

Evolutionary Tails of the Dis-stressing Response to Nature and Future Research Directions

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Introduction

Empirical knowledge about the relationship between humans and nature is remarkably limited in spite of philosophical and scientific interest (Knopf 1987). Currently, a growing body of research attempts to fill the void by studying nature experiences as a form of leisure. Empirical testing of leisure theory from a psychological perspective illuminates that people engage in leisure activities when they perceive freedom and are intrinsically motivated (Iso Ahola 1999). Self determination theory posits that we have psychological needs of autonomy, competence, and interpersonal relatedness, and that intrinsic motivation is the attempt to fulfill these unmet needs (Deci and Ryan 1985).

Driver, Tinsley and Manfredi (1991) outline in their summaries of the Recreation Experience Preference scales, that people are motivated to spend time in nature by escaping daily pressures, enjoying nature, experiencing tranquility, and being with other people. Montes (1996) states that “research has shown that pursuit of these restorative, or re-creative, benefits is a primary motivator for many people to select natural environments as places for their leisure” (p.109). Two perspectives of nature restoration dominate the literature, Kaplan and Kaplan’s (1989) attention restoration theory and Ulrich’s (1981) psychophysiological stress reduction framework. The purpose of this paper is to outline and critically analyze current research in both perspectives, and make recommendations for future research.

Review of literature

Current research on nature as restorer reveals that nature positively influences physiological measures, such as blood pressure and heart rate (Ulrich, Simons, Losito, Fiorito, Miles, and Zelson 1991; Orsega, Smith, Mowen, Payne and Godbey 2004; Hull and Michael 1995), and that nature pictures have a more pronounced effect on physiology than urban pictures (Ulrich 1981; Ulrich, Simons, Losito, Fiorito, Miles and Zelson 1991). Exposure to natural contexts increases positive emotions, decreases negative emotions (Morita et al. 2007), increases our ability to pay attention (Hartig, Evans, Jamer, Davis, and Garling 2003; Taylor, Kuo and Sullivan 2001) and decreases psychological stress (Wells and Evans 2003).

Much research in nature as stress alleviation relies on a psychophysiological perspective of stress. This perspective outlines that stress appraisal is individual, meaning that potential stressors are not perceived as stressful by every person, nor are the same potential stressors perceived as stressful every time by the same person. As well, stress is measurable by indicators such as heart rate and blood pressure. From this perspective, stressors are not viewed as life events, but as hassles: “Hassles are the irritating, frustrating, distressing demands that to some degree characterize everyday transactions with the environment” (Kanner, Coyne, Schaefer and Lazerus 1981, 3). They include such incidences as stubbing your toe, locking your keys in the car and being late for work. Hassles are more likely than life events, for example, the death of a loved one, to affect health (Kanner, Coyne, Schaefer and Lazerus 1981).

Attention Restoration Theory (ART) was developed by Steven and Rachel Kaplan (1989) and it refers to nature’s innate capacity to restore our ability to pay attention. The Kaplan’s propose that human beings have two types of attention: direct and indirect. Direct attention is when we deliberately and intensely focus on something – it is deep concentration. It is susceptible to fatigue that is not necessarily related to needing sleep. The result of an incapacity to engage in direct attention is inability to concentrate (Kaplan & Kaplan 1989), irritability (Kaplan & Kaplan 1989), impaired perception (Kaplan 1995), inability to self

discipline (Taylor, Kuo, and Sullivan 2002), and, as some researchers propose, it can lead to violence and aggression (Kuo and Sullivan 2001; Sullivan and Kuo 1996). Attention Restoration Theory proposes that nature is able to restore direct attention (Kaplan 1995) via fascination, or indirect attention, which is spontaneous and effortless.

It is an ongoing debate as to whether the experience of attention depletion causes stress or stress causes attention depletion, or whether or not they are even the same process, as “some researchers have discussed attention fatigue as an after-effect of stress and others have treated it as a condition that increases susceptibility to stress” (Hartig et al. 2003, 110). As such, many current studies measure both stress alleviation and attention restoration. In addition, research on nature as restorer recognizes that, although it is uncertain the exact cause and effect process, mood, emotion, physiology, and attention affect stress and are caused by stress. Most studies, therefore, measure the changes of one or more of the following throughout the nature experience: mood, cognition of emotion, physiology and attention, through such constructs as Thayer’s mood scale, Zuckerman’s Inventory of Personal Reactions or Feelings (ZIPRS) scale, and the Necker Cube (a measure of attention).

