Research Reports

Relationship between the Preference and Perceived Restorative Potential of Urban Landscapes

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SUMMARY. This study presents the relationship between “perceived restorative potential” (PRP) and “preference” for an environment with respect to their relationship with the restorative components outlined by attention restoration theory (ART) in two categories: urban built landscape (UBL) and urban natural landscape (UNL). In this experimental study, 120 participants from University Putra Malaysia (Serdang, Malaysia) rated four restorative components, the PRP and “preference” of 24 color slides depicting UBL and UNL scenes. The results showed that “preference” and PRP was moderately correlated in UNL and UBL. “Compatibility” was found to be the most influential variable among all the restorative components in explaining PRP and “preference” in both UNL and UBL. However, “fascination” appeared to be the second most significant predictor of “preference” in UNL, whereas “being away” was the second most significant predictor of PRP in UNL. Furthermore, “coherence” predicted “preference” but it did not predict PRP in UNL. “Being away” and “coherence” were distinct components of PRP and “preference” and of UNL and UBL.

Studies on restorative environments have shown that the perceived restorativeness of natural settings was not only higher when compared with urban settings but were also preferred to urban settings. The ART stated that the best environmental fit for an individual is one in

which there exists fewer attentional demands and more opportunities for restoration (Kaplan and Kaplan, 1989). The ART postulates that restorative environments possess the components of “being away,” “fascination,” “extent” or “coherence,” and “compatibility.” If that is indeed the case, then it would be expected that one would demonstrate a preference for environments which meet those requirements. Furthermore, researchers found a relationship between “preference” and perceived restorativeness (Herzog et al., 2003; Laumann et al., 2001; Nordh et al., 2009; Purcell et al., 2001; Tenngart Ivarsson and Hagerhall, 2008). This theory also stated benefits

of restorative experience, including attentional recovery and reflection (PRP). However, only a few studies have attempted to investigate the relationship between “preference” and “PRP” in terms of their relationship with the restorative components.

According to the ART (Kaplan and Kaplan, 1989), environments that contain the characteristics of “being away,” “fascination,” “extent,” and “compatibility” offer the possibility for recovery from directed attention fatigue and thus serve as restorative settings. The first component is “being away,” which refers to one’s ability to escape from unwanted distractions in the surroundings, distancing oneself from usual routines, and allowing for the suspension of the pursuit of particular purposes that impose demands on directed attention. “Fascination” is the second component that indicates that effortless attention is drawn by objects in the environment when one is engaged in the process of making sense of the environment. The third component is “extent,” which means the extent to which environments are sufficiently rich and coherent, such that they engage the mind and promote exploration. Finally, the last component of the restorative environments is “compatibility.” It indicates what the environment can offer to visitors to fulfill their desires, inclinations, or purposes.

The ART also stated that the 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. Later, Herzog et al. (1997) grouped these benefits into two categories: recovery of directed attention and the opportunity for reflection, and referred to them as PRP (Herzog et al., 1997, 2002, 2003). Likewise, in other studies these were indicated as the likelihood of restoration (Hartig and Staats, 2006; Nordh et al., 2009; Staats et al., 2003) or overall perceived restorativeness (Felsten, 2009).

The majority of research on restorative environments focused on the perceived restorativeness of urban and natural environments as well as natural settings in urban context. They showed the role of urban natural settings in the perceived restorativeness

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of urban settings (Hartig and Staats, 2006; Herzog et al., 2003; Kaplan and Kaplan, 1989; Laumann et al., 2001; Pasini et al., 2009; Purcell et al., 2001). A correlation between “preference” and perceived restorativeness was also found (Herzog et al., 2003; Laumann et al., 2001; Nordh et al., 2009; Pals et al., 2009; Purcell et al., 2001; Tenngart Ivarsson and Hagerhall, 2008).

Purcell et al. (2001) postulated that the restorative quality of landscapes contributed to different preferences for various scene types. They collected data on the responses of “preference” and perceived restorativeness of five scene types. Their results showed that there was a correlation between perceived restorativeness and “preference” ($r = 0.81$, $P < 0.01$).

Kaplan and Kaplan (1989) proposed that the preferred environment might also be the restorative environment. Therefore, within the development of perceived restorativeness scale (PRS), Laumann et al. (2001) suggested that the assessment of the restorative components can be a predictor of environmental preferences. Thus, in two studies, they investigated the relationship between the restorative component and “preference” evaluations of urban and natural environments while participants imagined themselves in or viewed videos of the environments. They found that restorative components could predict “preference” for both environments (Laumann et al., 2001).

