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Measuring Affective Responses to Different Types of Nature Exposure

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MEASURING AFFECTIVE RESPONSES TO DIFFERENT TYPES OF NATURE
EXPOSURE

By

Abigail Paige Moffett

THESIS

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MEASURING AFFECTIVE RESPONSES TO DIFFERENT TYPES OF NATURE
EXPOSURE

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ABSTRACT

MEASURING AFFECTIVE RESPONSES TO DIFFERENT TYPES OF NATURE
EXPOSURE

By

Abigail Paige Moffett

Natural environments provide many physical and physiological benefits for an individual.
Examples may include decreased stress levels, increased intrinsic motivations and prosocial
behavior, and more. Fueled by the curiosity of the extent to which nature provides these benefits,
this study investigated whether pre-existing preference for either waterscape scenes or
mountainous scenes, as well as self-reported affective and associative responses to those
environmental exposures are possible explanations for the experience of wellbeing when one is
exposed to nature. Measures included the Nature Relatedness Scale, State Vitality Scale, Positive
and Negative Affect Scale, and a nature preference scale (mountainous vs. waterscape). Nature
relatedness was a significant predictor for state vitality and positive affect, as participants who
scored higher on the nature relatedness scale prior to the study rated themselves as happier and
more energized after viewing nature scenes. More participants in the water condition cognitively
associated themselves interacting with the environment, recounting specific memories of their
own, as well as reporting more calm cognitive associations. Also, people who preferred
waterscape scenes reported more calm cognitive associations in both conditions. The interaction
between picture type and nature preference for the restorative element of fascination showed that
individuals who preferred a specific type of nature scene were in turn more fascinated when
viewing the scene they preferred. Implications for these results suggest that people who are more
closely related to nature experience higher levels of positive affect and state vitality when
exposed to natural environments. In addition, one's own nature preferences result in higher levels
of fascination when viewing environments that you like to see.

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DEDICATION

       This thesis is dedicated to my family: Dad, Mom, Katie, Erin, Andrew, and Harlow. Thank you for motivating me and inspiring me to be the best I can be. I dedicate this thesis to my patient and adventurous partner, Howard Shoda, for reminding me to appreciate each moment and not to stress about little things. Your unconditional love and support mean the world to me. I love you all to Pluto and back…

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INTRODUCTION

Previous research suggests nature is beneficial to our mental and physical health. One of

the most prevalent explanations is the reduction of stress. Extensive research fueled by curiosity

about the extent of nature's benefits has been launched in search for the answer for why these

benefits occur (e.g., Astell-Burt et al., 2013, 2014; de Vries et al., 2003; Kim et al., 2009; Maas

et al., 2009; Nguyen & Brymer, 2018; Paquet et al., 2013; Pratiwi et al., 2019; Reklaitiene et al.,

2014; Ulrich, 1984).

Roger Ulrich (1984) spearheaded research into the benefits of nature with his study

looking at whether a view through a patient's hospital window might influence their recovery

from surgery. He examined cholecystectomy patient records from 1972-1981 and comparatively

matched the patient's demographics. The sample exclusively consisted of patients who had

undergone a cholecystectomy, or gallbladder surgery. Only surgeries performed between May 1

and October 20 from 1972 through 1981 were considered to account for foliage present during

those months of the year. Patients were matched so one member of the pair had a tree view from

their hospital window, and the other member's window overlooked a brick wall. Other factors

for matching included sex, age (within 5 years), being a smoker or nonsmoker, obesity, year of

surgery (within 6 years), and floor level. In all, 46 participants(23 pairs) comprised the group for

which this study was based upon. The recovery data provided information on the number of days

patients were hospitalized, the number and strength of analgesics each day, number and strength

of doses for anxiety each day, minor complications such as a persistent headache and nausea

which required medication, and all nurses' notes pertaining to the patient's recovery. In

summary, the patients in the tree view group had shorter post-op hospital stays, fewer negative

nurses' notes, fewer moderate and strong analgesic doses, and slightly lower scores for minor

postsurgical complications. A group of Dutch researchers led by de Vries et al. (2003) examined the relationship between "green spaces," designated areas of nature in an otherwise urban setting, and health measured by number of symptoms. This was an empirical study combining data for over 10,000 Dutch people on self-reported health and the amount of greenspace in their living environment. The researchers obtained health records from the Netherlands Institute for Health Services Research (NIVEL) which included a health interview survey that was distributed to random health practices of 103 general medical practices in the Netherlands. Environmental data was gathered into one geographic information system (GIS) database. The GIS database and health survey data were then matched by postal code. After considering demographic influences like socioeconomic status, a significant effect was found for urbanity in that people in high urban areas display more symptoms of poor health (as assessed by the number of health provisions the individual required) and a higher risk for mental illness. Interestingly, in terms of the participants' perceived general health, there was no effect of urbanity.

There is a wealth of other research finding similar positive connections between nature experiences and both physical and mental health. A few target categories of health-related outcomes like depression, physical illness, stress/anxiety, and intrinsic aspirations have been studied to probe the relationship between nature and wellbeing. While little is known about the mechanisms behind this relationship, closer examination of the research demonstrating the links between nature experiences and the aforementioned positive outcomes will help us explore the various theoretical mechanisms responsible for these effects. The present study probes the question of whether different types of natural environments or even one's own nature preferences might influence those types of positive effects as well.

Reduced Depression Symptoms

     Kim et al. (2009) wanted to determine the effect of cognitive behavior therapy (CBT) applied in a forest environment on physiological changes and remission of major depressive disorder. Sixty-three patients diagnosed with major depressive disorder at a hospital in Seoul participated in the study. Participants were selected if they showed a higher than moderate severity according to the Hamilton Rating Scales for Depression (HRSD) and a score of above 25 before treatment with medication. This was a 4-week study, and all medications were maintained to each patient's treatment schedule. Twenty-three patients were assigned to the forest group, 19 in the hospital group, and 21 in the outpatient control group. Participants were assigned to conditions depending on sign-up sequence. Those assigned to the hospital or control group had the opportunity to join the forest group after the study. The forest group met once a week at the Hong-Reung arboretum for 3-hour sessions. The Hong-Reung arboretum is a forest garden with 440 thousand square meters of trees, shrubs, herb gardens, and plants. The hospital program met once a week in the room of Seoul Paik Hospital. The control group underwent usual outpatient treatment. The Hamilton Rating Scale for Depression (HRSD), Montgomery– Åsberg Depression Rating Scale (MADRS), and Beck Depression Inventory (BDI) were measured every week, while the Short Form 36 Health Survey Questionnaire was measured only during the first and last weeks. Heart rate variability (HRV) and salivary cortisol were also measured during the first and last weeks only. The CBT program was designed to use the forest environment as a mediator of CBT by allowing patients to reflect on their problems and try to reconstruct cognitive errors after strolling in the forest or hearing stories about trees. Patients in the hospital condition underwent the same program, but in an indoor setting substituting the forest environment with views from a window or objects in the room. When compared to the

control and hospital groups, depression scores for the forest group significantly decreased. Additionally, the remission rate of the forest group was 61%, significantly higher than the hospital group (21%) and the controls (5%). A similar study conducted by Reklaitiene et al. (2014) questioned whether the amount of time spent in green spaces would have a significant effect on the presence of depressive symptoms. In a cross-sectional study of a population-based sample, the researchers drew a random sample of 3,254 men and 3,907 women aged 45–72 living in Kaunas city, Lithuania. The mean response rate was 62.3% in men and 66.9% in women. The baseline survey questionnaire included questions about the respondent's age, education, marital status, smoking, alcohol consumption, BMI (body mass index), perceived general health, and depressive symptoms. Depressive symptoms were evaluated using CES-D10 scale, a 10-item Likert scale questionnaire assessing for the presence of 10 depressive symptoms during the past week on a two-point scale: yes or no. Symptoms were scored from 1 (yes) to 0 (no), with a total score of 0 to 10. Participants with CES-D10 scores equal to or greater than 4.0 displayed depressive symptoms. Questions about the participant's use of green spaces were also posed in the self-administered questionnaire, with a 69.9% response rate from the sample population. Findings from this study concluded that there was a relationship between perceived general health, depressive symptoms, and use of green space especially for women, for whom depressive symptoms were found to be more prevalent.

