

Restorativeness, Preference and the Perceived Naturalness of Places

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Abstract

The relationship between the perceived naturalness, perceived restorativeness and preference for a number of different types of outdoor scenes was examined. In a first phase subjects sorted examples of outdoor scenes into three categories - natural, built and scenes with mixtures of natural and built elements. Separate groups of subjects then judged the typicality of and preference for the examples within each category. On the basis of these ratings, one highly typical example for each scene type was selected in such a way as to obtain the widest possible range of preference within each naturalness category. In the main experiment the Perceived Restorativeness Scale was used to assess the perceived restorative value of and preference for the examples in each naturalness category. For the built and mixed naturalness categories, perceived restorativeness and preference were found to be closely related with both being lowest for the built category. However, while the perceived restorative value of the natural category was high, preference for this category approached that of the built category. Examination of the results for the different scene types within the natural category showed that there were two groups of natural scene types, one associated with low and the other with high preference. The basis for this result is discussed and the implications of it for models of preference and the perceived restorative value of environments are examined.

Key words: Restorativeness, preference, natural, build, mixed scenes

Capacidad restauradora, preferencia y la naturaleza percibida de los lugares

Resumen

Se examina la relación entre la percepción de naturaleza, capacidad de restauración percibida y preferencia, para diferentes

tipos de escenas exteriores. En la primera fase los sujetos clasifican ejemplos de escenas exteriores en tres categorías - natural, construida y escenas con elementos naturales y contruidos. Diferentes grupos de sujetos juzgaron la tipicidad y la preferencia de los ejemplos, dentro de cada categoría. Sobre la base de estas puntuaciones, se seleccionó un ejemplo altamente típico de cada tipo de escena. En el experimento principal se utilizó la Escala de Restauración Percibida para evaluar los ejemplos de cada categoría. Se observó que la capacidad restauradora y la preferencia estaban estrechamente relacionadas en las categorías de construido y naturaleza mixta. Sin embargo, mientras el valor restaurador de la categoría natural fue alto, el valor de preferencia se acercó al de la categoría construida. El examen de los resultados para los diferentes tipos de escena dentro de la categoría natural mostró que había dos grupos de tipos de escena naturales, uno asociados con preferencia baja y otro con preferencia alta.

Palabras claves: Capacidad restauradora, preferencias, escenas naturales, escenas urbanas, escenas mixtas.

Introduction

In a previous experiment (Purcell, Peron and Berto, 2001) a close relationship was found between perceived restorativeness and preference for typical examples of different scene types. In the same experiment it was also shown that familiarity did not play a major role in either the perceived restorative value of a place or preference. A considerable amount of previous work (for example, Schafer, 1969; Kaplan, Kaplan and Wendt, 1972, Dearinger, 1979; Kaplan and Kaplan, 1982; Dearden, 1984) however has demonstrated that preference is related to what is interpreted as the naturalness of places with natural scenes being highly preferred and built scenes being low in preference. Similarly there is some evidence that the perceived restorative value of a scene is associated with naturalness see, for example Hartig, Book, Garvill, Olsson, and Garling (1996) and Hartig, Korpela, Evans, and Garling (1997). Given the association between perceived restorativeness and preference demonstrated in Purcell et al (2001), it is possible that the perceived restorative value of a scene could also be associated with naturalness. Such a relationship between perceived restorativeness, preference and naturalness would also be predicted on theoretical

grounds and has been discussed, for example by Hartig et al, (1996; 1997). If environmental preferences are functionally significant and if natural environments provide opportunities for restorative processes to operate then preferences for such environments would have adaptive significance (see, for example, Kaplan, 1987; 1995). The aim of the experiment to be reported was to make an initial assessment of whether there is such an association by having participants assess the perceived restorativeness of and preference for a number of different types of scenes that varied in their perceived naturalness. If such a set of associations does exist, it would provide a starting point from which causal models could be developed to account for such a set of relationships.