In two studies, Pals et al. (2009) found a correlation between some restorative components and “preference” in the zoo environment. They measured visitors’ perceived restorativeness while viewing of a butterfly garden and a baboon cage in a Netherlands zoological park. The study examined how restorative components were related to visitor experiences (i.e., preference ratings and experienced pleasure). The result showed that “fascination” was a significant predictor of experienced “preference” in both studies.

Furthermore, a few studies underscored the relationship between “preference” and the PRP of settings. Herzog et al. (2003) stated that soft fascination (effortless attention) should generate a positive correlation between “preference” and PRP according to the importance of soft fascination in the restorative process. They collected

responses of “preference” and PRP from 70 color slides of natural and built environments. It was seen that “preference” and PRP were highly and significantly correlated ($r = 0.95$, $P < 0.001$) and the effective predictors of PRP were “being away” and “compatibility.” Furthermore, it was found that the pattern of prediction for PRP and “preference” was somewhat different in terms of relationship with the restorative components. However, their studies did not investigate the different urban settings (e.g., urban and urban natural).

In general, studies on restorative environments have indicated a high relationship between “preference” and perceived restorativeness (restorative components or overall PRS), and also between PRP and some of the restorative components; however, few studies investigated the relationship between “preference” and PRP. Therefore, this research investigated the relationship between PRP and “preference” for an environment with respect to their relationship with individual restorative components in two categories: UBLs and UNLs.

Materials and methods

PARTICIPANTS. The sample consisted of 120 undergraduate students (43 males and 77 females, age 19–25 years) from University Putra Malaysia. These students had a variety of education and cultural backgrounds

(Malays, Chinese, Indian). Participants gave their consent to participate in the experiment.

STIMULI MATERIAL. In total, 24 slides were shown: 12 from the category “urban natural” and 12 from “urban built” landscapes. These images were selected from a pool of slides taken of scenes in and around the capital city of Kuala Lumpur. All images were captured at eye level. Urban settings that represented a diversity of city landscapes with shopping streets, residential areas, transportation centers, office buildings and hotels, modern high rises (and so forth) with less vegetation, were represented as UBL (Hartig and Staats, 2006). Urban settings that prominently portray natural components, such as trees, shrubs, flowers, weeds, grass, and water (all or almost all), were represented as UNL (Herzog, 1989). One scene from each category landscape is shown in Figs. 1 and 2.

MEASURES. Each participant was asked to rate perceived restorativeness of each scene using the PRS, which had been introduced by Hartig et al. (1996b) based on the ART (Kaplan and Kaplan, 1989). It is composed of 16 items measuring the four restorative components, of “being away,” (sample item: being here is an escape experience) “fascination,” (sample item: the setting has fascinating qualities), “compatibility,” (I can do things I like here) and “extent” or “coherence”

Fig. 1. Example of an urban natural landscape (landscape that contains more vegetation and fewer buildings) used in an investigation of the relationships among restorative components and perceived restorative potential and preference for two types of urban landscapes.

Fig. 2. Example of an urban built landscape (landscape that contains less vegetation and more buildings) used in an investigation of the relationships among restorative components and perceived restorative potential and preference for two types of urban landscapes.

(sample item: there is a clear order in the physical arrangement of this setting) represented by two, five, four, and five items, respectively (Hartig et al., 1996b). An additional item assessed the target variable PRP; “This setting would be excellent for taking a break and restoring my ability to study for an exam or work effectively on a demanding project” (Felsten, 2009; Herzog et al., 2003; Nordh et al., 2009), whereas another item assessed target variable “preference”; “I like this setting” (Herzog et al., 2003; Laumann et al., 2001; Nordh et al., 2009).

Each participant rated each of the 24 settings with 18 items that consisted of the two target variables (preference and PRP), and the four components (16 items) of PRS. All items were rated on a seven-point Likert scale of agreement ranging from 1 (not at all) to 7 (a great deal) and were put in random order.

PROCEDURE. After describing the task and getting informed consent, to familiarize each participant with the testing procedure, five practice slides were shown. They also rated one practice slide. This procedure is designed to help all the subjects begin the actual experiment in a similar and stable condition. The participants’ task was to view the landscape slides as surrogates of the actual landscape and to record their assessments of the variables of interest for each slide while the slides

were still being shown on screen. Participants were asked to imagine themselves attentionally fatigued and in a state where they would need to take a break from an examination or focus on their projects (Felsten, 2009; Hartig and Staats, 2006; Herzog et al., 2003; Staats and Hartig, 2004; Staats et al., 2003).

