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The Restorative Effects of Natural Decor

Tobias Burnham
University of Nebraska-Lincoln, tobiasburn@hotmail.com

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Using Nature Based Design to Enhance Mood and Cognitive Functioning

Tobias Burnham

Under the Supervision of Dr. Hannah Swanson

Department of Environmental Studies

University of Nebraska-Lincoln

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Abstract

Humans are continually opting to live in urban environments, furthering us from the innate connection to the natural environment we have evolved with over millennia. These urban settings place several stressors on us in the form of stimuli that requires directed attention (cars, billboards, traffic lights, etc.) in which deplete our attentional resources leading to Direct Attention Fatigue (DAF). Attentional Restoration Theory (ART) is based on the ability of natural environments to have restorative effects on these depleted resources due to the relative ease of experiencing nature through involuntary attention. The focus of this study is to determine how nature-based décor used in indoor settings (e.g. home, office) may replenish directed attentional resources, influencing cognitive abilities and mood. Using twenty-seven participants in three environmental conditions, we found that the data points in the projected direction of the hypothesis that the nature-based décor condition replenished directed attentional resources, at least somewhat. The nature-based décor condition showed the greatest improvement and highest score on the cognitive measurement. Additionally, participants in the nature condition scored lower on the negative emotion items measurement.

Introduction

As of 2008, for the first time in human history, the majority of the global human populace resides in urban areas. The United Nations Population Fund has coined this phenomenon the “urban millennium” (UNFPA). The implications of this movement from rural landscapes to a built environment are significant in several ways, one of which is the lost connection to the natural environment. Human health and well-being are inextricably linked to nature; our connection to the natural world is part of our biological inheritance (Kellert, 2012). This disconnect from the natural environment however, may be remedied by use of biological design and environmental art, which can provide some of the restorative qualities of nature in an internal, built environment.

Our modern way of living, undoubtedly provides many benefits such as job opportunities, healthcare and access to consumer goods. However, the urban landscapes that we inhabit also place several stressors upon us. The build-up of stress can lead to mental-fatigue, the need for a break from the routine we have become entrenched in. This mental-fatigue is strongly related to an inability to pay attention, due to constant inundation of stimuli. Kaplan and Kaplan (1989) describe two types of attention, based on work by William James (1892): involuntary and direct. Involuntary attention is something that stimulates and excites yet requires no effort from the individual. Direct attention however requires effort and can eventually lead to mental fatigue, also known as Direct Attention Fatigue (DAF). In other words, "we do not increase our focus by thinking or working harder on a task; we do it by not focusing on those things that distract us from the task" (Kaplan & Kaplan, 1989).

According to American biologist and theorist E.O. Wilson, humans have an inherent connection to natural systems to which he refers to as biophilia (Wilson, 1984). The biophilia hypothesis can help further explain our natural tendency to be attracted to organic design. As Stephen Kellert (2012) puts it, "we evolved in a natural world, not an artificial or human created one." This evolution developed our senses, emotions, intellect and spirit which has been the experience of human-kind for 99% of our existence. Due to our evolvement not with, but as a part of nature, the connection that has developed remains ingrained in human psyche. Inundation with over-stimulation in urban settings requires mental effort that humans have simply not evolved to cope with, leading to DAF.

The concept of DAF is the foundation for Attention Restoration Theory (ART). ART identifies directed attention as the cognitive mechanism that is restored by interactions with nature (Berman, Jonides, Kaplan, 2008). While urban areas burden us with mostly direct attention stimuli (i.e. honking horns, billboards), natural environments stimulate us with inherently fascinating stimuli (sunsets)

requiring involuntary attention. The fascination component of ART is the reason that nature tends to be restorative and therapeutic while urban areas promote DAF.

Within ART, fascination with nature is considered (a) to imply an attentional bias towards natural environments, (b) to be a relatively effortless mode of attention, and (c) to have positive affective intrinsic attractiveness by being an aesthetically pleasurable experience (Joye et al., 2013). It is thought that the relative effortlessness in which natural environments are visually processed creates a restorative experience. Depleted attentional resources can be replenished when an individual is in an environment that is relatively effortless and requires little direct attention, such as a natural environment (Joye et al., 2013). Research on restorative environments has shown that exposure to nature can reduce attentional fatigue (Hartig et al., 2003; Berto, 2005) as well as reduce stress and negative moods (Ulrich et al., 1991).

