page to describe the

participants' demographics of age, gender, race and the IV's of childhood environment and frequency of exposure to nature.

Table 1 *Demographic Data and Number of Participants*

Demographic Categories		n
Age	18-24	44
	25-34	15
	35-44	12
	45-54	4
	55-64	10
Gender	Male	35
	Female	50
	Other	0
Race	Caucasian	50
	Black	16
	Latino	9
	Asian	5

Native Alaskan/American	2
Pacific Islander	0
Other	3

Table 2 *Independent Variables, Categories and Number of Participants*

IV	Categories	n
Environment	Urban	31
	Suburban	39
	Rural	15
Freq. of Trips	“Always”	45
	“Sometimes”	32
	“Rarely”	8

Materials

Survey questions included demographic questions and two measurement tests on Connectedness to Nature and Nature Relatedness (Appendix A-C). Section I asked questions on demographic information describing age, gender, ethnicity, and religious affiliation. Within the first section were also four questions relating to environment, frequency of field trips to natural spots, trips to a nearby natural area, childhood desire for indoor or outdoor environment. At the end of the survey, a debriefing note reassured the participant of IRB approval and anonymity, explained the purpose of this study and provided contact information for further inquiry (see Appendix D).

Measurements

Section II consisted of the Connectedness to Nature Scale (See Appendix B) (Mayer & Frantz, 2004). This measurement comprised of a series of 14 questions

inquiring how participants currently perceived their sense of connection or place in nature (e.g. “I often feel a kinship with animals and plants”, “I often feel part of the web of life”). The scale of answers ranged on a 5-point Likert-type scale (*Strongly Disagree* to *Strongly Agree*) ($\alpha=.73$). Section III was the Nature Relatedness Scale (See Appendix C) (Nisbet, et al., 2009). This test comprised of 21 questions related to attachment, behavior, emotions and beliefs about nature. The scale of answers ranged on a 5-point Likert-type scale (*Strongly Disagree* to *Strongly Agree*) ($\alpha=.87$).

Scores for this test are calculated for the average mean, taking all positive questions and switching all negative questions to positive. For example, if one question asked a participant if he or she does not like the outdoors and he or she scores it with a 1, but other questions ask a person likes the outdoors and the person scores it with a 5, the negative question will be made positive and the new score is now a 5 to align with the rest of the test. The mean scores are calculated after adjusting all negative answers to positive answers.

In order to explore other measures that are affected by childhood environment or frequency of trips, test questions from both CNS and NR measurements were then individually identified and re-clustered into the sub-categories of Attachment, Emotion, Behavior, and Beliefs based on the type of question. The category of Emotion (e.g., “the thought of being deep in the woods, away from civilization, frightens me”) consisted of the CNS questions 1, 6 and 13. The category of Behavior (e.g., “I don’t often go out in nature”) consisted of the NR questions 5, 9, 10, 14, 16 and 20. The category of Attachment (e.g., “my relationship to nature is an important part of who I am”) included the CNS questions numbered 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 14 as well as the NR questions

numbered 7, 12, 17 and 21. The Belief category (e.g., “humans have the right to use natural resources anyway we want”) comprised of the NR questions 2, 3, 4, 8, 11, 15, 18 and 19. The mean scores of each sub-categorical measurement were calculated after adjusting all negative answers to positive answers as explained previously. Then, one-way ANOVA tests were conducted again with the same independent variables but with the mean scores from the four new subcategories (Attachment, Emotion, Behavior, and Beliefs) as dependent variables. Table 3 below summarizes the questions classified under the CNS+NR scale and each sub-scale and reports the corresponding Cronbach’s alpha scores which determine internal consistency. The CNS+NR showed an excellent alpha score similar to their own individual internal validity test scores (Hefler & Cervinka, 2009). The category of Emotion showed a poor alpha score ($\alpha=.55$). The categories of Behavior and Belief had unacceptable alpha scores ($\alpha < .50$). The category of Attachment had a good alpha score ($\alpha =.76$).

Table 3

Measurement test sub-categorical questions and reliability through alpha scores

Measures	Questions	α
CNS+NR	CNS(1-14) and NR(1-21)	.85
Emotion	CNS (1, 6, 13)	.55
Behavior	NR (5,9,10,14,16,20)	.45
Attachment	CNS(2,3,4,5,7,8,9,10,11,12,14) and NR (7,12,17,21)	.76
Belief	NR(2,3,4,8,11,15,18,19)	.39

Procedure

This study was approved by the Gallaudet Institutional Review Board. Participants were voluntarily recruited at a booth set up in a common area during peak hours. The participants were asked to fill out the survey of demographic information, and two measurement tests relating to connection with nature. A three-page survey was given to participants of this study. All surveys were printed for distribution to be filled out by hand. Chocolate snacks were used as an incentive for participation received upon completion of the survey.