Respondents then rated each of the 24 scenes with 18 items. They took a 5-min break after every six slides, and they had refreshments after 12 slides to prevent boredom and fatigue. The slides were presented in two orders to reduce the effect of order on the results (Han, 2009; Herzog et al., 2003). One order was shown randomly with the constraint that no more than two slides of the same setting were in successive order. The second order involved the reverse of the first order. There were a total of six experimental sessions to incorporate enough subjects. All sessions were conducted in a classroom at the Faculty of Design and Architecture at University Putra Malaysia.

ANALYSIS. SPSS (version 18; SPSS, Chicago, IL) was used for analysis, and analyses included descriptive statistics, reliability analysis, correlation analysis, and regression analysis. The statistical significance level was set at 0.01.

Results

RELIABILITY ANALYSIS. A reliability analysis was performed for each of

the subscales using Cronbach’s alpha. The results showed a high internal consistency for each subscale in line with earlier studies (Chang et al., 2008; Hartig et al., 1996a, 1996b, 1997; Tenngart Ivarsson and Hagerhall, 2008): UNL: 0.81 for “being away,” 0.88 for “fascination,” 0.88 for “compatibility,” and 0.85 for “coherence”; UBL: 0.81 for “being away,” 0.89 for “fascination,” 0.89 for “compatibility,” and 0.84 for “coherence.”

CORRELATION ANALYSIS. Table 1 contains correlations among each of the variables. The two criterion variables (PRP and preference) were moderately correlated in UNL and UBL. There are high correlations among restorative components in UNL and UBL except for “coherence” in UBL. “Being away” and “coherence” were moderately correlated in UBL. A moderate relationship also appears between “coherence” and PRP in UNL and “coherence” and two criterion variables in UBL. “Compatibility” had high correlations with all variables, especially with “fascination” in both categories.

STEPWISE MULTIPLE LINEAR REGRESSION ANALYSIS. The stepwise multiple linear regressions were used to test the relationship between restorative components and two criterion variables: PRP and “preference.” The purpose of using stepwise multiple linear regressions was to identify the best predictors to explain PRP and “preference” for each type of landscape.

Although some of the four restorative components had high correlations, there was no serious multicollinearity in the regression model. Some authors argued that a regression model would have serious multicollinearity problems when the variance inflation factor (VIF) is larger than 10, or tolerance is below 0.1 (Ho, 2006; Pallant, 2007). As shown in Tables 2 and 3, VIF range is from 2.82 to 4.54 and tolerance range is from 0.22 to 0.35.

The results showed that “compatibility,” “being away,” and “fascination” were the best significant predictors of PRP in UNL, but “coherence” did not appear to be a predictor of PRP. The three variables explained 63% and 62% of the variance with “PRP,” respectively, in UNL and UBL [UNL: $F(3, 1436) = 832.53$; UBL: $F(3, 1436) = 767.07$, $P < 0.01$]. “Compatibility” was the more influential variable among restorative components in UNL and UBL, whereas

Table 1. Pearson's correlation coefficients for an investigation of the relationships among restorative components (coherence, being away, fascination, and compatibility) and perceived restorative potential (PRP) and preference for urban natural landscapes (UNLs) and urban built landscapes (UBLs).

Variables ^z	1	2	3	4	5	6
<i>UNLs^y</i>						
1 PRP	—					
2 Preference	0.68**	—				
3 Coherence	0.65**	0.70**	—			
4 Being away	0.72**	0.73**	0.72**	—		
5 Fascination	0.74**	0.76**	0.75**	0.74**	—	
6 Compatibility	0.76**	0.78**	0.77**	0.79**	0.84**	—
<i>UBLs^x</i>						
1 PRP	—					
2 Preference	0.65**	—				
3 Coherence	0.60**	0.63**	—			
4 Being away	0.69**	0.70**	0.65**	—		
5 Fascination	0.73**	0.76**	0.72**	0.74**	—	
6 Compatibility	0.76**	0.79**	0.72**	0.80**	0.85**	—

^zCompatibility = settings that fit with and support one's inclinations or purposes; fascination = settings that hold one's attention without effort; being away = settings that contribute to getting away from usual routines; coherence = settings sufficiently rich and coherent such that it engages mind and promote exploration.

^yUrban landscapes that contain more vegetation and fewer buildings.

^xUrban landscapes that contain less vegetation and more buildings.

