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Development of the PRCQ: A measure of perceived restorative characteristics of zoo attractions

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ABSTRACT

This study describes the development of the Perceived Restorative Characteristics Questionnaire (PRCQ), a measure of perceived restorative characteristics of zoo attractions. The questionnaire was administered in two zoo attractions. The hypothesized five factor structure of the PRCQ, and relations between perceived restorative characteristics and experienced pleasure in and preference for the attractions were examined. In Study 1, 137 visitors of a Dutch zoo evaluated perceived restorative characteristics of a butterfly garden; In Study 2, 158 visitors evaluated those of a baboon attraction. In Study 1 three factors emerged (fascination, escape and coherence); In Study 2 four factors could be distinguished (fascination, novelty, escape, coherence). Compatibility did not appear as a separate factoring either study. Perceived fascination and escape were significant predictors of experienced pleasure and preference in both attractions. The implications of the findings are discussed.

Zoos strive to give their visitors a memorable experience. But what exactly makes attractions in zoos successful? Knowledge about which characteristics of the attraction positively influence visitor experience, and, especially, being able to measure characteristics that can predict preference and experienced pleasure would be very helpful for zoos.

Research on how characteristics of attractions in zoos influence visitor behaviour is limited, and often observational methods are used. Observational studies typically include tracking visitors through an entire exhibition or exhibit area, conducting time sampling at specific areas, or doing observations of a single exhibit or exhibit area (Bitgood, 2002). For example, researchers have examined how characteristics of the animal and the attraction were related to visitors' movement through a zoo, and stopping time at specific attractions (Bitgood, Patterson, & Benefield, 1988). The characteristics of the animals and attractions were evaluated by the researcher and not by visitors themselves. Also, observational studies do not provide information about visitors underlying feelings and preferences. When a visitor lingers at the tigers for a certain time, it remains unclear whether this is because this visitor finds tigers fascinating creatures, or because the tigers are not visible. Also, we don't get to know if looking at the tiger is a pleasurable experience for this visitor. In order to get more insight in how visitors perceive characteristics of the attraction, and how this is related to their feelings and preferences, questionnaire studies are needed.

Previous research has shown that there is a positive relationship between characteristics of restorative environments and preference for these environments (Laumann, Gärling, & Stormark, 2001; Purcell, Peron, & Berto, 2001). In restorative environments places people can recover from stress and mental fatigue, and experience more positive and less negative affect (Hartig, Evans, Jamner, Davis, & Gärling, 2003; Hartig, Mang, & Evans, 1991). We argue that people will have a preference for, and experience more pleasure at zoo attractions that incorporate characteristics of restorative environments. The goal of this study was to develop a measure of perceived restorative characteristics of attractions in zoos, and examine how perceived restorative characteristics are related to preference for the attraction and pleasurable experiences at the attraction.

1. Attention restoration and restorative characteristics

An influential theory on restorative environments is the attention restoration theory (ART; Kaplan & Kaplan, 1989). Central to the ART is the concept of attention. Directed attention is used when a certain object does not attract attention automatically, but needs active effort to be able to focus on it. In order to be able to direct your attention it is necessary to inhibit all distractions. Directing attention and inhibiting distractions requires effort, and prolonged directed attention leads to directed attention fatigue. For example, when you have been working intensely on a task for considerable time, like writing a paper, this will lead to directed attention

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fatigue. Directed attention fatigue can lead to irritability, impatience, distractibility and an inclination to take unnecessary risks (Kaplan, Bardwell, & Slakter, 1993). An effective way to recover from directed attention fatigue is to spend some time in what Kaplan and Kaplan (1989) have called a restorative environment. So, what exactly makes an environment restorative? Kaplan and Kaplan identified four characteristics of restorative environments that enhance recovery from directed attention fatigue: fascination, being away, extent, and compatibility (Kaplan & Kaplan, 1989).

The first characteristic of a restorative environment, *fascination*, allows people to rely on effortless attention instead of directed attention. When your attention is drawn effortlessly by an interesting object in the environment, you do not need to direct your attention. This effortless attention is resistant to fatigue, and enables you to restore from directed attention fatigue.

