



## Effect of predictors of visual preference as characteristics of urban natural landscapes in increasing perceived restorative potential



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### ARTICLE INFO

#### Keywords:

Attention restoration theory  
Information processing theory  
Landscape design  
Mental fatigue  
Restorative environment

### ABSTRACT

Current literature on restorative environments generally shows the importance of urban natural landscapes in increasing perceived restorativeness of urban environments. However, little is known about the positive role of visual characteristics of urban natural landscapes in increasing Perceived Restorative Potential (PRP) of urban environments. This study aimed to understand the role of four predictors of visual preference as characteristics of urban natural landscape on the restorativeness of environments. In this study, 120 students from Universiti Putra Malaysia rated 12 colored slides of urban natural landscape scenes for four restorative components (Being away, Fascination, Coherence, and Compatibility), four predictors of visual landscape preference (Coherence, Complexity, Legibility, Mystery) and a criterion variable (PRP). Coherence, however, was considered as a predictor of visual landscape preference since it is not a significant predictor in explaining PRP. Results indicate that Coherence, Complexity, and Mystery positively explained PRP while Legibility did not. Further analysis revealed that the effect of Coherence and Complexity on PRP was fully mediated by the restorative components and Mystery was only partially mediated. The findings indicate that some predictors of visual landscape preference of urban natural landscapes contribute to increasing PRP of urban landscapes. Although Coherence as a restorative component was not a significant predictor of PRP, it contributed toward increasing the restorative potential of urban natural landscapes when considered as a predictor of visual landscape preference. The results of this study can aid city planners, landscape architects and developers with regards to the influence of visual landscape characteristics in increasing the restorative potential of urban environments.

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### Introduction

Urbanization has brought about a number of challenges such as greater ambient noise, increased environmental stressors and information overload. This has led to increasing incidences of Direct Attentional Fatigue contributing to increase stress and mental fatigue among urban residents (Kaplan and Kaplan, 1989; Grahn and Stigsdotter, 2003; Velarde et al., 2007). Attention Restoration Theory (ART; Kaplan and Kaplan, 1989) states that natural environments can reduce stress and promote recovery of mental fatigue (Ulrich, 1984; Kaplan and Kaplan, 1989; Kaplan, 1995). Studies on restorative environments have revealed the role of urban nature in increasing restorative potential of urban settings as well as the preference for natural over built urban settings (Staats et al., 2003; Hartig and Staats, 2006; Hansmann et al., 2007). It has been suggested that preference for urban nature is due to the restorative qualities of those environments (Purcell et al., 2001; Staats et al.,

2003; Hartig and Staats, 2006; Joye and van den Berg, 2011). Other studies found the roles of other variables of environments (harmony, openness, hardscape, entropy, building height and size) in addition to naturalness on perceived restorativeness of urban settings (Purcell et al., 2001; Hidalgo et al., 2006; Nordh et al., 2009; Lindal and Hartig, 2013). However, little is known regarding the role of predictors of visual landscape preference on restorative potential of urban natural landscapes. The aim of the present research is to investigate the relationship between predictors of visual landscape preference (Complexity, Coherence, Mystery, and Legibility) and Perceived Restorative Potential (PRP) in the presence of restorative components, within the framework of two theories: Information Processing Theory and ART.

Kaplan's Information-processing Theory proposed that visual preference for a landscape is derived from two basic human responses to an environment: the need to understand and a desire to explore. Information can be elicited immediately from an environment or it can be inferred. These two dimensions (human needs and information availability) were utilized by Kaplan and Kaplan (1989) to produce a preference matrix which has four key information variables: Coherence, Complexity, Mystery, and Legibility.

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The four important visual preference predictors provide information to understand why people prefer such environments and how comfortable people are in such places. Thus, natural and urban environment can be designed and managed based on this information needs (Kaplan et al., 1998). However, the effect of these visual predictors on restorative components of PRP is not yet known.

ART posits that prolonged use of directed attention leads to mental fatigue (Kaplan and Kaplan, 1989; Kaplan, 1995; Kaplan and Kaplan, 2001). Directed attention is defined as attention directed by cognitive processes as opposed to “soft-fascination”, where attention is effortless. ART theorizes that a restorative environment possesses four components: Being away (getting from demands on directed attention), Extent (rich enough and coherent enough so that it represented a whole other world, coherence is an aspect of extent), Fascination (effortful directed attention) and Compatibility (a function of environmental dictates and personal intentions). Benefits of restorative settings include clearing the mind, recovery from fatigued directed attention, the opportunity to think about personal and unresolved problems, and the opportunity to reflect on life’s larger questions such as directions and goals. Herzog et al. (1997) later grouped these benefits into two categories: recovery of directed attention and the opportunity for reflection and referred to them as the Perceived Restorative Potential (PRP; Herzog et al., 1997, 2002, 2003).

