

When the Nature of 'Nature' is Inconsistent:

Evaluating the Natural Environment in Attention Restoration Theory

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Abstract

The Attention Restoration Theory (ART; Kaplan & Kaplan, 1989) postulates that exposure to nature can help improve cognitive processes, specifically attentional control. These benefits are hypothesized to help with concentration and focus. However, there is tremendous variability in the definitions and manipulations of nature in research on ART. This complicates extrapolation from the results and makes it harder to see if nature itself is the restorative component or rather some other facet. This review evaluates randomized controlled trials studying the ART from 2013-2018 and catalogues differences in how nature was operationalized across studies. The paper presents suggestions for more methodologically consistent ART research, including direct replications, and an updated scale for measuring the restorativeness of an environment.

Keywords: Attention restoration theory, attention, nature, review, measurement

When the Nature of ‘Nature’ is Inconsistent: Evaluating the Natural Environment in Attention
Restoration Theory

“To sit in the shade on a fine day, and look upon verdure, is the most perfect refreshment.” (Austen, 1814).

Jane Austen is not alone in writing about the rejuvenative power of nature. One hundred and seventy-five years later, Kaplan and Kaplan set out to scientifically test this idea. The Attention Restoration Theory (Kaplan & Kaplan, 1989) describes how nature can be restorative, but much of the research on the theory does not clearly explain the methodological choice behind nature selection.

Attention Restoration Theory

The ART postulates that there is a psychological component to spending time in nature—something about nature itself is beneficial for mental health and cognitive processes and allows people to focus better. The ART describes two opponent processes of attention, partially based on William James’s definitions of attention (James, 1892)—directed attention and involuntary attention. In order to focus, even on things that are enjoyable, extraneous stimuli need to be filtered out (Kaplan & Kaplan, 1989). The process of filtering extraneous stimuli requires directed attention resources. There is a zero sum quality to the two kinds of attention – using more resources to filter out sources of involuntary attention means less resources for directed attention (Kaplan & Kaplan, 1989). Fatigue and difficulty focusing arise if this limited cognitive resource is overused. For example, reading a book requires directed attention on the words and concepts. Irrelevant distractions (or even relevant ones) such as sounds in the environment, advertisements, or even tables and images within a text make such directed

attention more difficult. This process of filtering takes effort and, over time, it becomes harder to block out irrelevant stimuli. An assumption of the ART is that in settings that completely trigger involuntary attention and do not require effortful fixation (such as nature), our mental processes for directing attention could rest and recuperate. Kaplan and Kaplan (1989) suggest four requirements for an environment to be considered restorative, and nature often fulfills all four of these characteristics: *being away* (the setting is perceived to be separated from daily stressors), *fascination* (the ability of an environment to capture attention without effort), *extent* (the environment is rich and coherent enough to simulate a whole other world), and *compatibility* (the ability of an environment to fit the goals and desires of a person).

One of the earliest experimental links between nature and psychological well-being presented “mildly stressed” participants pictures of natural or built environments to measure changes in mood or anxiety (Ulrich, 1979). Ulrich found that when participants were shown pictures of nature, they had increased feelings of affection, friendliness, playfulness, and elation. He interpreted these results as evidence that landscapes that included nature had positive impacts on affect and advocated for future research looking at environmental design in places such as hospitals, schools, and places of work. This study became part of the theoretical background for the ART development.

In addition to lab-based studies like Ulrich (1979), evidence exists for nature’s benefits in real-world settings. In a quasi-experiment for the U.S. Forest Service about the impact of nearby nature on job stress for employees (Kaplan et al., 1988), researchers found that individuals who had nature views from where they worked tended to have higher job satisfaction and lower work stress, showing that nature acted as a restorative environment during the work day.

In addition to the cognitive benefits of nature, early research that provided the basis for the ART also showed beneficial outcomes of nature for physical ailments in hospital settings (Ulrich, 1984). This study retrospectively examined recovery rates in patients who underwent the same surgery at the same hospital over 10 years and were matched for a variety of qualities. The only difference between the patients was whether their windows in the hospital looked out onto a tree or a brick wall. The patients who had a tree in their view recovered significantly faster, had lower self-reported pain ratings, and asked for less pain medication. This paper was one of the first studies that suggested a link between nature and physical health, and while Ulrich stated that more research needed to be done to tease apart the link between nature and faster recovery rates, he suggested that the results may have been attributable to a lack of boredom for the patients who had a tree view.