Another important restorative characteristic refers to experiencing a sense of *being away*, either physically or psychologically, from your everyday environment. This means that you are in a different setting than usual, and are able to escape from unwanted distractions and reminders of your daily obligations. The component being away is closely related to fascination. When there are no undesirable distractions around you, because you are in a different setting than usual, it will require less effort to focus your attention, so fascination will more easily occur.

The third characteristic is *extent*. Hartig et al. explained that "Extent is treated by the Kaplan and Kaplan (1989) as a function of connectedness and scope" (Hartig, Kaiser, & Bowler, 1997a, p. 4). 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. Scope refers to the scale of the environment, including the immediate surroundings and the areas that are out of sight or imagined. Kaplan (2001) clarified these concepts in terms of a cognitive map that an individual has of the environment. Having a cognitive map of a specific place or domain reduces the need to be vigilant or observant as you can anticipate what might happen and know how to deal with it. Situations in which one can rely on more extensive cognitive maps demand less directed attention. Kaplan (2001) wrote the following:

> In a coherent environment, things follow each other in a relatively sensible, predictable and orderly way. Coherent environments make a cognitive map easier to build and easier to use. But even in a coherent environment, the boundary may come too soon. If the environment has insufficient scope, one must relinquish one's currently running cognitive maps and bring up a different one. This is true whether this deficiency is physical or conceptual. A garden in which one has many things to check out, care for, and wonder about can have vast scope although it is physically small. Extent thus calls on coherence and scope. Insufficient scope terminates the experience; insufficient coherence makes it difficult to experience the setting as a unified entity. From the point of view of restoration, running a single cognitive map for an extended period of time is ideal (p. 488).

The fourth restorative characteristic defined by Kaplan and Kaplan (1989) is *compatibility*, and stands for a fit between the person and the environment. The idea is that being in a highly compatible environment will require little effort, so this helps to restore from directed attention fatigue. And the other way around: To rest directed attention you need to avoid situations where incompatibility may occur, because being in an incompatible situation demands directed attention. Kaplan (2001) defined four aspects of compatibility: information, motivation, (multiple) mental models, and competence. The first aspect of compatibility refers to the amount and kind of information available in the environment. Being in a situation were there is insufficient or inappropriate information to carry out what you wan to do, requires effort (and directed attention). The second aspect of compatibility, motivational compatibility, has to do with the ability to do the things you are inclined or want to do in the environment. Incompatibility occurs when the environment forces one to do something that one does not want (for example you wish to go left, but you can only go straight). The third aspect of compatibility refers to the use of mental models. Incompatibility occurs when an individual is in a situation where it is necessary to run multiple mental models (Kaplan, 2001). A mental model will guide behaviour in a particular setting. In a highly compatible situation using a single mental model will be sufficient. If what you are inclined to do is inappropriate in a situation, or if you have to check yourself constantly to be sure that what you are doing is acceptable, it is necessary to run multiple models at once. Running multiple models will increase the effort substantially, and hence directed attention cost (Kaplan, 2001). The fourth aspect of compatibility refers to level of competence. Incompatibility may occur when the action that one wants to do exceeds what one is capable of doing. An environment with all four types of compatibility satisfied will require little effort, and will help to restore from directed attention fatigue.

Fascination, being away, extent and compatibility can be experienced to various degrees in all kinds of environments, but these restorative characteristics are most likely to be experienced in natural environments. For most people who work and live in cities, nature is a place where they are away from their daily hassles. Nature has many sources of fascination (animals, flowers, water), natural settings are coherent (because it consists of related natural elements), and have scope. There is indeed evidence that people can recover faster in natural settings than in urban settings. People who were exposed natural setting (or to pictures of a natural setting) performed better on an attention task (Berto, 2005; Hartig et al., 2003), and showed more restoration in terms of skin conductance, blood pressure and heartbeat variability (De Kort, Meijnders, Sponselee, & Ijsselsteijn, 2006; Hartig et al., 2003; Laumann, Gärling, & Stormark, 2003), than people who were exposed to an urban setting.