Research done by Kaplan and Kaplan show that restorative environments are identified by four characteristics: a) being in a setting that is physically or psychologically different from one that is typically experienced; b) a setting that is rich and coherent enough to sustain a person's interest and the sense of being away; c) fascination, or effortless attention which can come from objects in the environment or processes related to making sense of the environment; and d) compatibility, which is the match between a person's purposes and inclinations within an environment and the demands and resources of the environment itself (1989). Essentially, an environment that is pleasurable to some degree in which we can take a break from directed attention.

Settings that promote indirect attention can come in many forms and don’t necessarily need to be natural ones, although research has shown that natural settings contain the properties of a restorative environment to a high degree (Kaplan & Kaplan, 1989; Ulrich, 1983). Empirical evidence of this has been shown through research regarding people’s opinions on natural versus built environments;

people prefer natural environments to built environments, and built environments with water and vegetation over built environments without these features (Kaplan & Kaplan, 1989; Ulrich 1983). In addition, consistently, people tend to give higher ratings to photographs of natural scenery compared with scenes from the built environment (Herzog, Black, Fountain & Knotts, 1997).

Several studies have explored the difference in attention restoration between simulated natural and simulated urban environments. This research has found that the simulated natural environment induced generally more positive emotional self-reports, faster recovery from stress, and better recovery from directed attention fatigue than did the simulated urban environment (Berto, 2005; Hartig et al.,1996; Laumann, Garling, & Stormark, 2003; Ulrich et al.,1991). Another study found that an actual natural environment and simulated natural environment were equally efficient at reducing stress, although a higher degree of altered states of consciousness (ASC) and increased energy were only found in actual natural environments (Kjellgren &Buhrkall, 2010).

Previous research has provided support for the hypothesis that interactions with nature alleviate mental-fatigue (Hartig et al., 2003; Berto, 2005), reduce stress and negative moods (Ulrich et al., 1991), and improve cognition (Berman, Jonides, Kaplan, 2008). Imagery of natural settings has shown positive benefits on mood and cognition, as has simulated natural environments. The focus of this study is to determine how nature-based décor (i.e. taxidermy, mounted insects, other natural relics) used in indoor settings (e.g. home, office) may replenish directed attentional resources, influencing cognitive abilities and mood. We expect to find alleviation of mental-fatigue and an improvement in mood and cognitive abilities by incorporating natural décor into home and office.

Materials and Methods

Subjects:

Twenty-seven (16 Females, 11 Males; Mean Age= 21.8) University of Nebraska-Lincoln students participated in this study. All participants gave informed consent as overseen by the university's institutional review board. Participants were recruited via the Environmental Studies Program's student email list serve. Recruitment also came from the following classes: ENVR 101, ENVR 249 and HORT 200. In addition to any extra credit given by the aforementioned course instructors, participants were given the incentive of the chance to win one of six $25.00 gift cards to the Downtown Lincoln Association, which were raffled off at random at the completion of the study.

Methods:

Participants were chosen to complete a range of tasks in one of three conditions. These conditions were created as follows:(1) a built environment incorporating twenty nature-based décor items (e.g. taxidermy jackal, beaver skull, mounted Atlas moth, etc.) which require involuntary attention; (2) a built environment without these elements (control environment); and (3) a built environment which included computer monitors and a projector showing images of a urban stimuli (i.e. cars, buildings, cityscapes, etc.) which tend to require directed attention.

Upon entering the assigned condition, each participant was given the pre- condition exposure Positive and Negative Affect Scale Short Form (PANAS-X) (Watson & Clark, 1994) which is a measure of one's current positive and negative affects. This scale consists of 10 words (5 positive, 5 negative) that describe different feelings and emotions. Each participant read each item and then listed the number from the scale (1: Very slightly/not at all – 5: Extremely) next to each emotion. They indicated to what extent they feel this way right then, that is, at that present moment.

Following the pre- PANAS-X, each participant was administered the pre-condition exposure Wechsler Adult Intelligence Scale- Fourth Edition (WAIS-IV) Digit Span Backwards Test (Weschler, 2008). This is a standardized neuro-cognitive measure which is easy to administer in a variety of settings. The administrator reads aloud a series of digits (e.g., 2…5…1), and participants are asked to repeat back the series in reverse order (e.g., 1 . . . 5 . . . 2). Series are administered in increasing length; if a participant fails a series of a given length, a second series of equal length is administered. If a participant successfully recites a series of numbers in reverse order, a subsequent series that is one-digit longer is administered, up to a series that is 9 digits in length. Scoring is based on the longest series performed correctly within two attempts. The digit span backwards task was used to a get a sense of attentional abilities.