These early studies on the ART have inspired much subsequent research. A recent systematic review identified 66 studies published between 1989 and 2017, which show the range of applications for the theory (Stevenson et al., 2018). A 1991 study (Hartig et al., 1991) examined self-report data of mood and cognitive performances, as well as physiological measures for participants in two studies. The participants in one study either took a wilderness backpacking vacation, a non-environmental vacation, or continued with their daily habits; while participants in the second study took either a nature walk, urban walk, or completed a relaxation session. In both experiments, the researchers noted greater restorative effects in the nature conditions. In a different study assessing the ART, Friedman and colleagues (2008) installed large television displays of real-time outside nature in offices of different faculty and staff at a university for 16 weeks. Based on participant self-reports, they found that the images improved

cognitive functioning and psychological well-being, as well as increased connection to the wider community.

Purpose of this paper

One notable feature of the ART literature is variability in how nature is methodologically implemented. Studies may have participants walk through nature (Bratman et al., 2015), see natural images (Chow & Lau, 2015), watch videos of nature scenes (Pilotti et al., 2015), or even listen to white noise that they are told is from nature (Haga et al., 2016). Two systematic reviews have examined the different outcome measures of attention in ART research (Ohly et al., 2016; Stevenson et al., 2018), but no studies to date have assessed the different ways that nature has been defined and operationalized in such studies. This paper examines how nature has been operationalized in studies on the ART, and argues that the differences make it difficult to draw conclusions across studies. The literature review evaluates 1) the duration and type of nature; 2) whether the nature conditions include water; 3) whether the control condition included nature; and 4) validation of the natural constructs in previous literature. Different choices on these dimensions may produce non-comparable results. I will argue for the need for more varied research on the ART and more consistency and clarity in experimental practices in this area. I will conclude with suggestions for ways to validate the construct of nature.

Heterogeneity in ART Research: What is a Restorative Environment?

The ART states that exposure to nature might lead to better cognitive abilities, mainly because nature can help replenish a specific limited cognitive resource, directed attention. When it was originally published, Kaplan and Kaplan used terminology that was not clearly defined, such as “soft attention,” “extension,” and “compatibility.” These terms still have not been

explicitly operationalized, which makes it difficult to study the ART to determine what makes an environment restorative.

Outcome Measures

Within the literature on the ART, there is tremendous variability in how “attention” and “directed attention” are operationalized and measured. A 2018 systematic review (Stevenson et al., 2018) of recent ART literature found 49 different measures for “attention” in studies published between 2013 and 2018. They found that certain cognitive abilities were restored by natural environments more than other cognitive abilities, such as working memory and cognitive flexibility, among others. The researchers concluded that in order for conclusions to be drawn from ART research, there needed to be a more “homogeneous” set of experiments that could be synthesized, with less variability in measurement (for more on inconsistency in measurement and how that affects conclusions drawn from research, see Flake & Fried, 2019). Both this review and a previous one (Ohly et al., 2016) pointed out important inconsistencies within the literature. For instance, in all of the studies surrounding working memory as a measure of listening effort, effect sizes (a measure of the magnitude of difference) ranged from -0.39 to +.54 with an average of +.16, indicating that some studies found that nature exposure did result in improved attention as measured by working memory, while others did not (Stevenson et al., 2018).

Inconsistency in Manipulation in ART

One of the major problems in the field of psychology is the lack of standards within many subfields for how manipulations should be conducted and whether manipulation checks, which attempt to determine if the manipulation affects what it intends to, are required. Uncertainty about whether a manipulation influences what it intends to measure makes it more difficult to

draw conclusions (Chester & Lasko, 2019). These problems are also present in research on Attention Restoration.

A 2019 paper on the ART discusses how this lack of clear definitions makes it difficult to compare results from the literature (Neilson et al., 2019). The authors focus on the term “soft fascination,” which they define as the ability of something to capture attention, but not dramatically. They contend that the vagueness of the definition makes it easier for researchers to construct new manipulation or measurement on the fly, without requiring testing for validity or reliability. They find little research to support the idea that nature innately holds attention.