Most studies on restorative environments have focused on restorative experiences in natural environments. However, it is important to look at the restorative potential of other places as well. Some people may not have the opportunity to visit natural settings, and could benefit from the restorative potential of other environments that are more accessible. Kaplan et al. (1993) found some preliminary evidence that people can also have restorative experiences in museums. In addition, Ouellette, Kaplan, and Kaplan (2005) examined the restorative value of a monastery. Zoos may also provide restorative experiences. This restorative experience could also be a motivation for many people to visit and enjoy zoos: They want to get away from their daily hassles, and have a great day to recover from a stressful week at work. The aim of this study is to measure perceived restorative characteristics of attractions in zoos, and to examine how these characteristics are related to visitor experience (i.e. preference ratings and experienced pleasure). To do this, we developed and tested a new instrument: the Perceived Restorative Characteristics Questionnaire.

2. Measuring restorative characteristics

Previous studies have aimed at developing measures for perceived restorative characteristics of urban and natural environments. Hartig, Korpela, Evans, and Gärling (1997b) developed the Perceived Restorativeness Scale (PRS) to measure the four restorative components as proposed by the ART (Kaplan & Kaplan,

1989). In several studies participants were asked to rate perceived restorative components of environments, either on site, using color slide presentations, or from memory or imagination. The results revealed that the four factors could not be distinguished empirically. Instead, two factors emerged, with the items designed to measure being away, fascination and compatibility loading on one empirical factor and the intended extent items loading on the other. It is likely that all extent items loaded on a separate factor because they were all negatively worded, whereas all other items were positively worded. This frequently occurring phenomenon that the valence of items defines a single factor is well described by Bentler et al. (Bentler, Jackson, & Messick, 1971) and Schmitt and Stuits (1985). Also, the extent items of the PRS (Hartig et al., 1997b) did not seem to correspond entirely with the definition of extent (i.e. a function of coherence and scope). In the PRS, extent was measured using four items (there is too much going on, it is a confusing place, there is a great deal of distraction, and it is chaotic here). The items seem to measure how complex people find a specific environment rather than extent.

Following up on this work, Laumann et al. developed the Restorative Components Scale (RCS; Laumann et al., 2001). In two studies, participants had to rate urban and natural environments, in the first study by memory, and in the second study by watching videos of simulated walks in several different environments. Laumann et al. (2001) used four items to measure extent (the elements here go together, the surroundings are coherent, all the elements constitute a larger whole, and the existing elements belong here). Again, the extent items did not seem to fully reflect the theoretical construct as proposed in the ART (Kaplan & Kaplan, 1989). It seems that the extent items only captured the coherence aspect of extent, instead of reflecting both coherence and scope.

Laumann et al. (2001) found a five factor structure in their data gathered with the RCS, largely in line with the four factor structure as proposed by Kaplan and Kaplan (1989). However, the being away factor split into two factors: a physical component (referred to as *novelty*), and a psychological component (referred to as *escape*). This finding seems plausible, because Kaplan and Kaplan's definition of being away also has two components: a physical component (being in different setting than usual), and a psychological component (being able to escape from unwanted distractions and reminders of your daily obligations). So, the distinction between the two being away components is plausible both theoretically and empirically. Therefore, we argue that the two components should be measured separately.

Laumann also examined how restorative characteristics were related to preference evaluations of different environments. In one study, Laumann et al. (2001) found that fascination, novelty, escape, extent and compatibility could predict preferences for both a natural and a city environment which subjects recalled from memory. Compatibility was the most important predictor in both environments, fascination contributed significantly in the natural environment only. In another study, Laumann et al. (2001) found that evaluations of restorative characteristics were able to predict preference for five different environments (using videos of walks in a forest, park, sea area, city and snowy mountain). Again, compatibility was the most important predictor for all environments. Fascination made a significant contribution to the variance in preference for the forest, park and city.