Typically vegetation has been strongly associated with naturalness and preference together with water and the presence of topographic variation (Brush, 1981; Kaplan and Kaplan, 1982, 1989; Herzog, 1985). Scenes that contain combinations of these variables are associated with the highest levels of preference. Similarly the absence of these variables, typically found in built environments, is associated with low levels of preference. While this literature concentrates on the natural / built distinction, it is clear that many places consist of mixtures of these natural and built attributes. These "mixed" natural and built scenes have been shown to be associated with a wide range of preference (Purcell and Lamb, 1984, Lamb, Purcell, Mainardi Peron and Falchero, 1994). Naturalness may therefore be better conceptualized in terms of variations in the extent of human induced change with variations in the types and extents of change being associated with variations in preference, that is as a dimension rather than a dichotomy (Abello, Bernaldez and Galiano, 1986; Hodgson and Thayer, 1980; Purcell and Lamb, 1984). While naturalness may be more appropriately conceptualized in this way, for the purposes of the present experiment three categories of naturalness were used to assess the association between naturalness, preference and restorativeness – natural, built and mixed natural and built.

However in order to examine this association, it is also important to note two other characteristics of the previous research into the naturalness and preference association. First, whether or not a scene is natural, built or consists of a mixture of natural and built elements has been inferred from an inspection of the physical attributes of scenes that

have been judged to be high or low in preference (Purcell and Lamb, 1984, Kaplan and Kaplan, 1982). This procedure involves the assumption that the scenes with these attributes would also be perceived in this way. Second in this literature the highly preferred, natural scenes that have been used come from a relatively restricted range of types of scenes. The scenes have generally come from a limited range of geographic locations, for example, the United States, Europe and Australia and from the more populated areas within these locations see, for example, Brush and Shafer, 1975; Brown and Daniel, 1987; Cotierier, 1983; Kaplan and Herbert, 1987; Kaplan and Kaplan, 1989; Peron, Purcell, Staats, Falchero and Lamb, 1998). Consequently scenes such as deserts, natural scenes from high latitudes or scenes such as savanna woodlands have not been assessed for preference although they would be considered to be natural in terms of their physical attributes. There have been some exceptions (see, for example, Balling and Falk, 1982; Herzog, 1987) however generally these types of places have been underrepresented in previous research. Both of these characteristics are potentially significant for the results of the previous naturalness and preference research and consequently are important for examining whether both are also associated with the perceived restorative value of a place. Consequently in the experiment to be reported, examples of underrepresented natural scenes were included and the final set of scenes used were based on preliminary experiments where the perceived naturalness of the scenes was assessed.

If there is such an association between naturalness, preference and perceived restorative value it would be expected that scenes judged to be natural should be high in preference and perceived restorative value and scenes judged to be built should be low in preference and perceived restorative value. Because little research has addressed the issue of mixed natural and built scenes, the level of preference and restorativeness associated with such scenes cannot be predicted. However if naturalness can be considered as a dimension or at least an ordered set of categories rather than a dichotomy (see, for example, Purcell and Lamb, 1984), it could be that scenes that are mixed will lie between the levels of preference and restorativeness found for the natural and built scenes. Finally it would also be expected that, with multiple examples of scenes perceived as natural, built and mixed, similar

levels of preference and restorativeness would be found for the examples within a category if the predicted associations do exist.

Method

Stimulus Material

In order to address these issues, the experiment involved a number of phases in developing the stimulus material to be used. First a large number of photographs of examples of different types of scenes were systematically collected by the experimenters from magazines and existing stimulus material. The basis on which the material was selected was that it had to include the types of built and natural scenes typically used in previous research, examples of natural scene types under represented in previous research and mixed, natural and built scenes. In order to achieve this range of stimulus material photographs were obtained that represented different biomes and that came from all major geographic regions of the world. The aim was to ensure that as many different types of scenes and examples within types as possible were obtained. However, while this diversity was obtained, the actual set of examples that were used in the different phases of the experiment was based on participant's responses obtained in the following way.