To get a sense of how connected to nature the participants were, following the WAIS-IV test, each participant was asked to complete the Mayer & Frantz Environmental Connectedness to Nature Scale (CNS) (2004). This scale consists of fourteen statements such as “I often feel a sense of oneness with the natural world around me” and “I recognize and appreciate the intelligence of other living organisms.” The participant would then indicate on a scale of (1) how strongly they disagree with the statement to (5) how strongly they agree with the statement.

Each participant was then be asked to wait several minutes and given a filler task. In this case, the nonsensical poem “Jabberwocky” by Lewis Carroll (Carroll, 2002) was given to the participant to read. Upon completion, each participant was asked to answer several questions about the poem such as “What do you think the Jabberwocky is?” and “What do you think the meaning of this poem is?” Additionally, they were asked to draw their version of the “Jabberwocky” allowing for a creative aspect to the filler task. This filler task allowed time between the prime and the measures which allowed the participant to become more fully emerged in their particular condition.

After the filler task was completed, a basic demographics questionnaire was filled out. This included age, gender, race/ethnicity, education, political affiliation, and background (i.e. rural, urban)

Following completion of the aforementioned tasks and scales, the administrator returned to the condition and administered the post- exposure PANAS-X and post-exposure WAIS IV- Digit Span Backwards test. By using a pre- and post- condition exposure, we were able to the measure any change from participant's first arrival to the respective condition to after submergence into the condition occurs. This included both changes in attentional resources via WAIS-IV, and mood via PANAS-X.

Results

As indicated in Table 1, participants in all conditions improved their score on the WAIS-IV DSB test from pre- to post- assessment. The difference for the assigned cognitive task between pre- and post- condition exposure in the nature-based condition increased by 2.1 points on average, while the control condition increased 1.3 points and a 1.6 point increase in the built condition. Mean scores across all three conditions for the post-condition exposure was found to be highest in the nature-based condition (10.1, SD 1.9), while the control condition (9.22, SD 2.4) and built (9.44, SD 2.1) were slightly lower. Running one-way ANOVA, post-exposure WAIS-IV significance output was .673.

Table 1. pre- and post- Condition Exposure WAIS-IV DSB Test

	Condition	N	Mean	Std. Deviation	Std. Error
Pre-Condition Exposure	Control	9	7.89	1.965	.655
	Built	9	7.89	2.261	.754
	Nature Based	9	8.00	1.581	.527
	Total	27	7.93	1.880	.362
Post- Condition Exposure	Control	9	9.22	2.438	.813
	Built	9	9.44	2.128	.709
	Nature Based	9	10.11	1.965	.655
	Total	27	9.59	2.135	.411

Comparing means for the post-condition exposure on the PANAS-X, as indicated in Table 2, we found that the control condition elicited the strongest response on the positive emotion descriptors (16.7, SD 4.1), while the built (14.8, SD 3.9) and nature-based (14.1, SD 4.1) condition scored fairly similar means.

Table 2. pre- and post-Condition Exposure of PANAS-X Short Form

	Condition	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean
						Lower Bound
PostivePOST	Control	9	16.6667	4.12311	1.37437	13.4974
	Built	9	14.7778	3.96162	1.32054	11.7326
	Nature Based	9	14.1111	4.10623	1.36874	10.9548
	Total	27	15.1852	4.05763	.78089	13.5800
NegativePOST	Control	9	8.3333	2.17945	.72648	6.6581
	Built	9	8.1111	3.91933	1.30644	5.0985
	Nature Based	9	7.3333	3.31662	1.10554	4.7839
	Total	27	7.9259	3.12467	.60134	6.6898

Additionally, as seen in Figure 1, participants mean scores (7.3, SD 3.3) were lowest in the post-PANAS-X Short Form negative emotion items (i.e. distress, scared, nervous, upset, afraid) that were in the nature-based condition. Mean scores for the built condition were almost one point higher (8.1, SD 3.9) and in the control condition were an entire point higher (8.3, SD 2.2).