Many studies supported the role of urban nature in increasing perceived restorativeness and restorative potential of urban environments (Kaplan and Kaplan, 1989; Laumann et al., 2001; Purcell et al., 2001; Herzog et al., 2003; Hartig and Staats, 2006; Pasini et al., 2009). They also reported relationship between preference and perceived restorativeness (Laumann et al., 2001; Purcell et al., 2001; Herzog et al., 2003; Tenngart Ivarsson and Hagerhall, 2008; Nordh et al., 2009; Pals et al., 2009).

However, in urban nature where visual landscape settings are more restorative than others (Purcell et al., 2001), the question is which components or characteristics of the visual landscapes constitute important drivers of human health benefits (Velarde et al., 2007)? Purcell et al. (2001) in investigating perceived restorativeness of different scene types suggested that although different scene types clearly vary in their content of naturalness, many variables of visual landscape preference could be associated with the restorative value of these environments. Furthermore, Velarde et al. (2007) in a review paper lamented on the lack of studies on effective components and characteristics of specific landscape that constitute the most important drivers of human health benefits.

Other studies have investigated the role of other variables on perceived restorativeness of urban environment. A study on the attractiveness and unattractiveness of urban environments found a relationship between restorative components and aesthetic attributes (Harmony, Openness, Luminosity, Suitability for leisure, and Meeting place). The authors suggested that restorative places tend to be open and luminous and are places noted for leisure and social interactions (Galindo and Hidalgo, 2005).

Nordh et al. (2009) investigated relationships between components of small parks (hardscape, grass, lower ground vegetation, flowering plants, bushes, trees, water and size) and likelihood of restoration in the presence of two restorative components (Fascination, Being Away). They found that the effects of components of small parks on likelihood of restoration in the presence of restorative components were reduced due to the mediation effect. Some components were fully mediated by restorative components and some were partially mediated. The result indicated that the effect of grass, water, size on likelihood of restoration was partially mediated while effect of lower ground vegetation, bushes, and trees was fully mediated by Being Away. Results also found that lower ground vegetation, trees, and water were fully mediated but bushes and size were only partially mediated by Fascination.

In another study, the physical attributes of the urban residential environment were found to influence restoration likelihood (Lindal and Hartig, 2013). They reported the mediation effect of Fascination and Being Away on relationships between entropy, building height and restoration likelihood.

Herzog et al. (2003) investigated the influence of four predictors of visual landscape preferences – openness, visual access, movement ease and setting care – on the relationship between restorative components and PRP. The result of regression analysis showed that the predictors were able to explain PRP. They also suggested that future studies should look into the mediation effect of restorative components on relationship between specific landscape quality and PRP.

Pals et al. (2009) stated that some restorative components (Fascination, Being Away and Compatibility) can be described as a psychological evaluation of the interaction between a person and an environment. However, the rest of components, including Coherence, are more related to characteristics of the environment itself. Therefore, it is probable that the perceived visual preference can be depicted as an environment affecting on the psychological evaluation of the person–environment interaction (Pals et al., 2009). In other words, Coherence might influence on Fascination, Being away and Compatibility which in turn influence on PRP.

Furthermore, Legibility was also considered in revised version of PRS with 26 items by Hartig et al. (1997a,b). However, they cautioned that Legibility items should not combine with the present Compatibility or Coherence items, whereas they theoretically different among them and consistence with suggestion Pals et al. (2009), it was investigated effect of Legibility on restorative components.

Han (2009), in a study on influence of preference and perceived restorativeness and scenic beauty of six major terrestrial biomes, found that physical landscape features (Complexity, Openness, and Water) influenced perceived restorativeness. The results indicated that among the three physical factors, only Complexity explained perceived restorativeness. This seems to suggest that individuals who lack cognitive resources and experience mental fatigue are unable to handle complicated situations.

## Hypotheses of the present experiment

The aim of this study was to determine the relationships between predictors of visual preference, restorative components and PRP. Since PRP of restorative environments depends on the level of the four restorative components, and preference and perceived restorativeness are also associated, in this article it is hypothesized that the predictors of visual preference, as a characteristic of urban natural landscape, influence the perception of restorative components which in turn influence PRP. It has also been suggested by Herzog et al. (2003).

As Coherence is a common variable between restorative environment and visual preference, thus it was considered as a predictor of preference with respect to earlier knowledge in preference researches and it is possible that Coherence as a characteristic of environment could contribute to increasing the restorative potential of landscape settings (Pals et al., 2009). However, in the beginning of the analysis the relationship was checked between coherence as restorative components and PRP. The theoretical model is presented in Fig. 1.

Therefore, this study posited three hypotheses that need to be studied for their mediating effects using Baron and Kenny’s (1986) procedure:

- **H<sub>1</sub>**: There is a significant relationship between predictors of visual landscape preference and PRP.

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