In this study, we developed the Perceived Restorative Characteristics Questionnaire (PRCQ), a new questionnaire inspired on the PRS (Hartig et al., 1997b) and RCS (Laumann et al., 2001) that measures perceptions of five restorative characteristics (fascination, novelty, escape, coherence and compatibility) of attractions in zoos. Following Laumann (2001), *novelty* refers to the physical being away component, and *escape* to the psychological component as defined by Kaplan and Kaplan (1989). We narrowed down the definition of extent to *coherence*, referring to the degree of coherence between elements in the environment, and how well all elements go together. Fascination is defined as the degree to which attention is drawn effortlessly by objects in the environment. Compatibility was defined as the fit between the person and the environment, including four aspects of compatibility: information-fit (does the environment provide the information a person needs), motivation-fit (does the environment support activities a person whishes to perform), clear behavioral norms (does one know how to behave in a setting), and expectation-fit (does the environment confirm expectations). The latter two are related to the use of mental models. In a setting with clear behavioral norms, running a simple mental model will be sufficient, so the directed attention costs are low. A setting that matches with your expectation, and therefore matches with the mental model you have of the setting, will keep directed attention costs low as well. Competence, one of the compatibility aspects defined by Kaplan (2001), was excluded from our definition of compatibilitybecause we think that competence is not relevant in a zoo context.

Only positively worded items were used in the PRCQ, because there is considerable evidence that including positively and negatively worded items within the same scale can lead to differential response patterns (Benson & Hocevar, 1985; Eys, Carron, Bray, & Brawley, 2007; Finney, 2001; QingKe, Dan, Zhao, & Kan, 2006; Weems, Onwuegbuzie, Schreiber, & Eggers, 2003).

The PRCQ was used to evaluate perceived restorative characteristics of two attractions in a Dutch zoo. Relationships between perceived restorative characteristics and visitor experience, that is preference ratings and experienced pleasure were examined. We were interested in preference and pleasure because a successful zoo attraction will get high preference ratings and elicit pleasurable experiences for visitors. Also, the factor structure of the PRCQ was examined. In Study 1 the PRCQ was applied to a butterfly garden. In Study 2 improvements were made to the PRCQ and the PRCQ was applied to a baboon attraction. We hypothesize that high evaluations of perceived restorative characteristics of the attraction result in positive preference ratings for the attraction and a pleasurable experience when walking through (or by) the attraction. In addition, we hypothesize that among the perceived restorative characteristics, five separate restorative components can be found: novelty, escape, fascination, coherence, and compatibility.

3. Study 1

3.1. Environment

The tropical butterfly garden in Emmen Zoo is the largest in Europe (see Fig. 1). The butterfly garden is an immersive attraction: you can walk through, and be entirely surrounded by the attraction. Butterfly garden is located near the entrance of the zoo and is a tropical greenhouse of approximately 1200 square meters. During daytime, the temperature in the butterfly garden is around 25 degrees Celsius. In the garden there are several pathways, a bridge, a pond, a small waterfall, benches, tropical plants, and about 1600 butterflies in various colors and sizes. Some other animals in the butterfly garden are hummingbirds, quails and tree frogs. There are information boards describing the transformation of the butterfly, a glass display with cocoons, plastic flower shaped feeding platforms for the butterflies and signs telling visitors not to touch the butterflies.

3.2. Participants and procedure

This study took place on clear days in Spring and early Summer 2007. Participants were 137 visitors of Emmen Zoo in the

Fig. 1. Butterfly garden in Emmen Zoo (the Netherlands).

Netherlands (45 men, 89 women, 3 people did not fill out this item). Mean age was 40.0 years ($SD = 16.0$). Among participants were 108 people who had been to Emmen Zoo before, of whom 50 people were season-ticket holders. Participants were recruited near the entrance of the butterfly garden, and filled out the questionnaire as they were walking through the butterfly garden. Participants could win a VIP treatment (i.e. free entrance, lunch, and a guided tour) in Emmen Zoo by filling out the questionnaire.

Because literature shows that familiarity and gender do not have a strong influence on perceived restorativeness and preference, we did not control for these variables (Berto, 2007; Purcell et al., 2001; Strumse, 1996).

3.3. Measures

3.3.1. Restorative characteristics

The Perceived Restorative Characteristics Questionnaire (PRCQ) measures perceived restorative characteristics of attractions in zoos, and includes 24 items: 7 items to measure fascination, 3 items to measure novelty, 4 items to measure escape, 3 items to measure coherence, and 7 items to measure compatibility (see Table 2). All items were in Dutch, and were put in random order. Several items were based on the PRS (Hartig et al., 1997b), and the RCS (Laumann et al., 2001). The items focused on the butterfly garden. Participants indicated on a 7-point Likert Scale how much they agreed with the items, ranging from 1 'totally disagree' to 7 'totally agree'.