First a group of participants reviewed all of the photographs and allocated them to one of three naturalness categories - natural, built and mixed. Following this another group of participants rated the typicality of each of the examples of the different types of scenes in each naturalness category. At this stage the most typical examples of seven scene types within each category were selected. The number of scene types selected was determined by two factors. The first was that, to be included, the scene type had to have one or more highly typical example(s) based on the participant's judgements. Second, because the Perceived Restorativeness Scale (PRS) to be used to assess the perceived restorative value of a scene, has a large number of items, the total number of examples to be judged in the main part of the experiment had to be kept within a range that was practical within a single experiment. Finally another group of participants rated the preference of each of the examples selected in the previous phase. For each scene type within a naturalness category one highly typical example was selected, choosing it

in such a way as to ensure the broadest possible range of preference within each naturalness category. This resulted in a total stimulus set of 21 scenes, seven from each of the naturalness categories. The scene types employed in the final experiment and the naturalness category to which they belonged were:

Natural - polar region, prairie, savanna, desert, tropical forest, lake and river;

Mixed - street with trees, childrens' playground, beach with seafront promenade, harbor front with boats, historical garden and fountain, village in the mountains, country house with cultivated fields;

Built - airport, theatre, skyscraper, industrial zone, city street, railway station, square.

Participants

Participants were undergraduate students from the University of Padua, Italy. In all phases of the experiment equal numbers of male and female participants were used. The age of the participants ranged between 20 and 37 with a mean of 26 years. In the first phase of the experiment where possible scenes were judged in terms of naturalness, 20 participants participated. For the second and third phases where typicality and preference for the stimulus set were assessed, two groups of 16 participated. In the main experiment there were 7 groups of 10 participants with participants in each group making judgments of one natural, one built and one mixed scene. The scenes from each category judged by a group were randomly selected with the constraint that no scene type was judged by more than one group.

Judgements and Procedure

In each phase of the experiment subjects participated in small groups. Before the judgements were made, the participants were told to consider not the photograph itself but the place represented, and to imagine themselves within the scene. If the place they were to rate was a familiar one, they were asked to keep in mind the people, things and activities that they thought were characteristic of the place or that defined it for them as they usually experienced it. This approach was taken for the following reasons. There is significant evidence that, provided the visual representation of a scene includes all relevant aspects of the scene, responses to the representation will be similar to those obtained in situ.

However there is also evidence that, in particular contexts and with specific types of scenes, there may be differences between photographs and responses obtained in situ (see, for example, Dunn, 1976; Coeterier, 1983; Zube, Simcox and Law, 1987; Bernaldez, Ruiz, Benayas and Abello, 1988; Hull and Stewart, 1992; Scott and Canter, 1997). A specific problem is the danger that participants could respond to the representation as a photograph rather than in terms of the scene represented. The approach adopted focussed participants attention on the meaning and content of the scene and not on the nature of the representation of the scene.

In the first phase of the experiment the instructions were: "Now I will show you a series of photographs of places. For each photograph, I ask you if the place is natural, built or whether it is natural and built. To answer, mark the corresponding square on the response sheet; for example if you think that the place is natural mark the square beside natural and so on.

In the second phase, where participants judged the typicality of the scenes, the following instructions were used: "Now you will see a series of photographs of places. For each photographs we ask you: "how typical is this place compared to the category that it belongs to?". Circle your answer on the 7 point scale beside each place; for example, if you think that the place is not typical you would mark the square "0" (not at all), if you think that it is very typical, mark "7" (very much).

In the third phase the instructions were: now you will see a series of photographs of places. For each photograph we ask you: "how much do you like this place?". Mark your answer on the 7 point scale. If you do not like it, you circle "0" (not at all), if you like it rather much, mark "5" (rather much).