Reduced Stress/Anxiety Symptoms

Astell-Burt et al. (2013) examined four European countries cross-sectionally to determine whether visiting green spaces is associated with vitality. The researchers acquired data from a sample of 260,061 participants between the ages 45 to 106 years (mean age = 62.8, standard deviation = 11.2). The sample population was randomly selected from records in the Medicare

Australia database and the researchers asked them to complete a survey modeled from the Kessler Psychological Distress Scale (K10) (Kessler et al., 2002) which assessed symptoms of psychological distress over four weeks prior to completing the questionnaire. Green space information was gathered from a GIS system and helped to assign a buffer of 1 km radius around the participant's residence. Physical activity was measured with the Active Australia Survey (Australian Institute of Health and Welfare, 2003). Compared with the residents from lesser green areas, residents in the greener neighborhoods had a lower risk of psychological distress and were found to be less sedentary (Astell-Burt et al., 2013). Nguyen and Brymer (2018) took a different approach in utilizing nature-based guided imagery (GI) as an intervention for state anxiety. They recruited 48 total participants (18 males, 30 females) with moderate levels of either trait or state anxiety as measured by the state-trait anxiety inventory (STAI). The mean age for the study was 34.5. Participants in this study were exposed to both a nature-based GI condition and an urban-based GI condition. Pre- and post- state anxiety levels were measured in both conditions. It was hypothesized that levels of anxiety would be lower for both GI conditions, with significantly lower rates of anxiety in the nature-based GI condition. A significant interaction effect was found between the condition (nature vs. urban) and time (pre vs. post), meaning that the difference between the pre- and post- assessments for anxiety levels was greater in the natural condition than in the urban condition in that participants showed significantly lower levels of anxiety in the nature condition. Pratiwi et al. (2019) measured the physiological and psychological effects of viewing urban vs. forest landscapes during different seasons as assessed by multiple measurements. The experiment took place in the same park in Japan from March to June 2019. Six females and six males with a mean age of 66.4 years participated in the spring experiment, and seven females and five males participated in the early

summer experiment with a mean age of 65.8 years. Participants were instructed to sit and view either a park landscape or urban area for 11-15 minutes. The researchers measured blood pressure before and after the participants viewed the nature or urban condition, and heart rate was measured continuously throughout the experiment. Next, psychological responses were evaluated using the Profile of Mood States and State-Trait Anxiety Inventory. They found diastolic blood pressure to be significantly lower in forested areas than in the urban areas as well as a significant "suppression" of sympathetic nervous activity in the forested areas. Heart rate in the forested areas was also significantly lower during every minute of viewing than in the urban areas.

Positive Affect and Emotional Health

Nisbet et al. (2010) explored whether nature relatedness contributes to overall wellbeing. They conducted two studies, the first assessing results of nature relatedness with wellbeing in college-age students, the second with working adults. In the first study, 184 undergraduate Canadian students were recruited with a mean age of 19.48 years. Participants completed the Nature Relatedness Scale (Nisbet et al. 2009), the Psychological Well-Being Inventory (PWB; Ryff 1989), Positive and Negative Affect Schedule (PANAS; Watson et al. 1988), and the Satisfaction with Life Scale (Diener et al. 1985). To investigate the relationship between nature relatedness and wellbeing with a more diverse group of participants, 145 Canadian employees from the federal government and private sector completed these surveys anonymously online as part of a larger study assessing work-life balance and personality. For both studies, there were significant positive correlations between nature relatedness and wellbeing. People rated more connected to nature also reported having a sense of purpose in life and practiced more self-acceptance. A study conducted by van den Berg et al. (2016) questioned whether visual features

might trigger more positive affective responses to natural scenes compared to scenes with man-made buildings. To test this theory, they adapted a method from Mandelbrot (1981) in which they cut an image of an environment into parts and magnify those images to the same size of the original image. In this way, the more elements that are visible in magnification, the higher the environment's fractal complexity, which is the extent to which a space is filled with details. Participants of this study were asked to rate the complexity of both natural and urban photographs, as well as cropped segments of those photographs at different magnifications. In addition, the researchers assessed how long the participants viewed these images as a way to establish a behavioral measure of fascination (Lang et al., 1993) and gathered self-reports of fascination for the original, unmagnified images. They tested for three hypotheses. The first predicted that the participants would view unmagnified natural scenes longer and rate them as more restorative when compared to the urban scenes. The second hypothesis predicted that magnified images of natural scenes would capture more of the participant's fascination in addition to the third hypothesis stating that perceived complexity of magnified scenes would statistically mediate differences in viewing times and positive affective responses between the unmagnified natural and built scenes. The researchers gathered 20 photos displaying natural landscapes and objects such as trees, bushes, or grassy areas. The other 20 photos displayed residential or office buildings. None of the scenes had water features, humans, or animals to minimize potential confounding variables. Forty students and employees (17 males, 23 females) from a Dutch University with a mean age of 21.8 years participated in this study. It was found that in terms of the first hypothesis, participants spent more time looking at the unmagnified natural scenes and rated the unmagnified natural scenes as more restorative. Their second hypothesis was supported by a significant interaction between scene type and magnification

level. Participants looked at urban scenes for a shorter time and rated them less complex as magnification increased. These differences supported the study's third hypothesis in that they were statistically mediated by the greater perceived complexity of magnified parts of natural scenes, showing that complexity is important when considering restorative potential of natural and urban scenes (van den Berg et al., 2016).

Intrinsic Aspirations

Piff et al. (2015) conducted a study which tested the hypothesis that awe can diminish the individual self and increase prosocial behavior. To test this, participants were exposed to a video of awe-inspiring nature imagery, a video of nature imagery that induced excitement, or a neutral control video. After viewing the video, participants completed a measure for the small self with questions such as "I feel small or insignificant", "I feel the presence of something greater than myself" (Huta & Ryan, 2010; Shiota et al., 2007). They also completed a behavioral measure of generosity called the dictator game. Participants were told that they had a 10-point endowment and they were to decide how many of their 10 points (if any) they would like to give to their anonymous partner, who did not have any points to start with. The awe-inspiring nature images increased generosity when compared to other positive emotions such as amusement, also elicited by nature exposure. This helps to rule out the possibility that the effects of awe on prosociality are reducible to mere nature exposure (Piff et al., 2015). Additionally, the awe condition also contributed to feeling smallness of oneself, meditating the effects of awe on prosociality. Folsom et al. (2020) studied whether affective responses to nature or urban photos are innate or associative. Eighty-five participants with a mean age of 22.6 were recruited. Participants were told they would be participating in three separate studies. In the first study assessing values and nature experiences, demographic information was gathered along with participant's responses to

the Material Values Scale and the Nature Relatedness Scale. In the second study, participants were randomly exposed to paired images of nature or urban photos and were instructed to respond to either a cognitive associative prompt such as "What does this make you think of," or a descriptive prompt "Describe the objects and environment you see." The third study assessed responses to the State Vitality Scale, Satisfaction with Life Scale, Positive and Negative Affect Scale, and the Intrinsic/Extrinsic Aspirations Index. Results for this study showed that nature relatedness correlated positively with intrinsic aspirations which in turn correlated with higher reported vitality, satisfaction with life, and positive affect.

Theoretical Mechanisms

Previous research suggests a multitude of physiological and psychological benefits for individuals who are exposed to nature. There are many explanations for the connection between nature experiences and positive outcomes including enhanced parasympathetic nervous activity, suppression of sympathetic nervous activity, lowered heart rate, increased intrinsic aspirations, prosocial behavior, and more. An article written by Kaplan (1995) attempted to provide a framework for understanding the mechanisms behind nature's positive effects using Attention Restoration Theory to organize the types of restorative experiences nature tends to provide. In terms of the components for restorative environments, Kaplan suggests a few ideas. First, the aspect of simply wanting to "be away" usually takes people to natural settings for extended restorative opportunities whether it's the beach, mountains, or a meadow. Kaplan asserts that one does not have to travel far to reap these restorative benefits. In fact, natural environments that are easily accessible are an important resource for resting an individual's directed attention. Another element to be considered is fascination. Nature offers many fascinating objects- clouds, sunsets, snowflakes. Extent is another aspect that helps one put things into perspective. In the wilderness,

extent is a given, but so can a smaller area with the construction of trails and paths that make the area feel much larger. Kaplan argues that extent can also function on a conceptual level in the setting of places like museums with historical artifacts that promote a sense of connectedness to past eras. Finally, compatibility to the environment may influence these restorative effects in that there is a "resonance" between that natural setting and human nature. For example, pictures of bodies of water might generate ideas of swimming or fishing. In turn, pictures of mountains or landscapes might lead people to see themselves camping, hiking, or hunting. These mental images of the self engaging with nature may represent a fitness of the human experience with the natural environment that is calming or stress reducing. This may help explain higher levels of positive affect which are found when individuals are exposed to natural environments.