Table 1
Mean, standard deviation and cronbach alpha scores for restorative characteristics, pleasure, and preference in the butterfly garden (Study 1) and the baboon attraction (Study 2).

	Butterfly garden			Baboon attraction		
	M	*SD*	α	*M*	*SD*	α
Fascination	5.92	.88	.87	5.11	1.20	.88
Novelty	5.48	1.05	.38	4.09	1.35	.85
Escape	5.33	1.14	.73	4.98	1.54	.90
Coherence	5.96	.91	.76	4.93	1.04	.78
Compatibility	6.00	1.00	.84	4.47	.94	.76
Pleasure	5.33	1.39	.92	5.01	1.01	.86
Preference	5.29	1.19	.74	4.77	1.31	.77

3.3.2. Pleasure and preference

Participants indicated on four (seven point) semantic differential items to what extent they experienced pleasure as they were walking through the butterfly garden: happy – sad, pleasure – annoyance, satisfied – dissatisfied, content – bored[1] (Mehrabian & Russell, 1974; Russell, 2003). Reliability of the pleasure scale was good ($\alpha = .92$, see Table 1). Items were mirrored, so a high score on the pleasure scale reflected more experienced pleasure ($M = 5.33$, $SD = 1.39$). Participants gave preference ratings of the butterfly garden by indicating their level of agreement with three statements: "The butterfly garden is my favourite place in Emmen Zoo", and "I like the butterfly garden", and "The butterfly garden is a good place to relax". Cronbach's alpha for the preference scale was acceptable ($\alpha = .74$, $M = 5.29$, $SD = 1.19$).

4. Results and discussion

The multiple group method (MGM), a simple and effective type of confirmatory factor analysis (Guttman, 1952; Nunnally, 1978; Stuive, 2007; ten Berge, 1986), was used to verify whether the data supported the grouping into the five restorative characteristics: novelty, escape, fascination, coherence and compatibility. We calculated mean scores of the items that were supposed to measure each restorative characteristic. Next, correlations were computed between the items and the five restorative characteristics. Corrections for self-correlation and subscale-length were carried out. These corrections are necessary because an item will automatically correlate highly with scales in which it takes part, and correlations of items with a scale that consists of more items will also be higher (Stuive, 2007). Finally, we checked whether the items correlated highest with the restorative component scale they were a priori assigned to. It is assumed that the factor structure (i.e. the distinction of five restorative characteristics) is supported when items correlate highest with the subscale they are assigned to on theoretical grounds (see Nunnally, 1978).

Results from the MGM support the notion that fascination, coherence and escape are distinct components. Six out of seven fascination items correlated highest with the fascination scale and one fascination item correlated slightly higher (.01) with the coherence scale (see Table 2). As Cronbach's alpha of the fascination scale was high ($\alpha = .87$, $M = 5.92$, $SD = .88$, see Table 1), and removing the item did not improve the reliability of the scale ($\alpha = .85$), we decided to keep the specific item in the fascination scale. Three out of four escape items correlated highest with the escape scale ($M = 5.33$, $SD = 1.14$). One escape item correlated

[1] We also measured arousal at the butterfly garden and at the baboon attraction. But because the Cronbach's alpha's for the arousal scales were low ($\alpha = .68$ and $\alpha = .62$, respectively), we decided not to include arousal in the analyses. Information about the used scales to measure arousal is available upon request.

Table 2
Corrected correlations between restorative characteristic items and restorative characteristics via multiple group method (butterfly garden).