The main experiment involved groups of participants making judgements of the final stimulus set using the PRS that includes items relating to preference and familiarity. The same version of the PRS was used as in the previous experiment (Hartig, 1997, personal communication) which consisted of 29 items that formed five sub-scales (Being Away, Fascination, Compatibility, Scope and Coherence) with two items loading on two of the sub-scales (Items 7, Scope and Compatibility; Item 10, Fascination and Scope). However on the basis of the results of the first experiment (Purcell et al., 2001) the following changes were

made. Item 7 was considered only for Scope and item 10 only for Fascination. Table 1 presents the sub-scales and the items making up each sub-scale. Judgements on the PRS were made on a scale of 0 to 10.

Table 1. Items making up the Perceived Restorativeness Scale (PRS)

This place is a refuge from unwanted distractions Spending time here gives me a break from my day to day routine. This is a place to get away from the things that usually demand my attention. Being here helps me to stop thinking about the things that I must get done. I experience few demands for concentration when I am here When I am here I don't have to focus on things that I'm not really interested in.	Being Away
There is a clear order in the physical arrangement of this place. The things and activities I see here seem to fit together quite naturally It is easy to see here how things are organized. Everything here seems to have a proper place.	Coherence
This place does not place demands on me to act in a way I would not choose. There is little here to prevent me from doing what I would choose to do. Being here fits with my personal inclinations. It is easy to do what I want here. I can find my way around here without trouble. The activities that it is possible for me to do here are activities I enjoy.	Compatibility
This place is fascinating Following what is going on here really holds my interest. This place is large enough to allow exploration in many directions. This place awakens my curiosity. There is much to explore and discover here. My attention is drawn to many interesting things here. It is hard to be bored here.	Fascination
There are few hard boundaries here to limit my possibilities for moving about. It seems like this place goes on forever. This place has the quality of being a whole world to itself.	Scope
This place is familiar to me.	Familiarity
I like this place	Preference
I prefer this place over all other places I have ever been.	Preference

The instructions for the main experiment were as follows. We are interested in how you experience this place. To help us understand your experience, we have provided the following statements for you to respond to. Please read each statement carefully, then ask yourself, "how much does this statement apply to how I would experience the place?" To indicate your answer, circle only one of the numbers on the rating scale beside the statement. So, for example, if you think that the statement does not apply to your experience of the place, then you would circle "0" (not at all), if you it applies rather much, then you would circle "6" (rather

much), but if you think it would apply very much, you would circle "10" (very much).

If the place you are being asked to rate is a familiar one for you rate it while keeping in mind the people, things activities, and so forth that you think are characteristic of the place or that define it for you as you usually experience it. Again this instruction was included to focus participants on the place represented and not on the photograph itself.

Results and Discussion

The data from the main experiment were analysed using a repeated measures analysis of variance with one between participants effect and two within participants effects. The between participants effect was associated with the seven examples within each level of naturalness. One within participants effect was the naturalness category – natural, built and mixed. Each example within a naturalness category was judged using the Perceived Restorativeness Scale and from this two measures were derived, one for perceived restorativeness and one for preference giving the second within participants effect. In the presentation of the results of the analysis and in the discussion, the between participants effect is referred to as Example, the first within participants effect as Naturalness and the second within participants effect as Measure.

The measure of the overall restorativeness of a place was based on the mean of the scores on the five sub-scales within the PRS (Being Away, Fascination, Coherence, Scope, Compatibility). This approach is based on the view that, at this initial stage of examining the naturalness, preference, restorativeness relationship, it is best to use the total scale score to examine the overall relationship. Consequently, while the psychometric properties of the scale are important, they were not investigated in detail for this experiment. A principle components analysis without rotation of the data was however carried out in order to compare the performance of the overall scale, excluding the preference and familiarity items, in this experiment with a similar analysis in our previous experiment (Purcell et al, 2001) and to determine whether the five sub-scales could be meaningfully combined into an overall scale score. As in that experiment a single factor solution was appropriate and this factor accounted for a similar amount of the variance in this experiment (42%) as in the previous experiment (40.1%). Cronbach's alpha was calculated