The proposed study will add more to our understanding of the following theoretical mechanisms. One thing missing from the previous research that might further inform our understanding of the various explanations for the connections between nature experiences and wellness is a controlled experiment to determine the effects of different types of natural environments. The proposed study addresses this question by assessing the individual difference of pre-existing preference for one type of nature over another, as well as self-reported affective and associative responses to mountainous compared to waterscape scenes to explore those associations responsible for the experience of wellbeing while one is exposed to nature. Not only would this study examine the extent of this relationship between viewing different types of nature scenes and feeling subjective well-being, but also the cognitive associations one makes when focusing on a photo of a mountainous landscape compared with a waterscape. There will be multiple hypotheses for this study, the first being that waterscape scenes will produce more positive affect and state vitality. The second hypothesis is that preferring waterscape scenes will

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increase the relationship between waterscape scenes and positive affect as well as state vitality. The third hypothesis is that waterscape scenes will also produce more restorative cognitive associations. Finally, the fourth hypothesis is that individuals who demonstrate having experienced more restorative elements such as being away, fascination, extent, and compatibility with the environment, will in turn exhibit more positive affect as well as state vitality. This will add to our understanding of these causal mechanisms of nature experiences and positive affect.

METHODS

Participants

Researchers recruited 185 psychology students enrolled in psychological science classes at Northern Michigan University. After accounting for missing data and incomplete data, the final data sample consisted of 170 participants. All participants were 18 years and older and were directed by course instructors to access a Psychological Science department webpage for descriptions and links to various research participation opportunities available for extra credit in their course.

The majority of the sample $n = 134$ (78.8%) identified as women. Other gender demographics showed $n = 30$ (17.6%) identified as men, $n = 1$ (0.6%) identified as transgender, $n = 3$ (1.8%) as a gender not listed, and $n = 2$ (1.2%) preferring not to answer. The ages ranged from 18-48, with the majority of the sample $n = 120$ (93.8%) being between the ages 18-21 years. Other age demographics include $n = 2$ (1.2%) being 22 years old, $n = 2$ (1.2%) were 23 years old, $n = 1$ (0.6%) was 25 years old, $n = 1$ (0.6%) was 27 years old, $n = 1$ (0.6%) was 33 years old, $n = 1$ (0.6%) was 48 years old, and $n = 42$ (24.7%) declined to answer. As expected with the demographics of the location where this study took place, the majority of the sample $n = 154$ (90.6%) identified as Caucasian/White. Other race demographics included $n = 2$ (1.2%) identifying as African American, $n = 3$ (1.8%) identifying as Hispanic/Latino, $n = 2$ (1.2%) identified themselves as Asian, $n = 2$ (1.2%) as Biracial/Mixed Race, $n = 4$ (2.4%) identified as Native American, $n = 1$ (0.6%) as Native American/ Caucasian, and $n = 2$ (1.2%) preferring not to answer.

Experimental Design

This study utilized a 2x2 between subjects, quasi-experimental design with the independent variables of picture type and nature preference. The two levels of picture type differentiated mountainous scenes and waterscape scenes. There were 10 total photos: 5 mountain scenes and 5 water scenes. Each participant was randomly assigned to view only one of the photo types. Photos between the conditions were matched based on color, dimension, and brightness. These photos can be found in Appendix A. The two levels of nature preference were water preference and mountain preference. Participant responses on the nature preference measure determined which group they belonged in for the analysis. State vitality and state affect were measured as dependent variables. Nature relatedness scores were treated as a covariate in the analyses for this study.

Measures

Nature Relatedness Scale.

Assesses the strength of an individual's connection to nature. All 21 questions were answered on a five-point Likert scale: (1-disagree strongly; 2- disagree a little; 3- neither agree or disagree; 4- agree a little, 5- agree strongly). An example of an item on the test is, "I enjoy being outdoors, even in unpleasant weather". The full scale is presented in Appendix B.

Demographic Questions.

A background questionnaire was administered to assess basic demographic information which included age, race, sex, and gender. The 4 questions for this scale are included in Appendix C.

State Vitality Scale.

   The State Vitality Scale measures subjective vitality levels and mood state in individuals. All 6 questions were answered on a nine-point Likert scale (1- not at all true, 2, 3, 4, 5- somewhat true, 6, 7, 8, 9-very true) An example of an item on the test is, "At this moment, I feel alive and vital". This scale is presented in Appendix D.

Positive and Negative Affect Scale.

   The Positive and Negative Affect Scale measures participants' current emotional state by assessing positive and negative affect. All 20 items measured on a five-point Likert scale (1- very slightly or not at all, 2- a little, 3- moderately, 4- quite a bit, 5-extremely) An example of an item on the test is, "Indicate to what extent you feel this way right now, that is, at the present moment: Interested, Excited, Distressed, etc…" This scale is included in Appendix E.

Nature Preference Scale.

   The Nature Preference Scale assesses preferences of nature between mountains and bodies of water. This scale was made specifically for this study to measure one's preferences for looking at, interacting with, and simply being in close proximity to the two types of natural environments. In this way, we hoped to have a better understanding of how specific nature preference produces different results in terms of positive affect and state vitality. All 5 questions were forced-choice between two statements to determine which one most strongly represented the participant's preferences. An example of an item on the test is choosing between, "I would rather go to the beach" and "I would rather go to the mountains." This scale is included in Appendix F.

Experimental Procedure

Participants who chose to click on the link to participate in this study first read through an informed consent form. After providing consent to participate in this study, they completed the surveys for nature relatedness and nature preference. Upon completion of the surveys, participants viewed a series of five photographs that were either water or mountain scenes. While viewing each image for two minutes, participants wrote freely about what they saw or associated with the environmental stimuli they were presented with. Once participants viewed all photographs for their condition, each participant completed the State Vitality Scale and the Positive and Negative Affect Scale. Upon completion of the study, participants read a debriefing statement and were thanked for participating. Students received extra credit for participating. The number of credit points awarded to students was given by the professor's own discretion.

Cognitive Association Statement Rating Process

Due to the complexity of rating cognitive responses, a sample of 40 participants were selected from the 170 participants with the use of a random number generator. Of this sample, three raters reviewed each of the participant's cognitive responses and rated their responses. Raters were prompted by a series of questions assessing whether the participant reflected on a specific memory, intrinsic aspirations, whether the photos were calm inducing, the participant's overall affect, and the restorative elements such as extent/awe, being away, fascination, and compatibility. The survey used for rating participants' responses can be found in Appendix G.

Data Analysis

Each scale and subscale were checked for its scale reliability with Cronbach's alpha coefficient, and inter-rater reliability for the random sample of 40 participants' cognitive association statements was assessed with the intra-class correlation coefficient (ICC). A 2x2

between subjects MANCOVA assessed main effects and interactions for picture type and nature preference variables on the dependent variables of state vitality and affect with nature relatedness as a covariate. We expected a main effect for picture type in the direction that exposure to waterscape scenes produce more positive state vitality and affect. It was also expected that there would be a significant interaction between picture type and nature preference. Specifically, both picture types were expected to generate greater positive affect and state vitality for participants with congruent nature preferences. A MANOVA was run to examine the effects of the independent variables of picture type and nature preference on the cognitive associations related to specific memories, intrinsic aspirations, calmness, and overall affect of the participants. Then, a pair of multivariate linear regressions were run to assess whether the restorative elements of extent (awe), being away, fascination, and compatibility predicted state affect or vitality. To further investigate the impact of the independent variables on each of the restorative cognitive association categories, a series of univariate F-tests were run as well.

RESULTS

Measure Reliability

Each scale and subscale were checked for its scale reliability using SPSS. When

calculating Cronbach's alpha coefficient for each self-report scale, the resulting scores fell within

the desired minimum target range of .65 – .80, revealing each scale to have adequate reliability.

Refer to Table 1 for the Cronbach's alpha reliability coefficients as well as the means and

standard deviations for each self-report scale.

In addition, inter-rater reliability for the random sample of 40 participants' cognitive

association statements were assessed using the intra-class correlation coefficient (ICC) to

provide an estimate for the accuracy of the rating process. The ICC for inter-rater reliability was

between fair and excellent (0.66-0.94) for all items rated. Please refer to Table 2 for the ICC as

well as the 95% confidence intervals, range, means, and standard deviations for each rated

component of the cognitive association statements.