Issues In Current Research

In order to enact a sound research project that is based on current research, several issues need to be discussed and resolved. To begin with, Knopf (1987) states that there are two main types of human-nature relationship philosophies. The evolutionary perspective outlines that we are innately drawn to nature because our human ancestors were so reliant on this relationship. Learned preference posits that we learn to enjoy nature through repeated experience.

The problem with Kaplan & Kaplan’s (1989) ART is its evolutionary roots. This is not a issue in and of itself, but when it is assumed that each person perceives the natural environment in the same way, there is a cultural bias at play. Implicit in much current research are these same evolutionary assumptions of nature as not threatening, and a universal preference for Savanna type settings (Kaplan and Kaplan 1989) where the landscape is “open and spacious...punctuated by scattered treelike vegetation” (Knopf 1987, 805).

Viriden and Walker’s (1999) research, however, reveals that preferences for natural spaces differ among African Americans, Caucasians, and Hispanics, as well as between women and men. Whites considered forests safer than Black and Hispanic participants who perceived wilderness as more threatening. As well, men preferred areas with few other users, while women preferred a place to be with close friends/family.

A learned perspective contends that a relationship with nature depends on previous personal experience and cultural import (Knopf 1987), and that these influences can have both positive and negative impacts on individuals. It is, therefore, important to include diverse peoples in future studies as well as measure the affective meaning that people have for the natural environment we wish to study. By using a National Park as a place to find participants, researchers can gain access to participants that are already in their favoured setting, as “most [people] have specific, favorite places to recreate and that they return to them repeatedly” (Knopf 1987, 807). It is still important, however, to measure affective meaning and preference for nature spaces as many individuals go to natural places to meet their needs of interpersonal relatedness through socialization and may not necessarily prefer the particular nature context that they are in.

Some previous research on nature as restoration, particularly Ulrich’s work, involves looking at pictures or videos of natural scenes in order to measure responses (Kaplan and Kaplan 1989; Ulrich 1981; Ulrich et al. 1991). These types of experiments may be relying on romantic notions of nature, and not necessarily authentic experience, as “notoriously missing, for example, are the biting insects, the bothersome winds, the repertoire of negative experiences

people associate with known environments, and other unattractive features” (Knopf 1987, 789). It is therefore important that future research take place in a natural context. As well, various authors are calling for multiphasic research in leisure settings, whereby experience is recognized as a dynamic and fluctuating interplay of a variety of factors (Stewart 1998; Schneider and Iwasaki 2003).

Another important issue to consider is whether the natural environment causes these restorative benefits or whether it is the leisure experience itself. In other words, does going for a run or spending time contemplating life have the same benefits whether it occurs in a natural or urban context? Some research has been unable to clarify this position (Hull, Micheal, Walker, and Roggenbuck 1996; Hull and Michael 1995), while some research shows evidence of nature as more restorative than urban contexts (Hartig, Evans, Jamer, Davis, and Garling 2003).

As well, is nature a buffer or moderator (Wells and Evans 2003), in that it does not directly influence stress? For example, do green spaces near apartment buildings allow space for people to congregate and therefore increase community ties, which then reduce stress (Kuo and Sullivan 1996)? This is an important implication for several reasons. One, as has already been discussed, women may prefer to experience natural settings with friends or family (Virden and Walker 1999). As well, many individuals state that one of their main motivations for wilderness experiences is for socializing (Driver, Tinsley and Manfreda 1991; Knopf 1987). Studies that segregate people from one another may inadvertently change the nature preferences of the participants.

Various authors are calling for more research from a psychophysiological stress perspective (Ulrich, Dimberg and Driver 1991; Ulrich 1991). Because the technology to measure heart rate and blood pressure continuously and immediately is high quality and low to minimally invasive, as well as the immediacy of the physiological stress response (Hartig et al. 2003), the researcher is able to get a real time reading of perceived stressors that can be downloaded onto a computer.

In Table One, I outline the research on nature as restorer as it pertains to the issues illuminated in order to give a succinct and critical impression of the current body of literature. The Table is organized by answering the following questions: What is the nature philosophy of the researcher’s (Evolutionary or Learned Preference)? Does the study take place in a dynamic context? How does the researcher define stress? What measurement tools do they use in their study? Are the participants active or passive or is there a control group? Who are the participants and is there an effort to include diverse peoples?