to check the reliability of the sub-scales and to compare the reliability between this experiment and the previous experiment using the PRS (Purcell et al, 2001). The results were Being Away - .88, Fascination - .90, Coherence - .61, Scope - .57, Compatibility - .85 for this experiment and Being Away - .84, Fascination - .90, Coherence - .60, Scope - .63, Compatibility - .82 for the previous experiment. Overall the reliability of the sub-scales in the two applications of the PRS is very similar and it is apparent that the Coherence and Scope sub-scales have significantly lower reliability than the other three scales. However the results of this analysis indicate that the sub-scales do form an overall scale and therefore, as in the previous experiment, the calculation of the PRS scale score was based on the mean of the sub-scale scores and included both of the Coherence and Scope sub-scales. Our results differ to the similar analyses (although using a different factor extraction procedure) of the PRS by Hartig et al., (1997). They found a two factor solution with the Coherence items forming a separate factor and all the items in the other sub-scales loading on the other factor. Hartig et al (1997) derived an overall PRS score by averaging across all the items in this factor. However, given that we had found that all five sub-scales load on the one factor, we considered that it was more appropriate to include all five sub-scales in the overall PRS score. The PRS also includes two measures of preference and these were averaged to give an overall preference score. The PRS also contains a familiarity item. Given the absence of a relationship between familiarity and preference demonstrated in Purcell et al.), the familiarity data was not included in the analysis.

All of the main effects in the analysis of variance were significant: Example - $F = 2.48$, $df = 6, 63$, $p = .03$; Naturalness Category - $F = 13.45$, $df = 2, 126$, $p = .0000$; Measure - $F = 70.17$, $df = 1, 63$, $p = .000$. The Naturalness by Example interaction was significant ($F = 2.53$, $df = 12, 126$, $p = .005$) as was the Naturalness by Measure interaction ($F = 3.95$, $df = 2, 126$, $p = .02$). The Measure by Example and the three way interaction were not significant. Given that there are three naturalness categories, the analysis of variance also tests for linear and quadratic trends between these categories and their interaction with the other two effects. There was a significant linear trend for the Naturalness effect ($F = 19.36$, $df = 1, 63$, $p = .000$) but neither the Naturalness by Example, the Naturalness by Measure nor the three way interaction were significant.

For the quadratic trend, The Naturalness trend was significant ($F = 8.29$, $df = 1, 63$, $p = .005$) as were the Naturalness by Example ($F = 23.45$, $df = 6, 63$, $p = .005$) and the Naturalness by Measure interactions ($F = 5.12$, $df = 1, 63$, $p = .03$). The three way interaction approached significance ($F = 2.06$, $df = 6, 63$, $p = .07$)

On the basis of the previous extensive research on preference and naturalness it would be expected that the natural category would be preferred to the built. If naturalness is conceptualized as being at least an ordered set of categories then it would be expected that preference for the mixed naturalness category should lie between the values of these variables for the natural and built categories. If perceived restorativeness and preference have a similar relationship to naturalness then similar changes should occur for the perceived restorativeness measure as that outlined for the preference measure. Finally it would be expected that there should be no differences between the examples within a naturalness category – all of the examples judged to be natural should be both highly preferred and perceived as restorative; with the built category preference and restorativeness should be low for all examples and the mixed category should be between the natural and built categories for preference and perceived restorativeness.

Each of these predictions can be assessed on the basis of the results of the ANOVA particularly on the basis of the linear and quadratic trends for the naturalness categories and the interaction of this effect with the measures and examples effects. The three predictions outlined above imply a significant linear trend between the naturalness categories and no significant interaction effects. This is confirmed by the results of the analysis. There is a strong linear trend for the naturalness effect with no significant interaction effects. However these predictions are not consistent with the significant quadratic trends and interactions obtained. The source of the naturalness by measure interaction is illustrated in Table 2 which presents the means for the preference and PRS score for each naturalness category. The significant quadratic trend results from both the preference and the PRS scale score being highest for the mixed category. The significant interaction results from preference being low and perceived restorative scale score high for the natural category. The significant quadratic trends are in fact consistent with there being a relationship between preference and restorativeness however the form of

the relationship to naturalness is unexpected. The low value for preference is also surprising given the long history of research demonstrating high preference for natural scenes. It is also surprising that scenes of low preference are also associated with high perceived restorativeness.