Table 1

Cronbach's Alpha, Mean, and Standard Deviation Scores for Each Measure Between Groups

Measure	α	*M*	*SD*
Nature Preference Scale	.688	7.28	1.65
Nature Relatedness Scale	.841	79.20	10.87
State Vitality Scale	.895	31.25	10.68
Positive and Negative Affect Scale	.818	44.45	10.09

Note. Possible range for Nature Preference is from 5.00-10.00. Possible range for Nature

Relatedness is from 21.00-105.00. Possible range for State Vitality is from 6.00-54.00. Possible

range for Positive and Negative Affect is 20.00-100.00.

Table 2

Interrater Reliability and Descriptive Statistics for all Rated Components of Participants'

Cognitive Association Statements

Scale	N	Interrater Agreement		Descriptive Statistics		
		Intraclass Correlation	95% Confidence Interval	Range	*M*	*SD*
Affect	40	.707	.628-.771	5.0-13.0	8.51	1.74
Compatibility with the Environment	40	.854	.815-.886	5.0-9.7	7.15	1.24
Fascination	40	.618	.515-.703	5.0-9.3	6.75	1.19
Element of Being Away	40	.508	.358-.623	5.0-8.7	6.63	1.12
Calm	40	.798	.729-.849	5.0-9.7	6.68	1.34
Awe	40	.781	.722-.828	5.0-10.0	6.19	1.18
Intrinsic Aspirations	40	.762	.698-.814	5.0-8.0	5.95	0.80
Specific Memory	40	.863	.823-.894	5.0-13.3	8.90	2.23

Assessing Main Effects and Interactions of Picture Type and Nature Preference on Affect and Vitality

A 2 (picture type) x 2 (nature preference) between-subjects multivariate analysis of covariance was performed on two dependent variables: state vitality and positive affect, while controlling for nature relatedness as the covariate. Levels of each independent variables were

picture type (Waterscape Scenes, Mountainous Scenes) and nature preference (Water Preference, Mountain Preference). With the use of Wilks' criterion, the combined DVs were not significantly different by picture type (Wilk's Λ = .99, $F(2, 156)$ = .19, p = .83, partial $\eta 2$ = .00) or nature preference (Wilk's Λ = .99, $F(2, 156)$ = .16, p =.85, partial $\eta 2$ = .00), after controlling for nature relatedness. No significant interaction was found (Wilk's Λ = .98, $F(2, 156)$ = 1.3, p = .27, partial $\eta 2$ = .02). As expected, our covariate nature relatedness was a significant predictor for both state vitality, $F(1,157)$ = 12.03, $p < .001$, and positive affect, $F(1,157)$ = 5.06, p = .026.

Unfortunately, these data do not support the first hypothesis that waterscape scenes will produce more positive affect, nor the second hypothesis that preference for waterscape scenes would increase the relationship between waterscape scenes and positive affect as well as state vitality. Table 3 details the means and standard deviations for state vitality and positive affect scores for each measure between groups.

Table 3

State Vitality and Positive Affect Means and Standard Deviations for Each Independent Variable

Grouping

| | Mountain Condition | | | | | | Water Condition | | | | | |
| | Mountain Preference | | | Water Preference | | | Mountain Preference | | | Water Preference | | |
Measure	*N*	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*
State Vitality	38	30.9	10.3	43	31.2	11.4	50	32.1	10.6	31	30.8	10.5
Positive Affect	38	28.4	7.9	43	27.5	8.7	50	27.5	9.2	31	28.8	7.0

Note. Possible range for State Vitality is from 6.00 – 54.00. Possible range for Positive and Negative Affect Scale is from 20.00-100.0.

Assessing Main Effects and Interactions of Picture Type and Nature Preference on Restorative Cognitive Associations

To investigate the third hypothesis, a between-subjects multivariate analysis of variance was performed using picture type and nature preference to predict each of the cognitive association ratings, including specific personal memories, calmness, overall affective tone, and the restorative elements of being away, fascination, awe, and compatibility with the environment. With the use of Wilk's criterion, the combined DVs were significantly different by picture type (Waterscape Scenes vs. Mountainous Scenes) (Wilk's Λ = .52, $F(8, 29)$ = 3.41, p = .007) and nature preference (Wilk's Λ = .57, $F(8, 29)$ = 2.73, p = .023). No significant interaction was found (Wilk's Λ = .72, $F(8, 29)$ = 1.42, p = .229).

To investigate the impact of the independent variables on each of the restorative cognitive association categories, a series of univariate F-tests using an alpha level of .05 was performed. The main effect of picture type was significant on compatibility with the environment $F(1,36) = 9.22$, $p = .004$. Specifically, statements reflecting more compatibility with the environment were found more in participants who experienced the water condition. Figure 1 details these main effects. The main effect of preference was significant for calmness $F(1,36) = 5.60$, $p = .023$, as well as a main effect of picture type on calmness $F(1,36) = 6.51$, $p = .015$. These main effects are shown in Figure 2. There was a marginally significant interaction effect between picture type and nature preference for the element of fascination $F(1,36) = 3.41$, $p = .073$, as shown in Figure 3. Namely, participants who preferred water generated more statements reflecting fascination when looking at water. Conversely, participants who preferred mountains generated more statements reflecting fascination when looking at mountains. Together, these results provide some support for the hypothesis that waterscape scenes produce more restorative cognitive associations and perhaps that one's nature preferences influences the experience of restoration as well. While not directly related to Kaplan's four restorative elements, there was a main effect between picture types for how specific memories were more cognitively associated in the water condition $F(1,36) = 4.75$, $p = .036$. This main effect is found in Figure 4.

Figure 1

Main Effect of Picture Type on Compatibility with the Environment
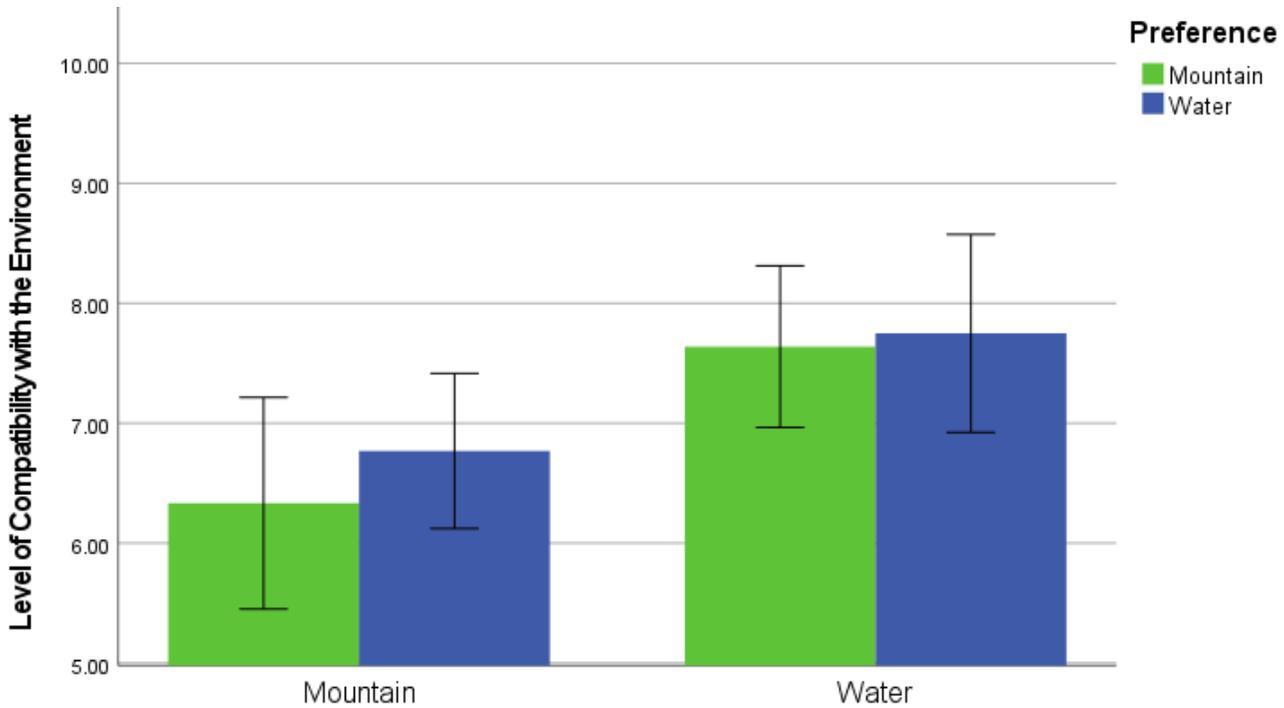
Note. Error bars show standard errors at 95% confidence intervals. Scores represent average ratings for each picture statement across totals for five pictures. This created a possible range for scoring from 5.00-10.00.