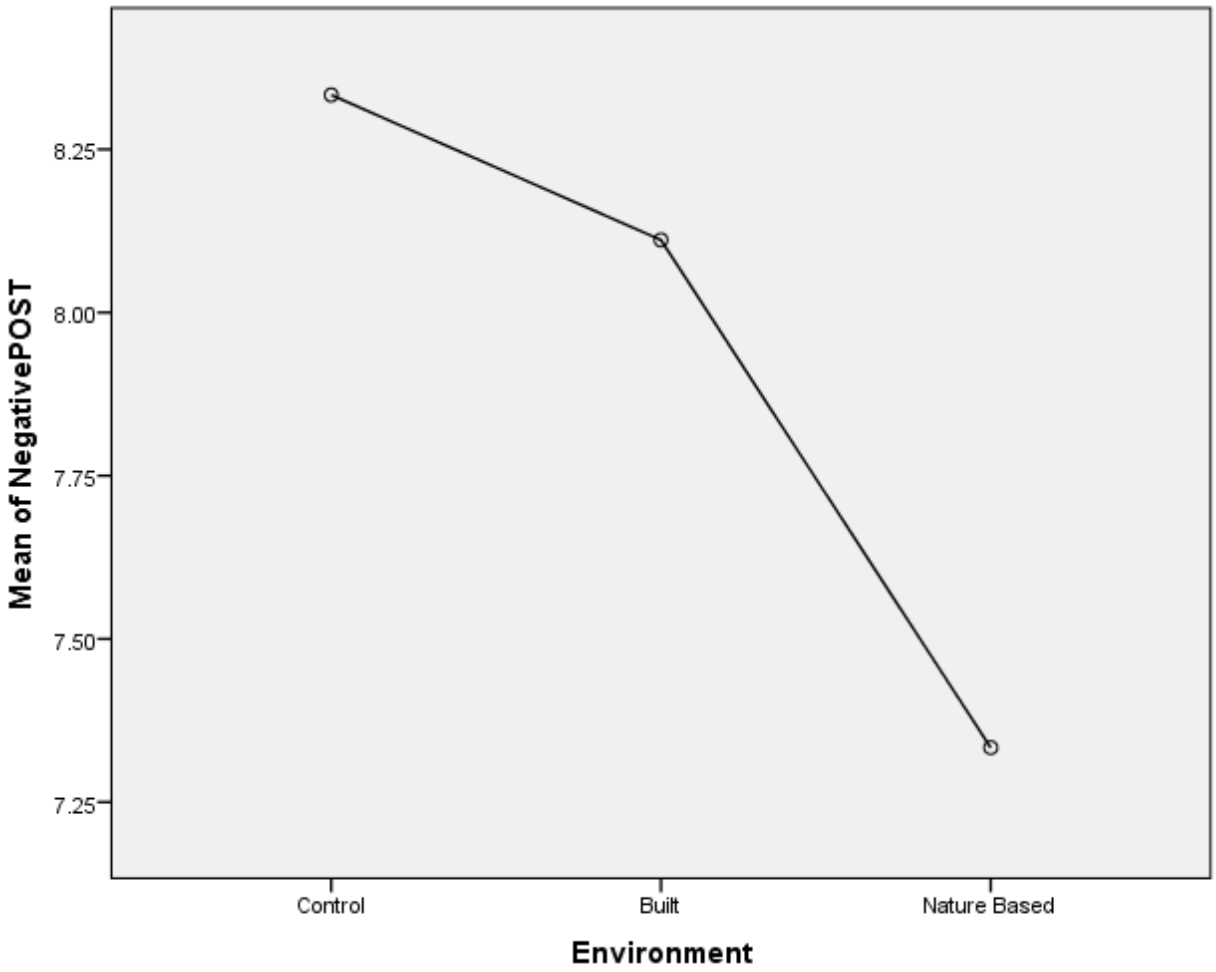

Figure 1. Mean post-Condition Exposure Negative Emotion Item Scores

The Connectedness to Nature Scale results showed a mean of 53.9 (SD 8.3) out of a total of 70 points. The minimum was 37 with two participants and the maximum was 69 from one participant. Out of the total participants, males scored a mean of 50.9 (SD 8.4) while females scored a mean of 56.0 (SD 7.9).

Discussion

Participants in all conditions improved their score on the WAIS-IV DSB test from pre- to post-assessment. This could indicate a potential testing effect, in where scores increase during the post-assessment due to participants becoming accustomed to the test administration. However, even

considering the testing effect, participants in the nature condition did show the greatest improvement (2.1 points) on the task and had the highest average score (10.1). The hypothesis that nature replenishes attentional resources was at least partially supported. While not statistically significant (.673), the means are in the projected direction.

Previous research has provided support for the hypothesis that interactions with nature improve attention (Tennessen & Cimprich, 1995). As outlined by Kaplan (1995) Attention Restoration Theory states that natural environments are particularly rich in characteristics necessary for restorative experiences. The creation of an environment utilizing nature-based décor allows for at least some of these same restorative qualities to be mimicked in an internal environment (e.g. home, office) providing benefits of replenishing mental fatigue.