Table 1.1. A Summary of Research in Nature as Stress Alleviation

<u>Author</u>	<u>Nature Philosophy</u>	<u>Nature Interaction</u>	<u>Definition of Stress</u>	<u>Measurements</u>	<u>Time spent as Passive or Active</u>	<u>Participants</u>	<u>Social effect?</u>
Ors ega	Evoluti onary	Immersion	Psychophysiological	BMI, waist to hip ratio, blood pressure, heart rate,	Both	100 Older Adults 50 – 86 66%	Not contro lled

				perceived mental health, perceived physical health, perceived park benefits, daily stress inventory		female 99% white	
Wells	Evolutionary	Immersion	Environmental	Lewis stressful life events scale, Rutter child behaviour questionnaire, Global self-worth scale	Not regulated	337 Children 6-12 49% girls 95% white 3% Black	Not controlled
Hartig	Evolutionary	Immersion / through a window	Psychophysiological	Blood pressure, ZIPERS, Overall happiness scale Necker cube	Both	112 college students 50% female Ethnicity not stated	Controlled
Hull	Evolutionary	Immersion /Indoor	Psychological	Thayer's mood scale	Not regulated	108 College students 55% women Ethnicity not stated	Not Controlled
Ulrich (1981)	Evolutionary	Lab	Psychophysiological	Alpha amplitude, heart rate EKG, ZIPRS	Passive	9 men, 9 women Ethnicity not stated	Alone

Ulrich (1991)	Evolutionary	Lab	Psychophysiological	Electrocardiogram Pulse transit time, Spontaneous skin conductance, Frontalis muscle tension, ZIPRS	Passive	120 college students 50% women Ethnicity not stated	Alone
Morita (2007)	Learned Preference	Immersion	Psychological	Multiple mood scale, State-Trait anxiety inventory A-State Scale	Active	541 Japanese 51% women	Not Controlled

Data Collection, Analysis and Potential Results

My proposed study will address the multiphasic experience of nature as well as the need to obtain data from various ethnic groups and both genders. The study will control for active leisure, social aspects, and ensure that participants have positive affect and preference for the park space in the study. The study will take place in a dynamic nature context and use Polar Heart Rate monitors and an AMG Physio Logic wrist blood pressure monitor that uses non-invasive oscillometric techniques to measure blood pressure. Heart rate and blood pressure will be used as a reflection of physiological state because of the relative ease of using the technology in a dynamic environment, the ease of training researchers in their use as well as the ease of understanding the data they produce. Emotion will be measured via ZIPRS (Zuckerman 1977) to recognize emotion's pre-emptive and circular role in stress (Cohen, Kessler and Gordan 1997), and the Necker Cube will be used to measure direct attention. My research questions for this proposed study are as follows: 1) Do people of various ethnic backgrounds and both genders experience lowered blood pressure and heart rate in natural environments? 2) Do people of various ethnic backgrounds and both genders experience reduced stress after exposure to natural environments? 3) Do people of various ethnic backgrounds and both genders experience increased attention after time in nature?

This study will be through a post-positivist lens. Fifty participants will be solicited via purposive sampling to provide an ethnically diverse sample. Five researchers will approach individuals who arrive at Elk Island Park during a Sunday in July, because this is the busiest season with approximately 1010 cars and 2485 people coming to the park via all three entrances (Personal communication 2007). Although the Park does not have specific statistics at this time, there are many more new Canadians visiting the park from a variety of ethnic backgrounds than ever before (Personal communication 2007). Individuals from a variety of visible minority groups will be approached in order to obtain volunteers. This method would ensure that

individuals who participate in the study already have a potential affinity for the Park as a restorative space. As well, wilderness preference and affective meaning will be measured according to bipolar scales (i.e. a place to share experience with others...a place to be by myself and reflect; mysterious...unmysterious).

The researcher will first place the Heart Rate and Blood Pressure monitors on participants in order to begin obtaining baseline measures. Heart Rate will be monitored continuously through a chest band and blood pressure will be measured at five-minute intervals through a wrist-watch measure. ZIPRS (Zuckerman 1977) will be filled out, a Likert type scale of one to five commonly used in nature/stress studies (Hartig et. al. 2003; Ulrich 1991) that measures such items as fear, arousal, sadness, anger, aggression, and positive affect. A Necker Cube baseline will be given at this time (for an explanation of the Necker Cube, see Appendix A). Twenty-five participants will be asked to self select a site and spend one hour in passive solo leisure. Because Hull and Michael (1995) discovered that the average time people spent in the park of their own free volition was 85 minutes, this study will be one hour. A control group of twenty-five participants will be asked to spend the hour as they normally would, and to inform the researcher of their activities and whether they spent the time alone, with friends or exercising. Because of previous multiphasic research that indicates a decrease in mood at the close of a multiphasic experience (McIntyre and Roggenbuck 1988), the participants will be asked to fill out ZIPRS again when their watch beeps, which will happen once at a random time throughout the hour. The Necker Cube will be given again at the end of the hour.