Figure 2

Main Effect of Preference and Picture Type on Calmness
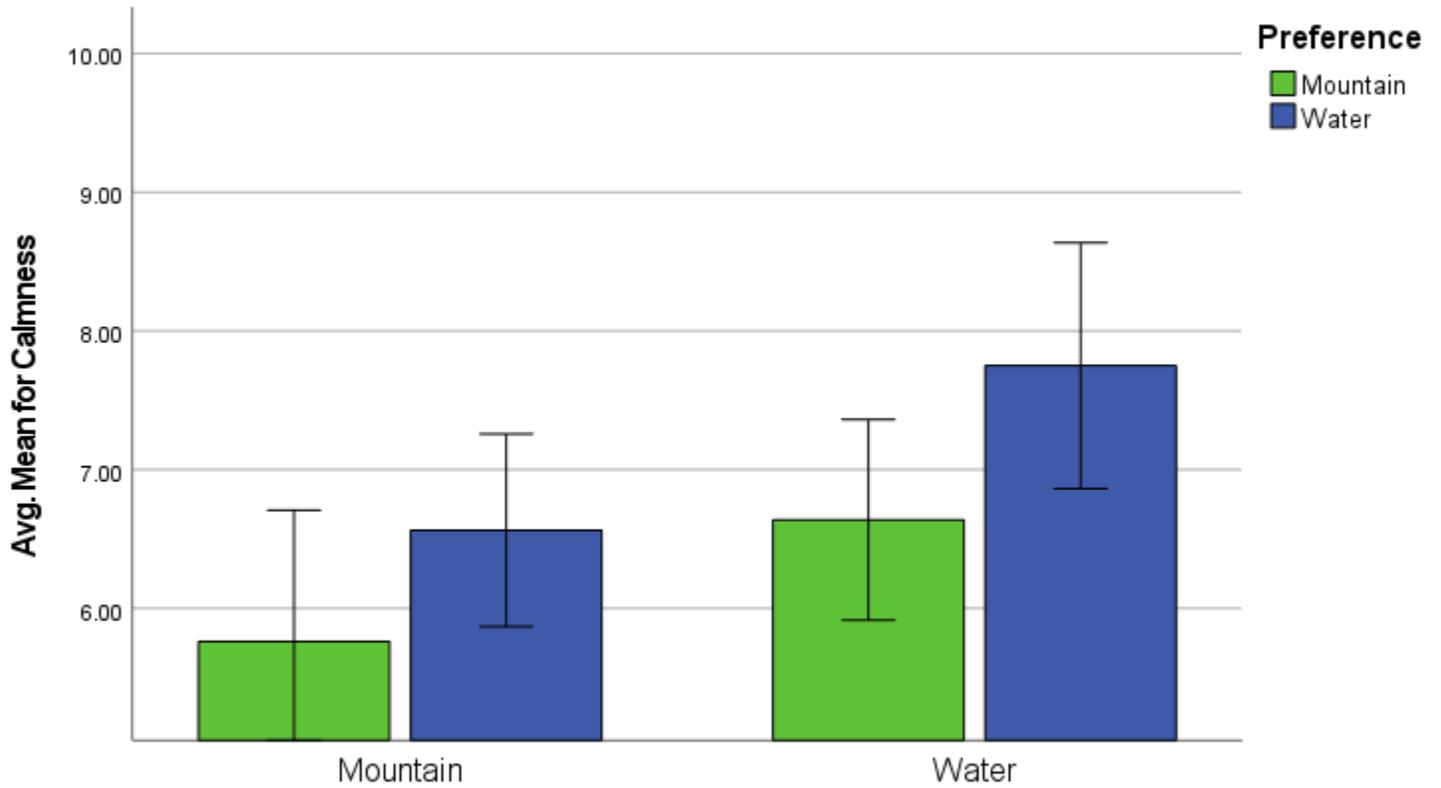
Note. Error bars show standard errors at 95% confidence intervals. Scores represent average ratings for each picture statement across totals for five pictures. This created a possible range for scoring from 5.00-10.00.

Figure 3

Interaction Effect Between Picture Type and Nature Preference on Fascination
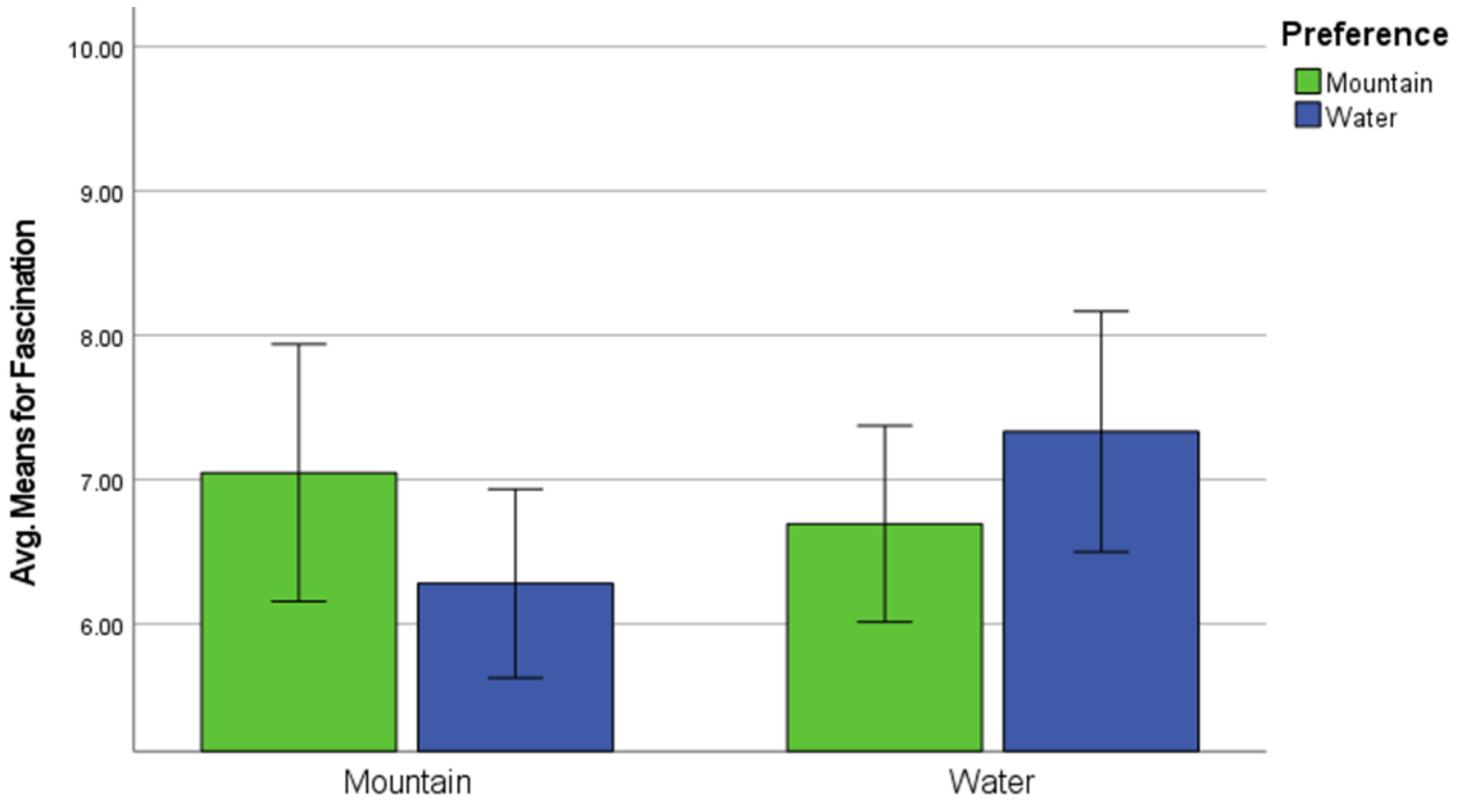
Note. Error bars show standard errors at 95% confidence intervals. Scores represent average ratings for each picture statement across all five pictures as rated by three different raters. This created a possible range for scoring from 5.00-10.00.