Using SPSS program, the data received from participants were cataloged and analyzed using one-way between-groups ANOVA with childhood environment, frequency of trips, nearby natural area, and desire for indoors/outdoors as independent variables and overall mean score of connection to nature as a dependent variable. The responses of the two measurement tests (NR and CNS) were combined to create the overall mean score of Connection to Nature.

Results

One-way between-groups ANOVA with Childhood Environment as an independent variable revealed no significant difference in the overall mean score of combined CNS and NR measurements of connectedness to nature [$F(2, 82)=1.39, p>.05$]. However, Frequency of Trips to natural areas as a child affected overall score of CNS+NR measurement [$F(2, 82)=3.37, p<.05$]. Post-hoc testing using Fisher's protected t-tests showed that those who reported "always" ($M=3.77, SD=.45$) had higher average CNS and NR scores than those who reported "sometimes" ($M=3.54, SD=.46$), and the difference approached significance ($p>.05$).

To further investigate the effects of environment and frequency of trips on connectedness to nature, mean response scores from four sub-categories (Emotion, Attachment, Belief, and Behavior) were entered as dependent variables into one-way ANOVA with Childhood Environment and Frequency of Trips as independent variables. There still appeared to be no significant differences for Childhood Environment on each of the four connectedness to nature sub-categories (see Table 4). No significant differences were detected between Frequency of Trips on Belief [$F(2,82)=.22, p>.05$], and Emotion [$F(2,82)=2.63, p>.05$]. However, there were significant differences between Frequency of Trips on specific sub-categories of Behavior [$F(2,82)= 4.89, p<.05$] and Attachment [$F(2,82)= 3.11, p=.05$], (see Table 5).

Post-hoc testing using Fisher's protected t-tests showed that those who reported "always" ($M= 3.91, SD =.55$) on the reported Frequency of Trips had significantly higher Behavior scores than those who reported "sometimes" ($M=3.53, SD=.49$), yet there was no significant difference between those who reported "Always" and those who reported "Rarely" ($M=3.82, SD=.42$) on Frequency of Trips. Post-hoc testing using Fisher's protected t-test showed that the difference between those who reported "Always" ($M= 3.71, SD=.57$) and those who reported "Rarely" ($M=3.19, SD=.52$) on field trips had Attachment scores that approached significance ($p=.057$).

Table 4 *Descriptive Statistics and Analysis of Variance Results for Childhood Environment and Connectedness to Nature Scores*

Scale	Child Env.	Mean	Std. Deviation	N	sig.
CNS+NR	Urban	3.5868	0.47971	31	.26
	Suburban	3.6538	0.35648	39	

	Rural	3.823	0.59893	15	
Emotion	Urban	3.5645	0.74713	31	.40
	Suburban	3.7051	0.63575	39	
	Rural	3.8833	1.01712	15	
Behavior	Urban	3.6653	0.53947	31	.19
	Suburban	3.7532	0.47942	39	
	Rural	3.975	0.67348	15	
Attachment	Urban	3.5337	0.64741	31	.58
	Suburban	3.5828	0.48137	39	
	Rural	3.7273	0.74253	15	
Belief	Urban	3.5305	0.77338	31	.41
	Suburban	3.5442	0.51096	39	
	Rural	3.7852	0.66464	15	

Table 4 reports the descriptive statistics and reports the significance of Childhood Environment on CNS+NR and sub-categorical scores. The information in Table 4 shows an insignificant relationship between Environment and Connectedness to Nature. The trend moves in the direction of slightly higher mean scores for rural over suburban environment, and suburban over urban environment; however the scores are not different enough to support the H1.

Table 5 *Descriptive Statistics and Analysis of Variance Results for Childhood Frequency of Trips and Connectedness to Nature Scores*

Scale	Trips	Mean	Std. Deviation	N	p>.05
CNS+NR*	Rare	3.4777	0.3089	8	.039
	Sometimes	3.5413	0.46046	32	
	Always	3.7754	0.4463	45	
Emotion	Rare	3.5937	0.42125	8	.08
	Sometimes	3.4688	0.78224	32	
	Always	3.8556	0.74713	45	
Behavior*	Rare	3.8281	0.4275	8	.01
	Sometimes	3.5352	0.49108	32	
	Always	3.9083	0.5516	45	
Attachment	Rare	3.1932	0.51297	8	.05
	Sometimes	3.5199	0.60268	32	
	Always	3.7111	0.57013	45	
Belief	Rare	3.4722	0.63064	8	.81
	Sometimes	3.5556	0.51035	32	
	Always	3.6198	0.73493	45	