However, researchers in this environmental psychology subfield have not paid much attention to the different constructs of nature used and the implications of this for conclusions. Researchers in the ART literature have defined the “nature” factor in a host of different ways: self-reported personal experience, exposure to pictures or videos of forms of nature, exposure to “nature” sounds, placement within an actual “natural” environment, or a combination of the above. The nature of “nature” is not consistent: it may or may not have water, for example. Yet the researchers term all of this “nature.” As a result, it is unclear if the studies evoke the same intended consequences.

Duration and Type of Nature

The remaining subsections of the paper analyze 37 papers published between 2013 and 2018 that were randomized controlled trials measuring the effects of nature on attention. The 37 papers were selected from Stevenson et al.’s 2018 meta-analysis of ART scholarship, which provides a detailed description of study selection and discusses differences in how the studies

operationalized attention. Figure 1, developed for this paper, visually depicts the variability in how nature was experimentally implemented.

Of the 37 studies, 16 used pictures of nature as the method of presentation. The pictures were shown to participants for varying lengths of time: from 40 seconds (Lee et al., 2015) to 350 seconds total (Emfield & Neider, 2014; Gamble et al., 2014; Jung et al., 2017). These studies generally had similar methods. For instance, Emfield and Neider first had participants complete a baseline cognitive test battery, then presented them with the experimental manipulation (nature exposure), and then completed an identical post-test cognitive battery for comparison. Some of these studies used sounds in addition to pictures: Emfield and Neider (2014) had a total of seven conditions, in which participants either saw pictures of natural environments or urban environments without sounds, listened to clips of nature or urban sounds without pictures, experienced both the sounds and pictures, or looked at a blank grey screen without sounds for seven minutes.

Thirteen of the papers (see Figure 1) had the participants physically interact with nature (e.g. Bratman et al., 2015; Greenwood & Gatersleben, 2016). The duration lengths ranged from a 15-minute walk or jog (Han, 2017) to an hour and a half of weekly exposure for eight weeks (Johansson et al., 2015). Most of these studies (e.g. Geniole et al., 2016; Zhang et al., 2017) did not have participants complete the tests in nature, but rather used pre- and post-manipulation cognitive tasks to examine whether a natural exposure as compared to an urban exposure resulted in more restoration after the exposure. Since the exact pathways for how nature causes restoration are not yet known, these differing exposures could cause restoration in different ways.