Figure 4

Main Effect of Picture Type on Specific Memory Cognitive Associations
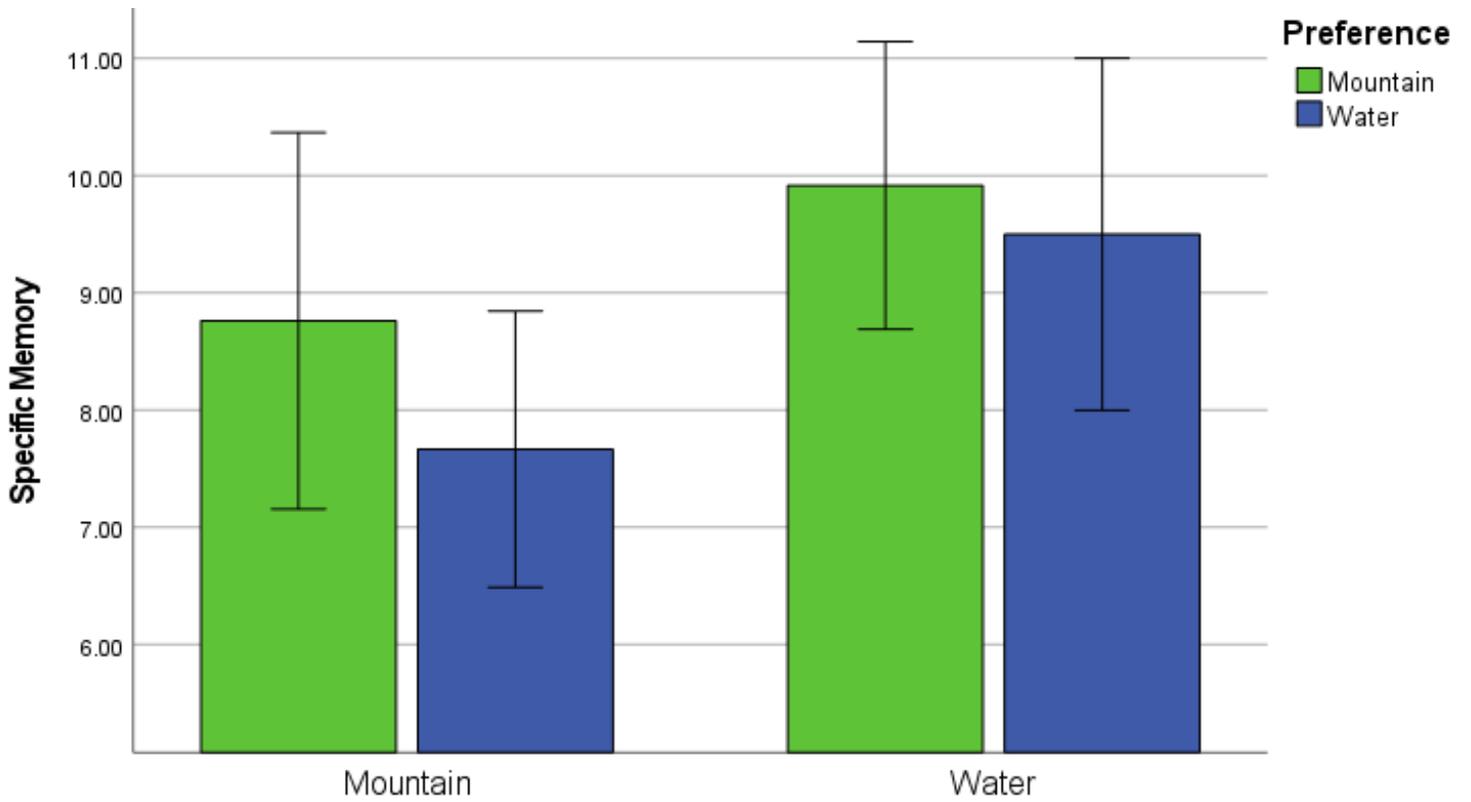
Note. Error bars show standard errors at 95% confidence intervals. Scores represent average ratings for each picture statement across all five pictures as rated by three different raters. This created a possible range for the five pictures scoring from 5.00-15.00

Assessing Outcomes of Experiencing Restorative Elements

To test the last hypothesis that individuals who experience more restorative elements will exhibit more positive affect, a pair of multivariate linear regression analyses revealed that being away, fascination, awe, and compatibility with the environment not to be significant predictors of the model (p > .05). Similarly, being away, fascination, awe, and compatibility with the environment were not significant predictors for state vitality (p > .05). Table 4 details the beta value, standard error, 95% confidence intervals, and the significance levels for the effects of restorative elements on positive affect and state vitality.

Table 4

Coefficients for Restorative Elements and Positive Affect and State Vitality

Outcome	Restorative Element	*B*	*SE*	95% CI	*p*
Positive Affect	Being Away	.14	1.60	-3.04-3.33	.928
Positive Affect	Awe	1.97	1.39	-.85-4.80	.165
Positive Affect	Fascination	-.57	1.35	-3.31-2.17	.674
Positive Affect	Compatibility	.77	1.42	-2.11-3.65	.591
State Vitality	Being Away	-1.15	1.67	-4.55-2.25	.496
State Vitality	Awe	1.69	1.45	-1.27-4.64	.254
State Vitality	Facination	.83	1.43	-2.07-3.74	.563
State Vitality	Compatibility	1.32	1.52	-1.77-4.41	.391

Note. CI = confidence interval

DISCUSSION

Overall literature surrounding nature and its effects on mental health are overwhelmingly positive, suggesting many physiological and psychological benefits for the individual experiencing nature (de Vries et al., 2003; Kim et al., 2009; Nguyen and Brymer, 2018; Pratiwi et al., 2019; Ulrich, 1984). The present study adds to our understanding of the mechanisms that contribute to these positive findings in terms of how we relate to certain aspects of nature.

We hypothesized that waterscape scenes would produce more positive affect and state vitality. We found that participants who scored higher on the nature relatedness measure at the start of the study also rated themselves as feeling happier and more energized after viewing the nature scenes. Explanations for why nature-related people experienced more state vitality could be found in a study by Nisbet et al. (2010) who found significant positive correlations between nature relatedness and wellbeing. People who are more connected to nature report having a greater sense of purpose in life as well as the practice of self-acceptance. In this way, state vitality plays a role in wellbeing in that the very definition of vitality is being full of life and thus bringing oneself a sense of meaning and purpose. One might argue that state vitality is also closely related to intrinsic aspirations in that connectedness to nature contributes to a greater sense of purpose, therefore contributing to more personal growth and, hopefully, more positive affect. This assertion is supported by a study performed by Folsom et al., which found a positive correlation between nature relatedness and intrinsic aspirations contributing to higher levels of state vitality as well as satisfaction with life, which in turn produces positive affect. This study highlights how all of these terms (intrinsic aspirations, sense of purpose, state vitality, and

positive affect) appear to be interconnected with nature relatedness as the common denominator. In this way, connectedness to nature brings about more personal development and serves a purpose for the individual who seeks out the nature experience as a way to replenish their energy or motivation.

When testing whether waterscape scenes would produce more restorative cognitive associations, we found a main effect for picture type on the restorative element of compatibility with the environment, as well as significant cognitive associations related to specific memories. Namely, participants in the water condition more closely associated themselves with that particular environment, cognitively associating themselves interacting with the water, and recounting memories of their own. Many of the participant's responses stated family vacations at the beach, fishing, swimming, etc. These mental images represent the resonance between the natural setting and human nature, creating a "fitness" with the human experience in the natural environment which contributes to stress reduction or calming effects (Kaplan 1995).

In fact, there was a significant main effect of both picture type and preference on calmness. Specifically, people who were exposed to waterscape scenes reported more calm cognitive associations. Additionally, people who preferred waterscape reported more calm cognitive associations in both picture type conditions. The aspect of color may help to explain the main effect of picture type on calmness. A study conducted by Gunes and Olgunturk (2020) sought to examine the relationship between color and its effect on emotion. They found the color blue to be associated with more secure, comfortable emotions. While the photos in the present study were largely matched based on color, the waterscape scenes did contain more of those calming, blue tones compared with the mountainous scenes which exhibited a variety of colors

such as green, blue, white, purple, tan, etc. Again, although the pictures were matched for color, it was unavoidable that the water scenes would have more blue tones. To further explain the reason for these findings, it would be helpful to consider the participants' cognitive associations. When asked to recount their feelings about the waterscape scenes, many participants wrote about their days spent on the beach, or family retreats to the water in the summer. It makes sense that people with both type of preferences would feel calmer when viewing waterscape scenes, particularly in the region we live in. This study took place in Marquette, Michigan which is located on the shores of Lake Superior in the Upper Peninsula. Many of the students who participated in this study have resided in Michigan or neighboring areas in close proximity to the Great Lakes. For this sample population, there is an abundance of freshwater lakes and beaches to interact with, making the water a popular destination to get away from work, school, or other every day stressors. This leads to an additional explanation for why familiarity with the waterscape environment would be relative to the accessibility the individual has to water. Kaplan (1995) states that natural environments which are easily accessible are an important resource for resting the individual's directed attention, thus contributing to these more calming effects. It makes sense that our familiarity with the waterscape environment makes us feel comfortable and calmer, because it's what we are exposed to most frequently. So, this particular sample would be hard to generalize to a greater population due to our accessibility to the waterscape. It begs the question of whether people in drier climates would also feel calmer when viewing waterscape scenes, or would they enjoy the mountainous scenes more?