* $p < .05$

Table 5 reports the descriptive statistics and the significance of Frequency of Trips on CNS+RNS and sub-categorical scores. There were significant differences found between Childhood Frequency of Trips and Connectedness to Nature. The findings did not fully support the H2 in the sense that people who “sometimes” were exposed to nature reported slightly higher mean score of CNS+NR than people who reported “rarely” exposure to

nature. In fact, the mean score of the “sometimes” group was lower than groups who reported “rarely” and “always.”

Discussion

The results of this study indicated no significant difference among the environments a child is raised in on measures of connection to nature, as measured by the CNS and NR. On the sample collected, whether one lived in an urban, suburban or rural environment as a child seemed to hold little to no relationship over a person’s later feeling of connection to nature. The results of this study were unable to support Tauber’s findings supporting a positive relationship exists between rural environment and connectedness to nature, despite showing a similar trend. His study showed people of rural environments had higher scores of connectedness to nature, compared to those who lived in suburban or urban environments (Tauber, 2013).

Within this sample, childhood environment did not appear to predict the relationship individuals had to nature. Many assume being raised in a rural environment would automatically provide eco-friendly experiences for children and in turn, raise the connection to nature scores. However, it is conceivable that today’s agricultural business practice has so little to do with eco-friendly practices and beliefs, that it negatively affects the children and adults who live and work in the rural environment every day. People of rural backgrounds have access to natural resources every day, and this could diminish their sense of value placed on the natural environment. As the land is the primary source of economic value, profiting off of the land may be a higher priority than eco-friendly actions to protect the land. In fact, priority for economic prosperity does seem to be the trend, as economic wellbeing was considered a higher priority than environmental

wellbeing in American society for the last five years (Saad, 2013). The rural environment, previously thought to be a buffer against life stresses in children according to Wells and Evans (2003), may not actually be as effective for a person's feelings of connection to nature, most particularly with people who were raised in agriculturally competitive areas as a child.

Despite similar scores of CNS+NR, people from different environments may possess entirely different rationales behind their scores of connection to nature. People of urban backgrounds are expected to have lower scores of connection to nature, yet according to the results of this study, their scores, while they do differ, are not significantly different from people of rural backgrounds. One conjecture about this finding is that people of urban backgrounds may appreciate the scarcity of resources and place higher value on a natural environment as a source of sustenance; another reason might be because this natural environment is rarely seen or enjoyed. This occurrence may explain the leveling of the scores on connectedness to nature in relation to a person's environment as a child.

As predicted, there was a significant difference for the frequency of natural exposures children received and the impact of that frequency on a person's connection to nature as an adult. The findings were extremely unusual in that the "sometimes" category did not perform as expected, receiving lower overall mean CNS+NR scores than either "rarely" or "always" groups. One explanation for this finding is that the low number of people reporting "rarely" (n=8) induced a higher mean response than would have occurred with a larger number of people responding "rarely." In any case, people who did experience frequent trips to nature as a child displayed a significantly higher connection

to nature than those who reported they only “sometimes” went on trips. Of the sub-categories, only Behavior showed significant differences among groups depending on their frequency of trips as a child, but the results were also very similar to the overall CNS+NR results, in that there was no difference between “rarely” and “always,” while the “sometimes” group scored significantly lower than both groups. Again, this result may be due to the low number of participants who reported “rarely” on frequency of trips to nature.

One concern that may explain the insignificance of the sub-scales is the mostly weak internal reliability of the sub-categories. The CNS+NR had an excellent reliability score, very similar to the CNS by itself which held an alpha score of $\alpha=.84$ and the NR by itself which held an alpha score of $\alpha=.87$ (Hefler & Cervinka, 2009). In separating the questions of the scale into sub-categories, however, reliability was reduced, despite the identification and clustering of similar questions. The sub-scale with the highest and most acceptable reliability, Attachment, did not show significant differences, whereas the Behavior sub-scale with unacceptable reliability did show significant differences.

Limitations

There were limitations with this study. The small size of the sample has an impact on the generalizability and accuracy of the data collected, particularly in those who reported “rarely” for Frequency of field trips. Despite finding some significant results, it may be the sample was not large enough to show if the environment experienced as a child does carry weight in later connectedness to nature. In addition, data collection from the survey was only allotted in a shorter time span than originally scheduled—two weeks instead of three months because of unanticipated issues with the IRB approval process.