**Significant at $P < 0.01$.

Table 2. Stepwise multiple linear regressions for the identification of the best restorative components (being away, coherence, fascination, and compatibility) to predict perceived restorative potential for urban natural landscapes (UNLs) and urban built landscapes (UBLs).

Restorative component ^z	<i>B</i> ^y	SE	Beta ^y	<i>t</i> ^y	Collinearity statistics ^x	
					Tolerance	VIF
<i>UNLs^w</i>						
Compatibility	0.38	0.04	0.31	9.65**	0.24	4.19
Being away	0.29	0.03	0.27	9.97**	0.35	2.82
Fascination	0.31	0.03	0.28	9.22**	0.28	3.54
<i>R</i> ² = 0.63 (** <i>P</i> < 0.01), <i>F</i> = 832.53						
<i>UBLs^v</i>						
Compatibility	0.51	0.04	0.42	12.09**	0.22	4.54
Fascination	0.26	0.03	0.24	7.51**	0.27	3.68
Being away	0.19	0.03	0.18	6.45**	0.35	2.87
<i>R</i> ² = 0.62 (** <i>P</i> < 0.01), <i>F</i> = 767.07						

^zCompatibility = settings that fit with and support one's inclinations or purposes; fascination = settings that hold one's attention without effort; being away = settings that contribute to getting away from usual routines.

^y B = unstandardized regression coefficients, Beta = standardized regression coefficients, t = corresponding test statistic.

^xVIF = variance inflation factor; VIF values > 10 and tolerance values < 0.01 indicate multicollinearity.

^wUrban landscapes that contain more vegetation and fewer buildings.

^vUrban landscapes that contain less vegetation and more buildings.

**Significant at $P < 0.01$.

“being away” and “fascination” had less explanatory power in both landscape types (Table 2).

Another stepwise multiple linear regression analysis was run for the same variables but with “preference” as dependent variable (Table 3). The results indicated that restorative components (“compatibility,” “being

away,” “fascination,” and “coherence”) explained 67% and 66% of the variance of PRP in UNL and UBL [UNL: $F(3, 1436) = 717.99$, $P < 0.01$; UBL: $F(3, 1436) = 944.64$, $P < 0.01$]. As can be seen, “compatibility,” “fascination,” “being away,” and “coherence” were the best significant predictors of “preference” in UNL

and UBL except for “coherence.” “Compatibility” was the most influential variable, and “fascination” and “being away” had less explanatory power in UNL and UBL.

Discussion and conclusion

This article presents the relationship between “preference” and the PRP of urban landscapes, labeled as two categories: UNLs and UBLs. It further explores the relationships between the individual restorative components, PRP, and “preference,” which could be a guide for practitioners and designers to design and plan landscapes that people not only like but also contribute to the recovery of mental fatigue.

The results of this study showed that “preference” and PRP were moderately correlated. This finding was in line with the suggestions of an earlier study by Herzog et al. (2003) that might not have an excessively high correlation between “preference” and PRP in different setting categories. Thus, it seemed that although a respondent likes a landscape, she/he may recognize that some landscape scenes do not contribute to increasing the recovery of directed attention and do not provide opportunity for reflection.

Consistent with the results of Herzog et al. (2003), in all settings (urban and natural), “compatibility” was seen as the most significant predictor of PRP in UNL and UBL. Furthermore, “being away” was found to be the second most significant predictor of PRP in UNL. Likewise, four restorative components also were successful in predicting “preference,” except for “coherence” in UBL. “Coherence” predicted “preference” in UNL, whereas it did not predict in UBL. “Compatibility” also appeared to be the most significant predictor of “preference” in both categories.

In investigations of the relationship between “preference” and PRP with the restorative components, findings showed that first, “coherence” predicted “preference” in UNL, whereas it did not predict PRP in any categories. It appeared that UNL that contained order and organization contributed to “preference” and people highly preferred this to other landscapes. However, it did not contribute to increasing PRP.

Second, “fascination” appeared to be the second most significant predictor of “preference” in UNL, whereas

Table 3. Stepwise multiple linear regressions for an identification of the best restorative components (being away, coherence, fascination, and compatibility) to predict preference for urban natural landscapes (UNLs) and urban built landscapes (UBLs).