When testing for main effects of waterscape scenes on restorative cognitive associations, we found an interaction between picture type and nature preference for the restorative element of

fascination. This meant that individuals who preferred mountainous scenes were more fascinated by the mountain pictures than individuals who preferred waterscape scenes. Conversely, individuals who preferred waterscape scenes were more fascinated by the water pictures than individuals who preferred mountainous scenes. Other than the notion that an individual's preference for nature in general might serve as an important adaptive function for psychological restoration (van den Berg et al., 2007), there is not a lot of research surrounding why different nature preferences may produce different restorative effects. However, it makes sense that our own preferences contribute to wellbeing when exposed to those environments we like to see. When rating the cognitive responses for fascination, the raters were specifically looking for associations related to specifically vivid details of any aspects of the environment the participant was particularly descriptive about. Such examples of these associations include "This picture reminds me of a fire place, the warm orange cast of the sun, the rippling smooth tops of the ridges, also the shadows wrap the warmth like a sheet" or "The waves are bright and vivid in blue, strong and uniform. They're surging, perhaps from the deep tremors of the earth below. The clouds are a soft rosy tint, suggesting sunset or sunrise." Clearly, one's preference for different types of nature influences the depth of explanation given when viewing that environment.

The fourth hypothesis that individuals who demonstrate having experienced more restorative elements such as being away, fascination, awe, and compatibility with the environment would exhibit more positive affect was not supported. Reasons for this might be found in the cognitive associations made by the participants. Mountainous scenes were commonly referred to as "lonely" or "dark", suggesting more uneasiness than positive affect. Additionally, mountainous scenes occasionally produced associations with being lost, or going

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on a long hike. While hiking falls under the category of compatibility with the environment, the associations of being lost aren't the most positive associations in that hikes and long journeys are sometimes exhausting. While journeys may be enjoyable for some, the reward is usually at the end. Most participants were viewing a mountain and thinking about survival. In other words, a statement like this would have been rated as compatibility with the environment, while simultaneously being rated as associating with lower levels of positive affect. Similarly, waterscape scenes were sometimes associated with drowning, cold, and a curiosity for what's "lurking" beneath the surface. Perhaps these associations are made due to the nature of how cold nearby Lake Superior is, and the dangers we face with rip currents and the deepness of the lake. Nevertheless, nature is regarded as something unknown, something to be charted and explored, danger inevitable. This idea stems from the more recent urbanization of our society. From the times of castles, moats, and wall-building to protect citizens from what lies beyond, to now, where we have become so removed from nature that we have designated "green spaces" for urban areas. Moore at al., 2003 states that while cities "offer the lure of better employment, education, health care, and culture… urban growth is often associated with poverty, environmental degradation and population demands that outstrip service capacity." How can we, as humans, return to our refuge in the wilderness and rediscover the many benefits that nature has to offer? While the restorative elements may not contribute to positive affect in this sample, might there be different results in a larger population? Future research should delve into the question of how these restorative elements might contribute to other feelings of wellbeing, as well as refining the rating of what is actually considered restorative. Additionally, the duration of

the nature exposure intervention should be considered as individuals in the present study were only exposed to photographic images of nature for ten minutes total.

Limitations

The analyses conducted in this study are not without limitations, the most evident being the sample population. Northern Michigan University is located in a remote area on Lake Superior in the Upper Peninsula of Michigan. Demographically, there is not a wide range of people to account for in terms of receiving data which can be generalized to a greater population, as 84% of the enrolled NMU students are white. Additionally, individuals who choose to live in this remote area may already have a bias toward nature experiences, which might be harder to generalize to the more urban populations who are not surrounded by as much nature. This bias is driven by the numerous recreational activities that draw people to the city of Marquette, such as numerous hiking and biking trials, a ski hill, and many other outdoor opportunities to explore. Our sample population comprised of NMU students only, which limits this study's ability to generalize the results to a wider range of ages. Other limitations include the mere exposure to the natural environment. Participants were limited to viewing nature only visually, on a computer screen. There was no sound accompanying the video, and the participant was not able to fully interact with the natural environment. One might wonder if a more immersive experience such as a hike would produce different effects by way of enticing more of our senses- smell, touch, sound, sight, maybe even taste. Every participant was exposed to nature in this study, which raises the question of whether the results would have been different if there had been a control group, or even pre-test measures for the outcomes. For example, we can only assume that people

experienced positive affect from viewing nature scenes, but a non-nature control group would help clarify whether it is truly the nature exposure producing that outcome. Additionally, participants had only 2 minutes to view each photograph and write their cognitive associations. If they had more time, there may have been a potential for creating more cognitive associations, giving us even more insight to how nature has an effect on us. Finally, because the comparative examination of differential wellness effects from exposure to different types of natural environments has not previously been explored and because this project was necessarily limited in scope, the selection of waterscape and mountainous scenes as the two levels of the independent variable may represent aspects of the experimenter's own preferences (possible experimenter bias). The use of other types of environmental stimuli such as deserts, prairies, or rainforests have the potential to create different results. Such possibilities require further investigation.

Further Direction

Certain directions can be taken to further investigate the relationship between specific nature preference and wellbeing which can be generalized to a greater population. A more diverse sample would prove beneficial, recruiting participants from a wide range of demographic backgrounds and age. Further directions should also be taken to investigate how to capitalize on the restorative elements which connect our human nature to the natural environment. This might be achieved with a more immersive nature experience, where participants interact with the environment and perform activities relatable to the early human experience in nature. These activities might include practicing self-sufficiency in the natural environment, building a fire and

cooking one's own food. In this way, participants will perform tasks which enable compatibility

with the environment and thus experience more of those restorative elements which connect

humans to nature.

CONCLUSION

The natural environment provides numerous physical and physiological benefits. The present research shows how specific preferences for natural experiences produce more benefits for an individual if that preference is strengthened by relatedness to nature by one's own experiences. Namely, those participants who generally feel more connected with nature exhibited more positive affect and state vitality. In terms of restorative elements, participants in the waterscape scene condition recounted more specific memories, cognitively associating themselves interacting more in the waterscape environment. While both preference types reported more calmness in the waterscape condition, people who prefer water reported more calmness cognitive associations with nature in both picture conditions. In this way, preferring different types of nature produces different effects on each individual. While this may be a result of the accessibility this sample population has to the Great Lakes, it must be noted that this resonance between the natural environment and human nature is vital in stress reduction and calming effects. Additionally, the interaction between picture type and nature preference on the restorative element of fascination proved to be interesting in that your own preference drives levels of fascination, drawing your attention to that particular stimuli. More research needs to investigate whether preference for different types of nature is what drives these effects of wellbeing, or if there is a specific type of nature which produces more benefit to the individual.

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Appendix A: Matched Photos with Examples of Cognitive Association Statements Made by

Participants with Congruent and Incongruent Nature Preferences

Congruent: "It looks like Wyoming or Montana. I want to summit those peaks. I want to ski down them. I want to find their glacial lakes. It makes me feel small on this planet. It looks like my happy place. I want to run in the mountains again. I need strong mountain legs to make it to the top. I want to go up down and up down again. I love mountains so much I might explode."

Incongruent: "My first thought, even though I realize is a bit silly, is Mt Everest. I think the image is beautiful, however it is not my ideal nature destination. I think the mountains are great to look at, but I would prefer to not climb them, I would rather observe and appreciate them from the bottom. I also worry while looking at the picture that with the continual decline of the atmosphere, that in the near future I might be deprived of views such as this one.

Congruent: "A wave crashes onto a quiet beach. The sun is beginning to set in the west and all is calm. The only sounds to be heard are the rolling waves and the cries of birds overhead. The scene is serene, undisturbed. All is as it should be."

Incongruent: "A scene where someone may be drowning. They got knocked off their surf board and is struggling to get out of the water."

Congruent: "A great place to hike up around 5 in the morning to take in the beautiful sunrise, a sunrise that are once in a life time to see with the open area, wind in your face and honestly if I was there I would scream to get my anger out."

Incongruent: "Arid lands. Sand in the mouth. Bright orange rocks carved out of wind. Bones. Lonely. Shadows. Dusk. Hidden life in the crevices, hiding, lonely. Worn out, like old leather. Sleepy."