	Fas	Nov	Esc	Coh	Com
Fascination					
1. There are many interesting things to see in the butterfly garden.	**.50**	.23	.38	.41	.32
2. There are many beautiful things to see in the butterfly garden.	**.50**	.20	.34	.40	.42
3. Being in the butterfly garden makes me wonder about many things.	**.41**	.19	.32	.30	.27
4. There are many things in the butterfly garden that attract my attention effortlessly.	**.49**	.14	.38	.29	.30
5. There is much to discover in the butterfly garden.	**.47**	.18	.33	.40	.37
6. Butterflies are fascinating animals.	**.46**	.10	.26	.38	.30
7. I find behaviour of butterflies interesting.	.48	.14	.40	**.49**	.43
Novelty					
8. The butterfly garden is very different than my daily environment.	.14	**.21**	.08	.07	.06
9. In the butterfly garden I am engaged in activities that differ from my daily activities.	.16	.17	**.20**	.14	.17
10. There are many things to see in the butterfly garden that are new to me.	**.21**	.16	.19	.09	.09
Escape					
11. In the butterfly garden I can forget about my obligations.	.35	.10	**.45**	.38	.41
12. In the butterfly garden I feel that I am away from everything.	**.54**	.18	.42	.46	.50
13. When I am in the butterfly garden I don't have to worry about other peoples' expectations.	.18	.14	**.33**	.19	.29
14. When I am in the butterfly garden I feel free from my daily routine.	.31	.22	**.49**	.24	.36
Coherence					
15. Butterflies belong in this kind of environment	.31	.07	.18	**.41**	.32
16. Everything I see in the butterfly garden goes well together.	.48	.14	.36	**.59**	.42
17. Everything I see in the butterfly garden belongs there.	.36	.09	.40	**.58**	.42
Compatibility					
18. The butterfly garden matches with what I want to do at this moment.	.41	.07	.42	**.46**	.36
19. In the butterfly garden I can find the information I need.	.40	.10	.36	**.44**	.43
20. In the butterfly garden I can do things I like.	.30	.18	**.41**	.26	.39
21. I know what I can and can not do in the butterfly garden.	.25	.13	.26	.33	**.45**
22. I know how to behave in the butterfly garden.	.30	.11	.31	.29	**.43**
23. What I can see in the butterfly garden fits with my expectations.	.42	.06	.36	**.53**	.44
24. What I can do in the butterfly garden fits with my expectations.	.31	.08	.36	.38	**.44**

Note. For each item, the highest correlation is printed in bold. Correlations are corrected for subtest-length and self-correlation. Fas = Fascination; Nov = Novelty; Esc = Escape; Coh = Coherence; Com = Compatibility.

higher with the fascination scale (see Table 2). Because removing the item would make the Cronbach's alpha for the escape scale drop (from $\alpha = .73$ to $\alpha = .68$), it was decided to keep the item in the scale. All coherence items correlated highest with the coherence scale ($r > .41$), and the reliability of the coherence scale was good ($\alpha = .76$, $M = 5.96$, $SD = .91$).

We did not find strong evidence that novelty and compatibility were distinct components. The novelty items correlated very low with all subscales ($r < .21$, see Table 2). One of the three items correlated highest with the novelty scale, one item correlated highest with the escape scale, and another correlated highest with the fascination scale. Because the Cronbach's alpha for the novelty scale was low as well ($\alpha = .38$, $M = 5.48$, $SD = 1.05$), we concluded that we did not adequately measure novelty, and decided not to include this construct in the remaining of the analyses. Although the Cronbach's alpha for the compatibility scale was high ($\alpha = .84$, $M = 6.00$, $SD = 1.00$), we did not find strong support that compatibility is a distinct component. Only three out of seven compatibility items correlated highest with the compatibility scale (see Table 2). One compatibility item correlated higher with the fascination scale, and three other items correlated highest with the coherence scale. Looking at the content of the items, we could not find an explanation for the findings. For example "The butterfly garden matches with what I want to do at this moment" and "In the butterfly garden I can do things I like" should both measure compatibility between motivations of a person and the butterfly garden, but the first correlated highest with the coherence scale and the latter with the escape scale.

Because we found that fascination, escape and coherence were distinct components, we carried out further analyses with these three factors, leaving novelty and compatibility out of further analyses. Table 3 shows that fascination, escape and coherence are significantly positively related to pleasure and preference. Especially fascination appeared to correlate strongly with pleasure and preference. Correlations among the restorative characteristics were high. Especially fascination correlated strongly with the other restorative characteristics (escape and coherence).