Restorative component ^z	<i>B</i> ^y	SE	Beta ^y	<i>t</i> ^y	Collinearity statistics ^x	
					Tolerance	VIF
<i>UNLs^w</i>						
Compatibility	0.41	0.04	0.31	9.72**	0.22	4.51
Fascination	0.31	0.04	0.26	8.65**	0.26	3.79
Being away	0.24	0.03	0.21	7.83**	0.34	2.98
Coherence	0.16	0.04	0.11	4.38**	0.35	2.85
<i>R</i> ² = 0.67 (** <i>P</i> < 0.01), <i>F</i> = 717.99						
<i>UBLs^v</i>						
Compatibility	0.56	0.04	0.43	13.19**	0.22	4.54
Fascination	0.35	0.03	0.30	10.15**	0.27	3.68
Being away	0.16	0.03	0.14	5.28**	0.35	2.87
<i>R</i> ² = 0.66 (** <i>P</i> < 0.01), <i>F</i> = 944.64						

^aCompatibility = settings that fit with and support one's inclinations or purposes; fascination = settings that hold one's attention without effort; being away = settings that contribute to getting away from usual routines; coherence = settings sufficiently rich and coherent such that it engages mind and promote exploration.

^y*B* = unstandardized regression coefficients, Beta = standardized regression coefficients, *t* = corresponding test statistic.

^xVIF = variance inflation factor; VIF values >10 and tolerance values <0.01 indicate multicollinearity.

^wUrban landscapes that contain more vegetation and fewer buildings.

^vUrban landscapes that contain less vegetation and more buildings.

**Significant at *P* < 0.01.

“being away” was the second most significant predictor of PRP in UNL. This meant that “being away” had more explanatory power than “fascination” in predicting PRP while it was seen to have less explanatory power in predicting “preference.” Therefore, in agreement with the results of previous studies (Herzog et al., 2003), the constructs of “preference” and PRP can be distinguishable in terms of setting (UNL) and the following components: “fascination,” “being away,” and “coherence.” As Herzog et al. (2003) stated, if the focus is on recovering from fatigue (e.g., hospitals, healing gardens), “being away” becomes strongly prominent; if the focus is on preference, in general (parks, gardens) “fascination” is more important. In general, “being away” could be the distinguishable component in PRP and “preference”; moreover, it is distinctive between UNL and UBL.

Collectively, the findings showed that UNL contributed to individuals getting away from everyday thoughts and daily routines that imposed demands on directed attention and led to increasing PRP of this environment. However, the UNL that contained order and organization of elements (coherence) can help people make sense of the enjoyable environment, but they

did not contribute to increasing PRP of urban environments. Moreover, “fascination” in UBL led to increasing not only PRP but also “preference” of these environments.

It is recommended that future research investigate the effects of other variables such as “coherence” as Kaplan and Kaplan (1982) argued that scenes with high “coherence” but lower complexity may cause people to feel bored. Also, as other researchers have suggested, there is a need to carry out more investigations on the effect of specific landscape qualities on restoration, the mediation effect of landscape qualities on one or more of the restorative components, and the amounts and combinations of certain components on restoration (Herzog et al., 2003; Nordh et al., 2009; Purcell et al., 2001).

Consequently, it is pertinent to comment on several aspects of these results. First, the participants in this study were university students: a pool that should be more diversified in future studies. A study should be conducted using a sample that is more representative of the general population and reflect the influence of demographic features.

Second, since each respondent usually rates more than one landscape, the sample size is not unusual

for landscape perception research. In the investigation on 114 environmental studies, a mean and mode of the respondent samples size were found to be 243 and 100, respectively (Stamps, 1992), and a split-block correlation could be 0.90 or higher for environment preference rating research with 25 to 30 respondents. Therefore, the sample size of this study can be considered to be reasonable in terms of this criterion. However, future studies can obtain a larger sample to make comparisons at the personal level.

Third, as previous studies (Herzog et al., 2003; Nordh et al., 2009) suggested, PRP is, of course, not the same thing as actual restoration as reflected for example in changes or performance on tests of directed attention (Berto, 2005).

Finally, this study showed that urban landscapes that contain “being away,” “fascination,” and “compatibility” not only contribute to enhance PRP, but also “preference” for those environments. However, what characteristics of urban landscapes contributed to increasing these components that led to enhanced PRP of urban environments is not yet known.

In general, the majority of research on restorative environments focused on built vs. natural scene types. However, this study investigated the relationship between “preference” and PRP in terms of their relationship with the restorative components of one type of environment (urban landscapes). Knowledge about the distinctiveness of the two constructs (preference and PRP) can be used as a guide in the designing and planning of landscapes that people like (parks and gardens) and also landscapes that contribute to the recovery of mental fatigue (hospitals, healing gardens).

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