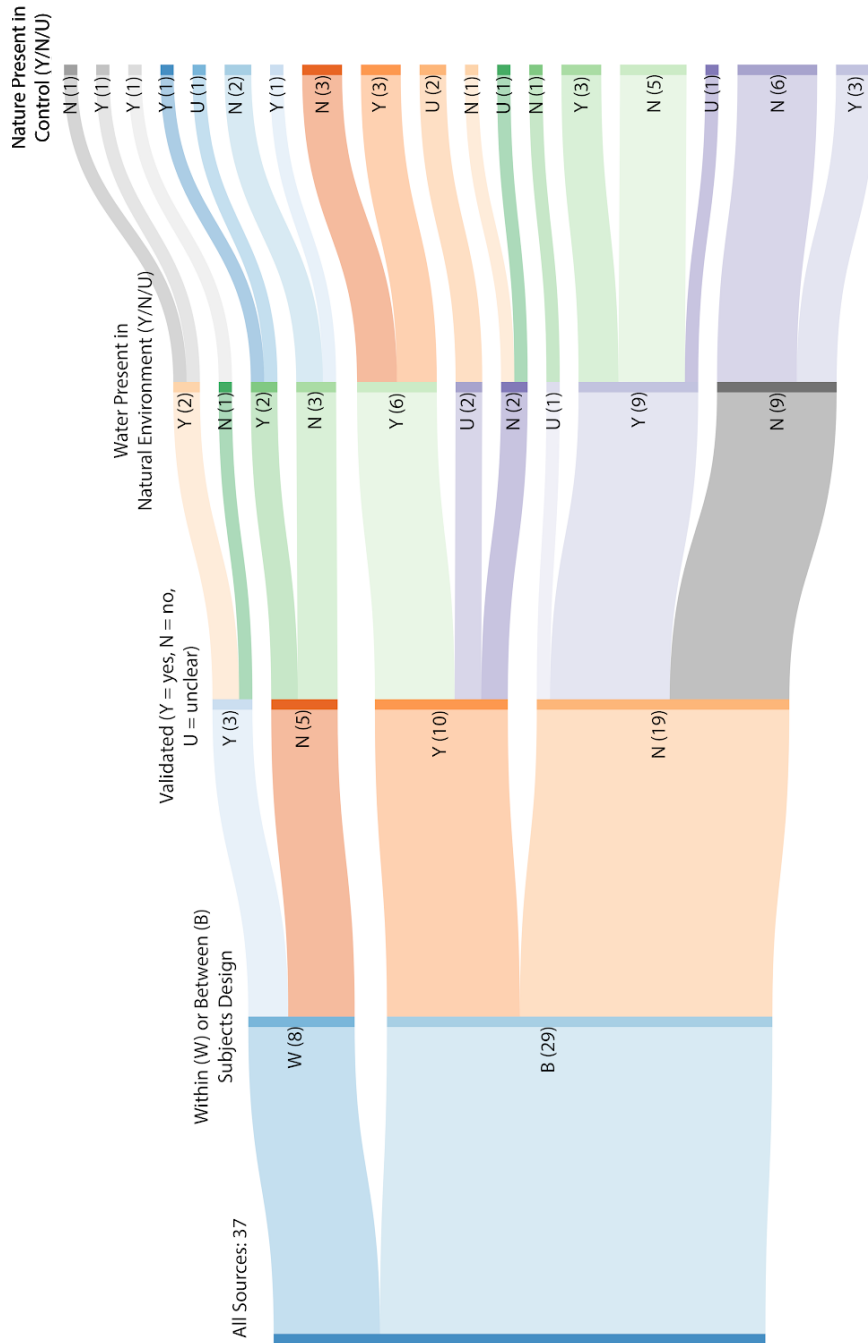


Figure 1. Read left to right, the 37 sources are divided by whether they were within- or between-subjects, then divided by whether they were validated, and so forth.

Four of the papers used videos of nature as opposed to physical exposure or pictures (e.g. Wang et al., 2016; Wang et al., 2018). These videos ranged from one minute long (Jenkin et al., 2018) to 15 minutes long (Pilotti et al., 2015), and also used pre- and post-manipulation

cognitive tasks. Some of the experiments, such as Pilotti et al. (2015), followed up with participants long-term to assess whether they remembered the experimental setting and procedure. While videos are more immersive than pictures, they are not as immersive as being in nature. This could cause differing levels of restorativeness.

Three of the studies had participants complete the stressor task while having a view of nature (Evensen et al., 2015; Li & Sullivan, 2016; Studente et al., 2016). In these experiments, participants were instructed to complete some sort of cognitive task with a window view of nature. The length of these experiments ranged from 5 minutes (Studente et al., 2016) to 45 minutes (Li & Sullivan, 2016). The research is conflicting on whether shorter exposure lengths produce the same restorative effect. There has been some research that indicates that it takes around 30-50 minutes for the ART to actually activate (Hartig, 2007). Other research (Lee et al., 2015) seems to indicate that 40 seconds of nature exposure can result in better cognitive functioning. However, having people conduct the cognitive tests while in nature means that nature may be acting as more of a buffer for not inducing cognitive fatigue as quickly, as opposed to the postulated rejuvenating qualities in already fatigued people.

One study seems to indicate that manipulating expectations of nature may be sufficient, even if a natural stimulus is not actually presented. The study used white/pink noise as a placeholder for the sounds of nature and told participants that the sound either came from a waterfall, a street, or did not indicate where the sound came from (Haga et al., 2016). In this study, Haga and colleagues attempted to tease apart the hypothesis that there are not specific components of nature that are restorative, but it is rather the associations we have with nature. For instance, an urban setting would be non-restorative because there may not be as many

positive associations with it, but rather stressful associations. This was supported by previous research (Bergman et al., 2008) that showed that sounds associated with factories were generally preferred less than sounds associated with nature, even if they were the same sound. This top-down processing theory does not refute that nature is beneficial for attention and cognition, but rather argues that the process by which the restoration happens can be due to the associations made rather than an innate or evolutionary feature.