Regression analysis showed that fascination, escape and coherence explained 57% of the variance in preference ($F(3, 114) = 51.21$, $p < .001$, see Table 4). Fascination and escape appeared to be significant predictors of preference. Higher evaluations of fascination ($\beta = .54$, $t = 5.78$, $p < .001$, Table 4 provides confidence intervals), and higher evaluations of escape ($\beta = .16$, $t = 2.06$, $p < .05$) were associated with higher preference evaluations. Regression analysis showed that fascination, escape and coherence explained 27% of the variance in pleasure ($F(3, 107) = 13.25$, $p < .001$; see Table 4). Higher evaluations of fascination were associated with more experienced pleasure ($\beta = .53$, $t = 4.46$, $p < .001$).

5. Study 2

In study two, the PRCQ was applied to the Hamadryas baboon attraction in Emmen Zoo (see Fig. 2). The baboon attraction differs from the butterfly garden in many aspects: The baboon attraction has less plants, the baboon attraction is not an immersive attraction, and there are more distractions in the surroundings. The fact that the baboon attraction is very different from the butterfly garden enables us to test the robustness of the PRCQ scale. The factor structure of perceived restorative characteristics of very different attractions was expected to be similar. We improved the PRCQ, tested the hypothesized five factor structure, and the hypothesis that high evaluations of restorative characteristics of the attraction will predict positive preference ratings for the attraction and experienced pleasure when walking by the baboon attraction.

5.1. Environment

The baboon attraction is an island of approximately 1450 square meters surrounded by a two meter wide moat, and a meter high

Table 3
Correlations between restorative characteristics with the butterfly garden above diagonal and the baboon attraction below diagonal.

	Fascination	Novelty	Escape	Coherence	Preference	Pleasure
Fascination	–	–	.63	.66	.74	.51
Novelty	.62	–	–	–	–	–
Escape	.55	.34	–	.49	.57	.36
Coherence	.52	.63	.35	–	.58	.34
Preference	.69	.54	.66	.46	–	.52
Pleasure	.31	.19*	.29	.23	.36	–

Note. All correlations were significant at $p < .01$, except * $p < .05$.

Table 4
Simultaneous Regression Analyses for Restorative Characteristics of the Butterfly Garden Predicting Preference, and Experienced Pleasure ($N = 137$).

	ß	t	95% Confidence Interval for ß				
			Lower Bound	Upper Bound	R^2	df	F
Dependent Variable							
Preference							
Fascination		.54		5.78**	.36		.73
Escape		.16		2.06 *	.01		.33
Coherence		.14		1.62	−.03		.31
					.57	3114	51.21**
Dependent Variable							
Pleasure							
Fascination	.53	4.46 **	.31	.80			
Escape	−.01	−.11	−.22	.20			
Coherence	.00	.01	−.22	.22			
					.27	3107	13.25**

* $p < .05$. ** $p < .001$.

brick wall. The baboon attraction is located in the middle of the park, and is surrounded by a few other attractions (kangaroos and ring tailed lemurs), a kiosk, and a terrace. The island is covered with sand, rocks, and some dead tree trunks. There is a small rocky hill with caves on the island, and there are a couple of oak trees. The oak trees are protected with electric fence to prevent the baboons from climbing them. There are about 120 Hamadryas baboons on the island including a few infants. Hamadryas baboons are very active animals.

5.2. Participants and procedure

In the second study, that took place on clear days in early Summer 2007, 158 visitors of Emmen Zoo participated (62 men, 93 women, 3 did not fill out this question). Mean age was 40.5 years ($SD = 13.89$). Among participants were 118 people who had been to Emmen Zoo before, of whom 44 people were season-ticket holders. Participants were recruited near the baboon attraction. By filling out the questionnaire participants could win a VIP treatment in Emmen Zoo. Participants filled out the questionnaire as they were walking by the baboon attraction.