Congruent: "This picture makes me think of days at the lake with my family when I was a kid. We would go camping and have our boat out on the lake. We would go tubing and surfing and have a great time. It's been a long time since my family had done that and it is one of my fondest memories as a kid. The waves we always calm in the morning and would get big."

Incongruent: "Waves in an ocean due to horrific weather conditions due to deforestation of the area. Dangerously high waves. Dark clouds."

Congruent: "Blue hues. Everywhere. From the peak of the highest mountain, the clouds, the sky, and even the snowy caps. It depicts the word divine. Nothing is greater than the Mount Olympus look-alike."

Incongruent: "This scene is really nice but also looks very mysterious and dark. The fog over the mountains makes it seem a bit scary."

Congruent: "Beautiful, shades of blue, reminds me of my home, sun reflecting of the water, mountainous background, painting, rolling waters, gorgeous colors, swimming."

Incongruent: "This one is scary like the first one. It looks like if I got stuck in this water, I'd drown. It looks choppy and dark. Again, I bet the sound of the waves is fantastic, but I'd go nowhere near this water. I might just have a fear of large bodies of water. I hate fish, so when I see water like this I think of fish swimming around my legs and it's terrifying. The teal-ish color is pretty, though."

Congruent: "THOSE LOOK LIKE MY ELK MOUTAINS. I looked really hard trying to find the ones I know and have been on top of. Reminds me of the top of independence pass, I love that place. I want to run all the peaks. This is the most beautiful sight. I could stare at it forever. Look at those runnable ridges! WOW!! Just all the wow. Oh my gosh. So beautiful. I miss Colorado so much dang it."

Incongruent: "I'm not very fond of this picture. The mountains just seem to go on and on, making me feel trapped."

Congruent: "This is one of my favorite views. It looks the same as the view I've always had sitting on the top of the boat and swaying with the waves trying to look down and spot grouper for my brothers. I could spend hours up there without a single worry except for the cold wind coming in as the sun would set. We would race back to the condo and snuggle in my grandparents' bed before getting ready to eat dinner and go to sleep."

Incongruent: "This picture makes me feel awful. The sky is pretty but I do not like how there is no land in sight. The water is too still and it makes me uneasy. Makes me wonder what's under there and what sea creature life is like. Is it scary? Dark? Cold? Who or what is down there?"

Congruent: "The picture makes me think of the morning after you have gone camping and the sun it rising. It makes me think of the animals still up and around looking for food or getting ready to sleep or hide until the sun goes down. It makes me think of nice clean air too."

Incongruent: "Volcanoes. London smog. Melting ice. Fog, haze, fading colors. Inability to see, feeling like there's something past the horizon but no longer able to make it out. Straining with the eyes. Muddy. Dirty. Grubby camera lens. Low light. Unreachable sun."

Congruent: "This picture reminds me of swimming in Lake Superior at sunset. It feels cold, but healing. It reminds me of skipping rocks and laughter."

Incongruent: "This one makes me think of the ocean. It looks scary, like there is something waiting under it. Makes me think of early morning eeriness. I would stay far away from that water. The ocean is terrifying."

Appendix B: Nature Relatedness Scale

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 any way 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 C: Demographic Questions

1. Please slide the bar to indicate your age. (18- 100)

2. What is your race?

3. What sex were you assigned at birth? (For example, on your birth certificate)

4. What is your current gender?

Appendix D: State Vitality Scale

1. At this moment, I feel alive and vital.

2. Currently I feel so alive I just want to burst.

3. At this time, I have energy and spirit.

4. I am looking forward to each new day.

5. At this moment, I feel alert and awake.

6. I feel energized right now

Appendix E: Positive and Negative Affect Scale

Indicate to what extent you feel this way right now, that is, at the present moment.

Interested

Distressed

Excited

Upset

Strong

Guilty

Scared

Hostile

Enthusiastic

Proud

Irritable

Alert

Ashamed

Inspired

Nervous

Determined

Attentive

Jittery

Active

Afraid

Appendix F: Nature Preference Scale

For each of the following pairs of statements, please select the one that you feel most strongly represents your preferences. If you like both statements, just pick the one that you like more. If you do not like either of them, just pick the one that is less undesirable.

Select one:

I enjoy hiking most

I enjoy swimming most

Select one:

I would rather go to the beach

I would rather go to the mountains

Select one:

I prefer looking out over land

I prefer watching the waves

Select one:

I prefer views from high above

I prefer to look out over water

Select one:

I love large bodies of water

I love towering mountains

Appendix G: Cognitive Response Rating Prompts

Rater Initials (Abby Paige Moffett= APM)

Participant ID #

Picture #   1   2   3   4   5

Reflected on a specific memory or experience (imagined or real) eg. "going hiking, beach day",

"looks like Colorado"

No   Yes   Yes; with episodic personal memory

Example of statement with experience: "This picture makes me think of a wave rolling over

moving towards the beach and crashing onto the sand or rocks. It also makes me think of a surfer

looking out to and paddling to the wave wanting to catch it."

Example of statement with episodic personal memory: "This picture reminds me of the waves in

Lake Superior and camping with my grandparents. We would always bring a boogie board and

kayaks and it makes me think about running into the waves and being consumed by them as they

go over me. It was always a great time camping with them and I hope that I can for many years

to come."

Intrinsic aspirations (self-growth, relationships, community etc.)

Yes   No

Example of statement with intrinsic aspirations: "Going on a hike in the mountains, having lunch

mid-hike eating lunch with my hydro flask and good people around that also like to hike.

Awe inspiring (beautiful, amazing, gorgeous, vast..)

Yes   No

Example of statement describing awe: "The amazing adventures that we can go on in our lives

and how there are endless possibilities when you go out to explore nature. When you see how

long and wide this mountain top it you think about how many animals that people may have never seen before or maybe a new type of tree to discover."

Calm inducing (calm, relaxing)

Yes   No

Example of calm statement: "That is serene. Absolutely tranquil. Positively euphoric. Actually picturesque. Genuinely nirvana."

Overall Affect

Negative   Neutral   Positive

Example of statement with negative affect: "nighttime, death, doom, mysterious, cold, deserted"

Example of statement with neutral affect: "Sunset, large, dark, skiing, exploring, steep"

Example of statement with positive affect: "It makes me think of very happy times with my family on vacation and jumping waves with my cousins."

Element of being away (from everyday stressors like school, work...)

Yes   No

Example of statement for being away: "Summer vacations in Mexico or the Caribbean. The water and sand look warm and inviting. It reminds me of sunburnt skin and salty eyes. Snorkeling and coral reefs. Vacation."

Element of fascination (descriptive details of clouds, sunsets...)

Yes   No

Example of statement containing fascination: "This reminds me of the view over the water when you are on top of Sugar Loaf mountain. The only difference is there are no little islands of rock scattered throughout the water's surface. I assume this is a sunrise rather than a sunset because the bottom right is dark and it looks like the sun is creeping towards that side."

Element of compatibility (provides details about what they would do there: hunting, fishing, hiking, boating, gardening, caring for pets, bird watching, fire building, creating shelter)

Yes   No

Example of statement with compatibility: "Paddle boarding. Canoeing. Reminds me of sunsets on the lake during the summer. Cold beers and warm snacks. I enjoy that you can see land out stretched ahead, makes me feel comfort and makes it feel like there is a destination. I want to swim in it with my friends, maybe catch a fish or two, but only for sport."

Appendix H: IRB Approval Letter

NORTHERN MICHIGAN UNIVERSITY

Memorandum

TO: Jon Barch
Department of Psychological Sciences

Abby Moffet
Rachel Miller
Jeremy Lawrence
Sarah Houpt
Cole Holt
Department of Psychological Sciences

FROM: Lisa Schade Eckert
Dean, Graduate Studies and Research
Northern Michigan University

DATE: October 20, 2021

SUBJECT: IRB Proposal HS21-1232
"Measuring Affective Responses to Different Types of Nature Exposure"
IRB Approval Date: 10/20/2021
Proposed Project Dates: 10/20/2021 – 12/31/2021

Your proposal ""Measuring Affective Responses to Different Types of Nature Exposure"" has been approved by the Northern Michigan University Institutional Review Board. Please include your proposal number (HS21-1232) on all research materials and on any correspondence regarding this project.

If you find that modifications of investigators, methods, or procedures are necessary, you must submit a Project Modification Form for Research Involving Human Subjects before collecting data. Any changes or revisions to your approved research plan must be approved by the IRB prior to implementation.

Until further guidance, per CDC guidelines, the PI is responsible for obtaining signatures on the COVID-19 Researcher Agreement and Release and COVID-19 Research Participant Agreement and Release forms.