



Physical features, coherence and positive outcomes of person–environment interactions: A virtual reality study



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ABSTRACT

In this study we examined how physical features of a natural setting influenced perceived coherence and three positive outcome variables: preference, pleasure, and (self-reported) restoration. Furthermore, we examined the mediating role of perceived coherence. One hundred thirty-one students evaluated three (virtual) natural environments: an environment with metal furniture, an environment with wooden furniture, and an environment without furniture. Results showed that metal furniture negatively influenced perceived coherence as well as preference, pleasure and restoration, compared to wooden furniture and no furniture. Perceived coherence of the environment with wooden furniture was significantly higher than the environment with metal furniture, but significantly lower than the environment without furniture. We did not find support that preference for, and experienced pleasure and restoration in the environment with wooden furniture differed from the environment without furniture. Perceived coherence mediated the effect of (metal) furniture on preference, pleasure, and restoration. Scientific and practical implications are discussed.

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1. Introduction

Imagine that you have been working intensively on a difficult project for a considerable time. You experience stress and you find it hard to stay focused. You feel the urgent need to restore your energy level. Where would you go? Previous research has shown that individuals who experience stress or mental fatigue benefit more from a stay in a natural setting than an urban setting. Compared to urban environments, nature allows people to restore quicker from (psychological and physiological) stress or mental fatigue (Berman, Jonides, & Kaplan, 2008; Berto, 2005; Kaplan & Kaplan, 1989; Laumann, Gärling, & Stormark, 2003; Ulrich, 1984; Ulrich, Simons, Losito, & Fiorito, 1991), and to experience more positive and less negative affect (Hartig, Evans, Jamner, Davis, & Gärling, 2003; Hartig, Mang, & Evans, 1991). Also, people tend to have a preference for natural settings over urban settings (Laumann, Gärling, & Stormark, 2001; Pals, Steg, Siero, & Van der

Zee, 2009; Purcell, Peron, & Berto, 2001). So, being in a restorative environment (e.g. nature) has three important positive outcomes: 1) restoration from stress or mental fatigue, 2) positive affective responses (such as pleasure), and 3) positive cognitive evaluations of the environment (preference). These outcome variables seem closely connected. For instance several studies have shown that perceived restoration is closely linked to both positive affect (i.e. emotional restoration) and environmental preference (Korpela & Hartig, 1996; Purcell et al., 2001; Staats, Kieviet, & Hartig, 2003; Van den Berg, Koole, & Van der Wulp, 2003). The current study aims to examine the relationship between physical features of the environment, perceived restorative characteristics (which are explained below), and three positive outcomes of person–environment interactions: preference, pleasure, and restoration.

The Attention Restoration Theory (ART; Kaplan & Kaplan, 1989) proposes that natural environments score higher on so-called restorative characteristics, which may explain why nature has a higher restorative quality than urban environments. The first restorative characteristic, *fascination*, implies that your attention is drawn effortlessly by interesting things in the environment, for example a colorful butterfly. When you experience fascination, you

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do not need to actively direct your attention, allowing you to restore from mental fatigue. The second restorative characteristic, *being away*, implies that you are physically and mentally away from your usual surroundings. Empirical research has shown that this characteristic should be split in two sub-components: a physical component (novelty) and a psychological component (escape; Laumann et al., 2001; Pals et al., 2009). *Novelty* implies that you have the opportunity to recover if you are in a different setting than usual that allows you to be free from reminders of your daily obligations. *Escape* refers to being able to free your mind from stressful thoughts. This distinction between *novelty* and *escape* is also theoretically meaningful because being away clearly has two components (i.e. a physical component and a psychological component) that may not always both be present (or absent) in a particular environment. Therefore, in this study we will measure novelty and escape as separate components. The third restorative characteristic described by Kaplan and Kaplan (1989) concerns the amount of *coherence* or harmony between all elements in the environment. Being in a highly coherent environment requires little cognitive effort, which will positively affect restoration. Coherence was originally referred to as *extent*, which was defined in terms of scope and connectedness. Scope refers to the scale of the environment, including the immediate surroundings and the areas that are out of sight or imagined. Connectedness refers to a degree of coherence of relatedness between perceived features or elements in the environment, and if these elements contribute to a larger whole. However, in a later publication Kaplan (2001) has suggested that both scope and connectedness rely to a large extent on the coherence of the environment. Therefore, in this paper we will narrow down the definition of extent to coherence. Finally, a good match between the individual and the environment, or *compatibility*, will enhance restoration. The environment has to be compatible with an individual's inclinations or expectations. Being in a highly compatible environment requires little effort, thus restoration is more likely to occur.