I would analyze the data produced by doing a Stepwise Regression Analysis on SPSS with the variables on setting preference, affective meaning, ZIPRS, and change in Necker Cube results to determine which had the most affect on the dependent variables heart rate and blood pressure. This will determine if stress reduction was experienced. In particular, I would analyze for gender and ethnicity variations or consistencies. As well, I would analyze the patterns of heart rate and blood-pressure themselves in order to discover any significant fluctuations in the experience as well as the Necker Cube itself to see if attention increased.

Practical Implications

Research that includes the voices of minorities or marginalized individuals is important to theory and scales development, generalizability of research, and to practitioners. Government organizations such as Elk Island National Park would benefit from information about psychophysiological experiences in nature (Driver, Tinsley and Manfredro 1991). For example, if the researcher can disseminate concluding results, it may be a useful marketing tool to use the restorative properties of the Park in order to meet the Parks Canada Mandate “to engage the hearts and minds of Canadians and compel them to embrace their natural and cultural heritage” (Parks Canada) and appeal to the larger Edmonton population. A marketing strategy that included the far reaching health benefits of nature, such as reducing hostility and depression, which are factors for cardiac heart disease (Morita et al. 2007) would be a potentially fruitful avenue to pursue. This tactic would gain more visitors and would be beneficial as staff at Elk Island feel that the Park has not yet reached maximum capacity for visitor use (Personal communication 2007).

People visiting nature to alleviate stress becomes important when we consider the statement that “an estimated 75% of all visits to primary care physicians are for stress-related complaints and disorders” (Orsega-Smith, Mowen, Payne and Godbey 2004, 232). If concrete scientific proof can be offered about what benefits surround nature/human transactions and simple instructions as to how to cultivate this relationship (ie. how much time, types of activities, what type of nature, etc.) then doctors can educate patients and the result will be reduced economic strain of the health care system. In Morita et al.’s (2007) study, it is mentioned that Shinrin-yoku (walking and/or staying in forests to maintain health), was slowly

embraced beginning the 80's via educating the Japanese people. Although Japanese culture may be unequivocal, Alberta Health currently tries to educate the public on issues like smoking and violence through television ads, and a "nature as stress reducing" campaign would be of interest in an overburdened and under funded health care system.

The problem with targeting doctors to disseminate nature restoration practices, however, is that physicians in Western society are not trained nor paid to practice preventatively (Montes 1996), nor are practices that have long term benefits an easy sell for a culture that relies on quick and short term solutions (Montes 1996). In essence "the mitigation of this environmental crisis may necessitate nothing less than a fundamental shift in human consciousness" (Kellert 1993, 26). This dilemma may seem impossible to resolve; however, Knopf (1987) offers us hope for resolution: "As stress levels within a culture escalate, so does the significance attached to natural environments as places of solace" (p.787).

Conclusion

Research indicates that nature experiences are important for humans, although the motivations for such participation may vary across gender, culture and individuals. Potential common motivational threads are escaping daily pressures and experiencing tranquility, situations that can be attributed to the restorative function of nature as stress alleviation. To further current research, data from individuals of various ethnic backgrounds and both genders needs to be examined in order to increase the validity of current scales and expand the theory in order to be inclusive, generalizable, and applicable to practice.

This paper attempted to promote inclusiveness by including individuals of various ethnic backgrounds and both genders in order to advance understanding of the nature/stress relationship. It also attempted to push the quantitative stress research further by controlling for active leisure and social aspects, and include measures of positive affect and nature preference, in order to ensure that participants have a fondness for the natural space they occupied. Stated practical implications of this research include health benefits with the potential to reduce impact on an overburdened health care system.

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Appendix A: The Necker Cube Test

Participants are first familiarized with the properties of the Necker Cube (see above). It is possible to manipulate the appearance of the cube by mentally viewing the dotted parts of the 3-D object as either the front or the back part of the cube. Once this is understood, the participant is given a second picture (see below) and told to prevent the image from changing. Every time the picture switches, participants indicate by raising their hand. The goal is to have as few switches as possible. This test measures direct attention.