Table 2. Means and 95% confidence intervals for preference the PRS and for each of the naturalness categories.

Naturalness Category	Preference	PRS Scale Score
Natural	4.77, (5.31, 4.23)	6.14, (6.49, 5.80)
Mixed	5.31, (6.01, 4.60)	5.90, (6.37, 5.44)
Built	3.59, (4.27, 2.92)	4.55, (5.03, 4.07)

A possible explanation for these unexpected results can be found in the significant Naturalness by Example interaction and the three way interaction that approached significance. Table 3 presents the means and 95% confidence intervals for each of the examples in each of the naturalness categories. If the results in the natural category are examined, it is apparent that the overall low preference results from the low preferences for the natural scenes that have been underrepresented in previous research - polar region, prairie, savanna, desert, tropical forest. For scenes that are more typical of natural categories used in previous research - lake and river - preference is high and for all scenes restorativeness is high. The issue this result raises is why preference is low for these types of natural scenes. A possible basis for the effect can be seen in the familiarity means for each of the examples in the different naturalness categories shown in the final column in Table 3.

It is apparent that these scenes are judged to be unfamiliar in contrast to the lake and river scenes and to all examples in the mixed and built categories. Natural categories that are unfamiliar to those making the judgement therefore appear to be low in preference. This result contrasts with the previously demonstrated lack of a relationship between preference and familiarity (Purcell et al., 2001; Peron, Purcell, Staats, Falchero and Lamb 1998). This discussion must be treated with caution however as each scene type within a naturalness category was only represented by a single example. A clear direction for future research is to examine these relationships using multiple examples of the different scene types within a naturalness category.

Table 3. Means and 95% confidence intervals for Preference and the PRS Score and for each of the examples in each of the naturalness categories.

Naturalness Category	Preference	PRS Score	Familiarity
Naturalness Category, Natural			
Polar Region	3.40 (4.52, 2.28)	5.70 (6.67, 4.72)	2.90 (4.67, 1.13)
Prairie	4.75 (5.91, 3.59)	6.38 (7.16, 5.61)	3.90 (6.20, 1.60)
Savanna	4.65 (6.22, 3.08)	6.41 (7.44, 5.37)	1.90 (3.31, 0.49)
Desert	3.65 (5.63, 1.67)	5.38 (6.46, 4.30)	4.10 (6.72, 1.48)
Tropical Forest			
Lake	4.65 (6.19, 3.11)	5.91 (6.80, 5.03)	2.60 (4.92, 0.28)
Lake	6.00 (7.55, 4.46)	6.54 (7.60, 5.47)	5.30 (7.73, 2.87)
River	6.30 (7.89, 4.71)	6.69 (8.00, 5.39)	6.80 (8.87, 4.73)
Naturalness Category, Mixed			
Street with trees	3.85 (5.87, 1.83)	4.65 (6.37, 2.94)	8.80 (9.86, 7.74)
Children's playground	5.05 (6.78, 3.32)	5.91 (7.10, 4.71)	8.90 (10.30, 7.49)
Beach with seafront promenade	6.30 (8.58, 4.02)	6.18 (7.31, 5.05)	6.90 (9.50, 4.70)
Harbour front with boats	6.10 (7.57, 4.63)	6.26 (7.21, 5.31)	6.40 (8.43, 4.77)
Country house with cultivated fields	5.70 (7.83, 3.57)	6.51 (7.54, 5.47)	7.70 (9.09, 6.31)
Historical garden with fountain	3.55 (5.44, 1.66)	5.12 (6.59, 3.62)	6.70 (8.73, 4.68)
Village in the mountains	6.60 (9.23, 3.97)	6.71 (8.46, 4.96)	7.80 (9.73, 5.87)
Naturalness Category, Built			
Airport	4.20 (5.57, 2.83)	5.40 (6.68, 4.12)	6.70 (8.96, 4.44)
Theatre	5.00 (6.74, 3.26)	5.14 (6.02, 4.07)	4.60 (6.39, 2.87)
Skyscraper	3.35 (5.72, 0.98)	4.39 (6.26, 2.52)	5.50 (7.94, 3.06)
Industrial Zone	0.95 (2.42, -0.52)	3.07 (4.27, 1.88)	6.60 (8.92, 4.28)
City Street	2.30 (3.86, 0.74)	3.24 (4.39, 2.09)	7.00 (8.94, 5.06)
Railway Station	4.45 (7.06, 1.84)	4.96 (6.58, 3.35)	8.70 (9.92, 7.48)
Square	4.90 (6.33, 3.47)	5.62 (6.60, 4.63)	6.80 (8.64, 4.96)