Thus, although there is a large body of research on the ART, there is relatively little consistency in how this research is conducted. Figure 1 shows how variable the body of literature can become when all of the differences are catalogued. Even in studies that use the same manipulation of nature, there is still little consistency in what outcome measures they use—for instance, two studies that used the same materials used either the Attention Network Task and Digit Span (Gamble et al., 2014) or the Navon Global-Local Task (Lobo et al., 2015).

Water in the Composition of Nature

One major distinction between the different types of nature in the studies examined in this paper is that certain natural environments include water while others do not. Multiple papers indicate that environments that include views of water are more restorative than environments that do not include views of water (Felsten, 2009; Purcell et al., 2001). The biophilia hypothesis, which states that humans are genetically predisposed to seek out nature, may partially explain why natural environments that include water are perceived as more restorative: since water is essential for survival, being hardwired to seek it out is evolutionarily beneficial (Ulrich, 1993).

To assess the rates at which water was included in each of the 37 studies, I evaluated each paper and noted whether water was included in the experimental condition. Based on this

evaluation, 19 included water in their natural environment (e.g. Lymeus et al., 2017; van Rompay & Jol, 2016), 15 did not include water (e.g. Lin et al., 2014; Tanaka et al., 2013), and the presence of water could not be determined for three studies (Gamble et al., 2014; Wang et al., 2018; Zhang et al., 2017). These differences make it difficult to interpret the results. If part of the variability is driven by whether water is present or not in the environment, then the extent to which certain environments are restorative could be increased or decreased by this variable.

Was Nature Present in the Control?

Another important consideration is whether a nature factor was present in the control condition. Many studies have found that even small amounts of nature exposure, for example to pictures of nature or plants in a room, can improve restoration (Berto, 2005). In the 37 studies analyzed for this paper, 19 of them did not have nature in the control condition. However, 12 of the studies did include some sort of nature in the control condition—sometimes a view of a tree or grassy strip in a street. Having nature in the control condition makes it even more difficult to determine the difference between the experimental and control conditions—if a study finds no difference between the experimental and control condition for attention restoration, interpreting the finding is complicated because the control was not a true control. This goes the other way as well—results that do support the attention restoration theory could not show the extent to which nature does affect attention (i.e. the difference between the control and nature condition are stronger).

Summary

As can be seen above, there is a lot of variability in the manipulation of nature—in terms of the duration and type of exposure, whether water was present, or whether nature was present

in the control. It could perhaps be that differences in effect sizes (mentioned above) are attributable to inconsistency in how nature is manipulated or how outcome variables are measured. In addition to the operationalization of nature, another key factor in analyzing the definition of nature is investigating whether the constructs of nature were validated in some way.

Validation of Studies

Examining whether studies have a validation of the nature construct (if the type of nature chosen has been somehow proven to be restorative) can help show whether the manipulation was made “on the fly” (Flake & Fried, 2019), or with prior experimenting. While validation does not necessarily solve other problems with experimental manipulations, it does help with replications of specific constructs. Of the 37 studies analyzed, 24 did not have a validation of their nature construct (e.g. Evensen et al., 2015; Rogerson et al., 2016). Many of these studies used pictures of nature or built environments from the areas around where the experiment was conducted (e.g. Lobo et al., 2015), or had participants walk through built or natural environments nearby (e.g. Schutte et al., 2017; Triguero-Mas et al., 2017). Thus, it is unclear whether or not the specific environments chosen were actually restorative or not. It could be that null results obtained from a certain experiment were not in fact due to the underlying construct of attention restoration not existing, but rather due to the fact that the natural setting of the environment did not actually tap into the restorative effects of nature. On the other hand, a result confirming the ART could be due to a different feature of the environment chosen that does not relate to nature.

Six of the studies validated their stimuli using previous testing by the experimenters – either pilot studies using lab participants (e.g. Wang et al., 2018), or undetermined validations (e.g. Lobo et al., 2015). For instance, one study had 16 pilot participants rate a total of 32

pictures of natural or urban environments on ratings of aesthetic pleasantness and perceived naturalness, and chose sets of pictures that differed based on naturalness but not aesthetic pleasantness (Chow & Lau, 2015). While pilot testing is helpful in determining the validity of a manipulation, not having preregistered and open pilot studies means that arbitrary decisions about how to implement these tests may be left unanswered (Chester & Lasko, 2019). Four of these studies did not give clear explanations for how the pilot studies were completed, or what the full results were.