The PANAS-X findings also had implications of the restorative effects of nature-based décor on participant's mood. The positive emotion item score was found to be highest in the control condition. While this doesn't support our hypothesis of the nature-based décor condition increasing the higher positive emotion item score, this could be due to the positive emotion items (inspired, alert, excited, enthusiastic, and determined) used. These positive descriptors do not necessarily correlate with feelings elicited by a natural setting, except perhaps "inspired".

However, participants in the nature condition scored lower on the negative emotion items of the PANAS-X on the post-measure assessment. This indicates that participants in the nature-based condition may have felt less negative emotions after several minutes of exposure, meaning they may have felt less distress, less scared, less nervous, less upset, and less afraid. This would also partially support our hypothesis that nature-based décor could have an influence on one's mood, at least partially assuaging negative emotions.

Restorative environment research has shown that exposure to nature can reduce stress and negative moods (Ulrich et al., 1991), which coincides with the findings of this study. The relationship between mood and nature-based experiences is in that natural environments are restorative primarily in their ability to elicit positive affect, which can assuage negative moods and provide a break from stress (Ulrich, 1983). By simulating an environment with natural décor, similar aspects of the restorative effects of nature can be implemented creating a space that allows for a rejuvenating experience and lessening negative emotions.

The Connectedness to Nature Scale proved to be unfruitful for this particular study. The data it provided had relatively little to do with proving the hypothesis, but was rather just used as a general guide to see how participants perceive their connectedness to nature. What we did find was that females tend to have a higher connection to nature than males by almost 6 point (on a 70 point scale).

This study may have been able to provide some evidence of the restorative effects of nature-based décor on attention fatigue by an increase in cognitive functioning, as well as influence on the negative aspects of mood, but there are several factors that would be recommended for future studies. While the data are in projected direction to support the hypothesis, increasing the number of participants could have improved our chances of detecting statistically significant differences. Nine participants in each condition didn't provide for concrete analyses in either direction of mood or attentional abilities.

It is also possible that the environments didn't elicit strong enough responses on any scale. This may be due to the short amount of time the participant was in each condition, or the number of tasks each participant was asked to complete which may have hindered full submersion in each condition. Participants were asked to complete the Environmental Connectedness to Nature Scale, pre- condition exposure PANAS-X, "Jabberwocky" filler task, and demographics questionnaire at their own pace. The

majority of participants completed this set of tasks/scales fairly rapidly, not allowing for time to establish themselves in their respective condition as long as we would have desired. The set of scales also perhaps created an environment more conducive toward directed attention than desired, as participants were focused on completion of the task at hand.

Future studies may want to consider using a different scale to measure mood, as the PASNAS-X positive mood words aren't necessarily positive words that are associated with the environment or being in nature. More inclusive words that could provide an accurate measurement of a natural environment may include calm, tranquil, serene, etc.

This study did not include any of the qualitative data collected from the "Jabberwocky" task. While the task was primarily to be used as a filler task between the pre- and post- measurements, the data acquired could have implications in the various conditions. This is especially true of the participant's drawings of what they believed the "Jabberwocky" to look like. It would be interesting to see if participants in the nature-based condition would spend more time on their illustrations, or perhaps be more creative. However, this was beyond the scope of this study.

Conclusion

Attention Restoration Theory is a growing field with great implications on human psyche and our continued mental state of health. As humans continue to move into urban environments, it is important to keep in check the vast stimuli we are inundated with. While urban living has provided us many benefits, it has also created new stimuli that place stressors on us that we have not evolved. These stimuli can deplete our attentional resources which can lead to mental fatigue, physical and emotional stress, and other undesirable consequences. These effects can be remedied, at least to an extent, with exposure to environments that are conducive to involuntary attention, helping to replenish depleted

attentional abilities. While natural environments may be the most conducive, it certainly isn't the only environment that assuages these effects.

This study has found that incorporating natural décor may also create a restorative environment. A correlation between nature-based décor and its influence on both mood and attention fatigue has been at least somewhere supported. While neither of these measures had statistical significance in this study, all measures were pointed in the direction of the hypothesis that nature-based décor may replenish directed attentional resources, influencing cognitive abilities and mood. While a simulated nature-based environment may not elicit as strong of a response as an actual natural environment, by bringing nature-based décor into home and office, we can at least in part, create an environment with attentional restorative properties and assuage negative mood factors.

It is important to continue research in this area. Incorporating ecological design, bio-mimicry, and environmental art into our way of existence can have substantial influence on the way we interact with each other and our surroundings. Creating restorative environments in which we live, work, and play can help balance the constant inundation of directed attention depletion from our relatively new-found way of existence.

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