Conclusion

This experiment has demonstrated first that the perceived restorative value of sets of examples of scenes in three perceived naturalness categories - natural, mixed natural and built, and built, varies according to the naturalness of the category - that is scenes that are perceived to be highly restorative are natural. However similar high levels of perceived restorative value are associated with examples of the mixed naturalness category. Further scenes that are perceived to be highly restorative are not necessarily highly preferred. Analysis of the relationship between the naturalness categories and preference demonstrated that preference for the natural category was significantly lower than expected. Closer examination of this category revealed two groups of scenes. In one group, that contained scenes similar to those used in previous research, preference is high and close to the restorative value of the natural category. In the other group, preference is much lower and in fact close to

the low level of preference for the built category. Furthermore the scene types contained within this group are those that are under-represented in previous research. This result indicates that previous research linking natural scenes to high preference needs to be reconsidered as it may only apply to particular types of natural scenes. These results would also appear to be in conflict with the result in our previous experiment (Purcell et al., 2001) in two ways. High perceived restorativeness was not necessarily associated with high preference in the current research. However the difference may only be apparent rather than substantive. Where similar natural scene types to those used previously are separated out, the relationship found previously is apparent. Further in the previous research the correlation between familiarity and preference and perceived restorativeness was low. In this experiment it appears familiarity may be playing a role in that low familiarity appears to be associated with low preference for a particular set of natural scenes. For the mixed scenes both preference and perceived restorative value were high, another unexpected result. In fact the only expected result that was clearly present in the data was the low preference and perceived restorative value of the built examples.

This pattern of results raises a number of issues for current theories of preference and the perceived restorative value of scenes. Theories of preference that are based on naturalness and the content of the scenes such as those of Kaplan and Kaplan (1982, 1989) would need to be modified to take account of the low preference for certain types of natural scenes found here and for the high preference for scenes that are clearly mixtures of natural and built elements. Theories of preference that are based on discrepancies between an example and the mental representation of a type (Peron et al., 1998) somewhat paradoxically receive some support from the finding that natural scenes that are low in preference are also low in familiarity. This is paradoxical because, in the research that was designed specifically to test discrepancy theories, familiarity did not appear to play a significant role in preference. Similarly what appeared to be a relatively straight forward argument for the adaptive basis of preference for natural scenes, because natural scenes have the potential for recovery from stress and focussed attention, has become much less straight forward given these results. The low preference for certain types of natural scenes is incompatible with this

view and this is particularly the case as these scenes are perceived as having high perceived restorative value.

Major differences between this research and previous research lie in the use of a wider range of natural scene types and the categorization of scenes as natural, built or mixed based on people's perceptions of the scenes rather than on an experimenter's post hoc inferences. These two differences and the results that spring from them indicate that future research on preference and restorativeness and the relationship between them will have to focus on the issue of scene types and associated issues such as familiarity further reinforcing the significance of scene type documented in previous research (Lamb et al., 1994; Peron et al., 1998). This also indicates that any causal model of the naturalness, preference, perceived restorativeness relationship will probably have to be more complex than would first appear to be the case on looking at the naturalness, preference and perceived restorativeness literature.

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