Two more studies used the materials of Berman et al. (2008). This original study used pictures of nature taken from Nova Scotia or pictures of urban settings from Ann Arbor, Detroit, and Chicago. They also pointed to a study that showed that just viewing pictures of nature could have restorative effects (Berto, 2005). One of the two studies, however, used pictures of urban areas that were taken from around Mumbai (Lobo et al., 2015). Using the materials from previous studies has both benefits and drawbacks. While using Berman et al.'s materials means that the manipulation was not made up on the spot, there is no sense of whether the original study used a validation for the materials to determine whether they did manipulate attention.

One additional study (Rider & Bodner, 2016) also used stimuli validated by previous experimenters (Tennessen & Cimprich, 1995). The original 1995 study used pictures taken from dorm windows of college students and were rated on a four-point scale from all-natural to all-built by six adults. The internal consistency of these ratings was very high ($\alpha = 0.85$), indicating that among the raters, the stimuli used were similarly considered natural or built.

The remaining four studies explicitly tied their validation back to Hartig et al.'s 1996 study validating the Perceived Restorativeness Scale (PRS; Hartig et al., 1996, 1997), which is a

measure that researchers commonly use to determine the restorativeness of an environment. The PRS includes different measures of all four restorative characteristics of an environment: extension, compatibility, being away, and fascination. In the validation of the scale, the authors found the survey to have high validity and reliability.

While validation is a useful step in operationalizing a variable, there are some concerns about how well the PRS actually measures restorative environments. The original validating study used a factor analysis to see how the different questions that made up the survey loaded on different features of attention restoration. Factor analyses analyze all data available for a particular survey to see how well the questions relate to each other. While they can be used to determine the reliability of parts of a scale, they do not necessarily say anything about the validity of it. In the end, three of the features of the attention restoration effect (being away, fascination, and compatibility) all loaded onto the same factor, creating a two-factor model for the data. The researchers did not perceive this as a weakness of the scale—rather, they argued that certain ART characteristics (such as fascination) imply another characteristic (such as being away). A follow-up validation done to further alter and validate the PRS (Hartig et al., 1997) created a new survey that resulted in the proper four-factor model that the ART originally postulated. However, the studies that used the PRS cited the 1996 validation, indicating that they may have used the older version of the survey. Since the actual scale was updated, it is hard to determine whether the natural environments were the best options for manipulation.

Although the factor analysis for the updated PRS loaded on four characteristics that matched the theory, the factor analysis cannot reveal whether there are other components not represented by the factor analysis that have an effect on restoration. That is, the survey does not

include questions about how other possible factors (such as vitamin D or the presence of water) could be driving the attention restoration. The validation is not a comprehensive evaluation of everything that ART is not: the scale and factor analysis support the theory because they were made to support the theory, but they do not tell us about the psychological reality of how nature affects attention. The theory and the factor structure are internally consistent, but that is not evidence that they actually represent the construct in the wild. Factor analyses can show how items on an existing scale fit together, but they cannot reveal any important missing components from the scale—not just for the ART, but for other constructs as well.

Does Exposure to Nature Restore Attention?

From this review of the literature and the different definitions of attention, it is currently unclear whether exposure to nature restores attention in all scenarios, or if there are instead specific features of certain natural environments that are not specific to nature, that cause this restoration. For instance, there is some research that non-natural environments can also cause restoration: such as places of worship for spiritual people, or art museums for people who enjoy art (Herzog et al., 2010; Kaplan et al., 1993).

Another challenge with the ART literature is that ART research is often confused with Stress Reduction Theory (SRT) research. While the ART claims that exposure to nature improves cognitive processes and attention, Stress Reduction Theory (SRT, Ulrich et al., 1991) proposes that such exposure also reduces stress. There has been much research focusing on nature exposure and autonomic nervous system activation, supporting the SRT. Children who had more access to nature deal with psychological trauma better (Wells & Evans, 2003). They found that nature acted as a buffer for psychological distress from stressful life events: the results

of this study indicate that having more access to nature reduced the impact of life stress. In a similar study examining SRT, van den Berg and colleagues (2015) showed that pictures of nature as opposed to built spaces decreased sympathetic nervous system activation after a stressful task. The participants who were shown pictures of natural environments had a more rapid parasympathetic nervous system activation after the stressor – indicating that the stress response was shorter in this condition. Additionally, Yeager et al. (2018) found a link between residential greenness and cardiovascular disease risk: using GIS data to measure the amount of green space by people’s houses, the researchers found that there was reduced sympathetic nervous system activation, oxidative stress, and heightened blood vessel creation capacity (which are all linked to cardiovascular disease risk) in people who had more green space near their house.