Another limitation was the study sample was collected only from members of the Gallaudet University community and might be qualified as a sample of convenience. Furthermore, questions distinguishing Deaf, hard of hearing or hearing participants were not included in the demographic collection. The results may have been different between hearing and Deaf groups, or had there been wider diversity, perhaps of people who are not enrolled in college or are not affiliated with the Deaf community. It is not clear if and/or what role deafness plays in individual connectedness to nature, and it was not within the scope of this study to explore this.

A further limitation to this study was the reliability for each of the sub-categories of Emotion, Behavior and Beliefs was weak. The category of Emotion showed a poor alpha score ($\alpha=.55$). The category of Behavior had an unacceptable alpha score ($\alpha=.45$). The category of Attachment had a good alpha score ($\alpha=.76$), despite showing no significant difference for either of the IVs. The Belief category had an unacceptable alpha score ($\alpha=.39$). Due to the unreliability of the scales, the results may also be considered unreliable.

Future Research and Action

All ideas proposed in the discussion for the explanation of why the findings of this study occurred as they did are merely conjecture. Further research can study possible differences between Deaf, hard of hearing and hearing populations. With many differences in experiences as a child and adult, perhaps one's environment or exposure to nature may have a relationship with one's hearing-based cultural identity. Doing so may reveal a more accurate and generalizable result. Another area of focus could be specifically related to a much larger and highly diverse population, including people who

are uninvolved with academic institutions. It would be interesting to study the impact of one's level of education and connection to nature. Do people who are not highly educated differ in connection to nature compared to people who have a higher education? One could run the scales again and survey the sample about their highest achieved schooling as well as their current knowledge about nature and environmental issues. It is possible that while there may be a connection between level of schooling achieved and connection to nature, one must also take into consideration the knowledge one learns outside of the academic realm is very different, but no less important than the knowledge one learns within the academic realm.

Future research could also study how different sub-types of environment can change a person's experience in relation to nature. For example, a rural environment in one area may be entirely different from a rural environment in another area. Agricultural farm businesses are classified as rural, but the type of experiences given in that type of environment are very different than a small town, a home near a national park, or a family home paid by the government to protect conservation land. The impact of agricultural business should be studied as well. Future research could even study connectedness to nature within multigenerational families. Perhaps a pattern can be found between family members, of consistently similar behaviors or beliefs about nature. Among families, the transmission of values toward nature may even vary between completely culturally Deaf families, hearing families with Deaf children, Deaf families with hearing children and hearing families. Last, some work has been done on socioeconomic status, but more could be done with this category, too, as well as race and ethnicity.

An increase of psychological research is needed with focus on the individual's mental, physical and emotional development of connection to nature and his or her experiences throughout childhood. Future study can examine various types and frequency of therapeutic intervention, which might lead to more consistently environmentally friendly attitudes and behavior, with the goal of also improving mental and physical health.

Future research is needed to study the relationship between feelings of connectedness and attachment to nature on mental and physical health, not just the *presence* of a natural environment on mental and physical health. If such research is conducted and it is empirically shown attachment influences health, researchers can build support for medical diagnoses related to nature deficiencies and lack of connectedness to natural environments, such as Nature Deficit Disorder (NDD). While this study does not provide causal evidence, further research could indicate that less exposure to nature is related to lower levels of eco-friendly behaviors. According to NDD, many health issues can be linked to less contact with nature (Louv, 2006). Evidence from previous research shows frequent exposure to nature improves cognitive and physical functioning as well. The expansion of literature on connection to nature and health could add support for an official medical diagnosis of NDD. Research has already shown simply a walk in the park can relieve some symptoms of attention disorders in children (Taylor & Kup, 2008); therefore, practitioners in the medical and mental health field can work toward symptom prevention and symptom-relief of some psychological disorders through exposure to nature at young ages without resorting to invasive medications.

Conclusion

Overall, the findings of this study show that while there was not a significant difference between the types of environment one was raised in as child, the frequency of trips to natural environments does seem to have an impact on a person's connection to nature as an adult. In conclusion, according to these results, changing beliefs in the future is not the challenge, because most participants had very similar scores of beliefs about nature. Changing behaviors toward nature may be more important than changing beliefs; however, due to unreliable scales, the results of this study do not make a strong case for such a conjecture. Understanding and teaching how childhood experience has impacted adult connection to nature and habits is important for all people to learn. It can be hoped that more education and exposure will see an increase of environmental awareness in the general population and positive changes in attitudes as well as behavior.

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Appendix A

Survey Questions on Demographic Information

What is your age?

- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65-74
- 74 or older

What is your gender?

- Male
- Female
- Other

What is your race? Mark one or more

- Black or African American
- White
- Asian
- Native Hawaiian or other Pacific Islander
- Native American, or Native Alaskan
- Latino

What is your religious affiliation?

- Christian
- Jewish
- Buddhist
- Muslim
- Hindu
- Pagan

- Follower of a different affiliation/no affiliation

Survey Questions on Childhood Environment and Outdoor Exposure

During your childhood, what environment were you raised in?

- More of an urban neighborhood
- More of a suburban neighborhood
- More of a rural land
- Mixed (more than one area)

As a child, did you frequently attend outdoor field trips, vacations or other similar experiences allowed you to come within direct contact of nature?

- Rarelylyly
- Sometimes
- Always

Did you frequent a natural spot, such as a creek, park, or patch of woods as a child?

- Rarelylyly
- Sometimes
- Always

When you were a child, do you remember desiring to play outside more or inside more?

- Outside
- Inside
- Equally desired

Appendix B

The Connectedness to Nature Scale (Mayer & Frantz, 2004)

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

- | | | | | |
|-------------------|---|---------|---|----------------|
| 1 | 2 | 3 | 4 | 5 |
| Strongly Disagree | | Neutral | | Strongly Agree |
-
- ____ 1. I often feel a sense of oneness with the natural world around me.
- ____ 2. I think of the natural world as a community to which I belong.
- ____ 3. I recognize and appreciate the intelligence of other living organisms.
- ____ 4. I often feel disconnected from nature.
- ____ 5. When I think of my life, I imagine myself to be part of a larger cyclical process of living.
- ____ 6. I often feel a kinship with animals and plants.
- ____ 7. I feel as though I belong to the Earth as equally as it belongs to me.
- ____ 8. I have a deep understanding of how my actions affect the natural world.
- ____ 9. I often feel part of the web of life.
- ____ 10. I feel all inhabitants of Earth, human, and nonhuman, share a common 'life force.'
- ____ 11. Like a tree can be part of a forest, I feel embedded within the broader natural world.
- ____ 12. When I think of my place on Earth, I consider myself to be a top member of a hierarchy exists in nature.
- ____ 13. I often feel like I am only a small part of the natural world around me, and I am no more important than the grass on the ground or the birds in the trees.
- ____ 14. My personal welfare is independent of the welfare of the natural world.

Appendix C

The Nature Relatedness Scale (Nisbet, et al., 2009)

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

1	2	3	4	5
Disagree Strongly	Disagree a little	Neither Agree nor Disagree	Agree a little	Agree Strongly

- _____ 1. I enjoy being outdoors, even in unpleasant weather.
- _____ 2. Some species are just meant to die out or become extinct.
- _____ 3. Humans have the right to use natural resources anyway we want.
- _____ 4. My ideal vacation spot would be a remote, wilderness area.
- _____ 5. I always think about how my actions affect the environment.
- _____ 6. I enjoy digging in the earth and getting dirt on my hands.
- _____ 7. My connection to nature and the environment is a part of my spirituality.
- _____ 8. I am very aware of environmental issues.
- _____ 9. I take notice of wildlife wherever I am.
- _____ 10. I don't often go out in nature.
- _____ 11. Nothing I do will change problems in other places on the planet.
- _____ 12. I am not separate from nature, but a part of nature.
- _____ 13. The thought of being deep in the woods, away from civilization, is frightening.
- _____ 14. My feelings about nature do not affect how I live my life.
- _____ 15. Animals, birds, and plants should have fewer rights than humans.
- _____ 16. Even in the middle of the city, I notice nature around me.
- _____ 17. My relationship to nature is an important part of who I am.
- _____ 18. Conservation is unnecessary because nature is strong enough to recover from any human impact.
- _____ 19. The state of non-human species is an indicator of the future for humans.
- _____ 20. I think a lot about the suffering of animals.
- _____ 21. I feel very connected to all living things and the earth.

Appendix D**Debriefing Note**

Your completed survey above is to be used for the completion of an undergraduate Honors Capstone psychological research study under the supervision of Dr. Caroline Kobek Pezzarossi and Dr. Daniel Koo. This study has been approved by the Gallaudet Institutional Review Board.

The study is being conducted in efforts to decipher any sort of relationship between your childhood environment and your current preference for outdoor or indoor environments. It is hypothesized there will be a strong relationship between certain environments and preferences. Your responses are anonymous. If you would like to keep in contact with the researcher to learn what the results of the study are, please contact kallissa.bailey@gallaudet.edu.

Thank you for your time and responses!