Restorative characteristics (i.e. fascination, novelty, escape, coherence, and compatibility) are perceptions, and provide no clear guidelines on what physical features of environments are of key importance in the restorative process and the positive outcomes of person–environment interactions (i.e., preference, pleasure, and restoration). Coherence, for example, reflects an individual's *perception* of the level of harmony in the environment, and does not indicate what environmental features make the environment more or less coherent. Therefore the restorative characteristics do not provide clear guidelines on how to improve an environment in order to enhance its restorative potential. For practitioners, it is highly important to understand which *physical characteristics* influence perceived restoration, experienced pleasure and preference for the environment, because this reveals how such outcomes can be improved by changing particular physical features.

The current study attempts to integrate the Attention Restoration Theory, a prominent psychological approach, with the physical-perceptual approach. The physical-perceptual approach examines relationships between physical characteristics of the environment and judgments of preference for landscapes (Im, 1984; Shafer, Hamilton, & Schmidt, 1969; Vining, Daniel, & Schroeder, 1984). For example, (the presence of) water or vegetation are physical landscape characteristics that may predict positive evaluations of environments (Bell, Greene, Fisher, & Baum, 2001). An advantage of the physical-perceptual approach compared to the ART is that it does identify objective characteristics of the environment that positively affect esthetic judgments. However, an understanding of *why* people prefer certain physical characteristics is lacking. We propose that by combining both approaches, we can study to what extent different environmental features affect perceived restoration, experienced

pleasure and preference for the environment, and understand why they do so. Therefore, the aim of the study is to combine both approaches and examine the relationship between specific physical features, positive outcomes of person–environment interactions (i.e., preference, pleasure, and restoration), and the restorative characteristics described in the ART.

Based on the ART, we would expect physical features to influence positive outcomes of person–environment interactions (i.e., preference, pleasure and restoration) *via* restorative characteristics. After all, restorative characteristics are based on the interaction between the observer and the environment. Therefore physical characteristics of the environment may influence the perceived restorative characteristics of the environment, in turn influencing preference, pleasure, and restoration. There is some initial evidence that restorative characteristics (i.e. being away and fascination) mediate the relationship between physical components and restoration likelihood. Nordh, Hartig, Hagerhall, and Fry (2009) found that certain *natural* components in small parks (such as lower ground vegetation, bushes, grass, water and trees) increased the restoration likelihood, and these effects were (partially or fully) mediated by the restorative characteristics being away and fascination. Fascination appeared to be associated with the presence of water and the size of the park, whereas being away appeared to be associated with the presence of grass, bushes, trees, and with the size of the park (Nordh et al., 2009). Nordh et al. (2009), however, did not systematically manipulate the physical components of the parks. Therefore the individual influence of each (physical) component on restoration and other variables such as preference and pleasure, remains unclear.

In the current study we are interested in the effect of physical characteristics on restorative characteristics and pleasure, preference, and restoration. As a first step we will focus on (perceived) coherence, one key restorative characteristic of the ART with a strong physical component. Previous research showed that coherence is a significant predictor of preference for the environment (Herzog, 1989; Strumse, 1994). We are interested to find out whether this preference for natural environments and the two other positive outcome variables pleasure and restoration, are *caused by* (or influenced *via*) perceived coherence. We are interested to see what happens to experienced pleasure, preference and restoration if perceived coherence of natural settings is disrupted when unnatural elements are introduced.

Laumann et al. (2001) found that natural scenes (i.e. a forest, a sea area, and mountain scene), where only natural elements are visible, were perceived as more coherent compared to an urban setting. Although it has not been tested empirically, one may argue that the natural scenes are more coherent, *because* all natural elements (trees, plants, grass, mountains, water) go well together. If this is indeed the case, it would be advisable to design environments where only natural elements are visible and let existing natural settings as they are. However, in many instances planners also want to meet the needs and wishes of people visiting natural areas, often leading to the placement of human-made objects such as park benches and garbage bins. It is quite imaginable that the introduction of these human made objects may have a negative impact on the perceived coherence of the setting, leading to a decrease of its restorative potential. But what if the objects (for example the benches in the park) are designed in a way to harmonize optimally with the environment? Will this preserve the perceived coherence of the environment, and pleasure, preference and restoration?

The first aim of the current study is to manipulate perceived coherence of a natural setting and examine its effect on restoration, pleasure and preference, by introducing two different designs of street furniture. The second aim is to examine the mediating role of

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