While the SRT provides more evidence for nature’s positive affect on mental health and cognitive processes, there are distinctions between it and the ART—namely stress reduction versus attention restoration. SRT and ART are often equated in the literature, and many of the same studies provide some of the theoretical basis for both theories, with studies looking at “attention and stress” together, as opposed to splitting them up to examine each theory separately. However, since the processes by which the two theories act are unknown, they should be studied separately. ART and SRT are theoretically and methodologically distinct but the environmental psychology literature sometimes equates or confounds them.

Recommendations for Future Work

Within the ART literature, there is tremendous variability: in outcome measures, manipulations, and validation, and research also conflates the ART with the SRT. Major differences in the manipulations include the duration and type of nature, whether water was

included in the nature condition, and whether the control condition also included an aspect of nature. These differences make it difficult to extrapolate from the existing literature. There are many recommendations to help resolve some of this variability. The first is that there should be more direct replications of ART papers, especially seminal ones that theory is based on. Based on my review of the literature, I found no direct replications. While heterogeneity in research helps determine how results might extrapolate in different situations, it is also important to make sure that seminal studies actually show what they are supposed to.

Additionally, in line with recommendations by Chester and Lasko (2019), the ART literature would benefit from increased transparency in nature operationalization and manipulation. There should be clear validation of the manipulations, and manipulation checks should be employed to determine how nature is influencing attention (Chester & Lasko, 2019). This increased transparency in methodology and consistency in manipulation will help determine exactly what factors of nature are restorative.

The ART literature would also benefit from an updated scale for validation. While the PRS does include the different factors that the ART theory postulated as important for restoration, it does not explain why art museums can be considered restorative. Determining what factors actually make a setting restorative will increase the understanding of the theory and pave the way for future research.

In tandem with more validation of the scale, the populations involved in ART research should be expanded. Most studies are conducted on “WEIRD” populations (Western, educated, industrialized, rich, and democratic; see Henrich et al., 2010 for a short discussion on WEIRD populations in psychological research) and use a Western-centric view of nature. In order for

nature's effect on attention to be fully understood, research should also include non-WEIRD populations and potentially other definitions of nature, as people experience nature differently based on background. The PRS's samples were largely composed of "WEIRD" participants (Hartig et al., 1996, 1997). The experiments that they used to validate the scale were from the United States, Finland, and Sweden. This has problems for validity, as it might be that certain environments are restorative for certain populations but not others. Personal experiences with nature differ vastly from person to person and across cultures. For instance, someone who grew up in a desert environment may find deserts to be restorative, while someone who grew up in a lush green forest may find similar environments to be more restorative. This distinction supports the argument that nature's restorative effect is due to the associations that people have developed with "nature." While examining this potential theory is not the purpose of my paper, it is important to note that it may have consequences for the validity of scale creation, especially if the group studied is not a representative sample of the population.

It should be noted that there is some evidence that the types of natural environments that people enjoy looking at are relatively stable across cultures. In a 1997 book that included surveys from the United States, China, Kenya, Russia, and five other countries, the types of paintings that people preferred were remarkably similar: they were all natural scenes involving water, and often included trees or mountains (Komar & Melamid, 1999). While these surveys were specifically asking about art as opposed to attention restoration, they may provide a first step into determining how different natural environments affect different people.

There are many real-world applications of the Attention Restoration theory—including in design of buildings, parks, and cities to reduce the attentional stress on people. However, the

field would benefit from more consistency and transparency in methodology. This problem is not specific to the ART research, but a widespread issue in psychology—a recent study showed that out of 100 replicated papers, only around a third produced the same results with similar effect sizes (Open Science Collaboration, 2015). If the purpose of the field of psychological science is to learn truths about the world and how these truths interact with people, consistency and transparency in the field will only help us. Addressing methodology in specific fields can be a daunting task, but it may prove very fruitful.

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