5.3. Measures

5.3.1. Restorative characteristics

All items of the PRCQ were rephrased focusing on the baboon attraction instead of the butterfly garden. Because reliability of the novelty scale we used in Study 1 was low, revision was needed. Items were formulated that more explicitly referred to novelty, originality, and uniqueness (see Table 5). From the escape scale we eliminated the item "In the butterfly garden I do not have to worry about what others expect me to do" as this item does not apply well to a zoo context, because many people visit the zoo with others who's needs they need to consider. We added two extra items to the coherence scale, namely "Baboon island looks well organized", and "Everything I see on baboons island fits there". The fascination and the compatibility scale remained unchanged. Although in Study 1 we did not find evidence that compatibility was a distinct component, we decided not to change the compatibility scale at this point. The reliability of the compatibility scale was very high, and removing any item would not affect the Cronbach's alpha of the scale significantly. We wanted to collect more data and examine whether compatibility could be distinguished as a distinct factor in Study 2 using the same scale.

5.3.2. Preference and pleasure

The same scales from Study 1 were used to measure preference and pleasure. Again, participants had to indicate on four (seven point) semantic differential items to what extent they experienced pleasure as they were walking by the baboon attraction: happy – sad, pleasure – annoyance, satisfied – dissatisfied, content – bored. Reliability of the pleasure scale was good ($\alpha = .86$, see Table 1). Items were mirrored, so a high score on the pleasure scale indicate more experienced pleasure ($M = 5.01$, $SD = 1.01$). Participants gave preference ratings of the baboon attraction by indicating their level of agreement with three statements: "Baboon island is my favourite place of Emmen Zoo", "I like the Baboon island", and "Baboon island is a good

Fig. 2. Baboon attraction in Emmen Zoo (the Netherlands).

Table 5
Corrected correlations between restorative characteristic items and restorative characteristics via multiple group method (baboon island).

	Fas	Nov	Esc	Coh	Com
Fascination					
1. There are many beautiful things to see on Baboon island.	**.51**	.44	.30	.33	.31
2. There are many things on Baboon island that attract my attention effortlessly.	**.52**	.44	.35	.33	.35
3. There is much to discover at Baboon island.	**.55**	.42	.39	.27	.34
4. There are many interesting things to see on Baboon island.	**.51**	.46	.34	.28	.34
5. Being at Baboon island makes me wonder about many things.	.49	.41	**.55**	.34	.44
6. I find behaviour of baboons interesting.	.40	.22	**.41**	.20	.25
7. Baboons are fascinating animals.	**.35**	.24	.31	.20	.27
Novelty					
8. There are many new things to see on Baboon island.	.42	**.45**	.24	.30	.28
9. Baboon island is original.	.36	**.58**	.26	.40	.33
10. Baboon island is unique.	.39	**.62**	.33	.42	.35
11. Baboon island is novel.	.34	**.60**	.24	.43	.33
Escape					
11. At Baboon island I can forget about my obligations.	.38	.24	**.71**	.17	.32
12. At Baboon island I feel that I am away from everything.	.39	.30	**.75**	.28	.37
13. When I am at Baboon island I feel free from my daily routine.	.37	.25	**.79**	.20	.39
Coherence					
14. Baboon island is well organized.	.21	.20	.14	**.24**	.16
15. Baboons belong in this kind of habitat.	.28	**.45**	.24	.42	.33
16. Everything I see on Baboon island belongs there.	.28	.38	.23	**.43**	.30
17. Everything I see on Baboon island goes well together.	.31	.49	.24	**.49**	.34
18. Everything I see on baboons island fits there.	.30	.43	.23	**.47**	.36
Compatibility					
19. At Baboon island I can find the information I need.	.30	**.38**	.22	.32	.29
20. At Baboon island I can do things I like.	.40	.33	**.59**	.26	.35
21. I know what I can and can not do at Baboon island.	.25	.19	**.43**	.26	.28
22. I know how to behave at Baboon island.	.22	.07	**.46**	.16	.26
23. Baboon island matches with what I want to do at this moment.	**.33**	.31	.28	.20	.32
24. What I can see on Baboon island matches with my expectations.	.39	**.47**	.30	.41	.37
25. What I can do at Baboon island matches with my expectations.	.42	**.53**	.26	.45	.37

Note. For each item, the highest correlation is printed in bold. Correlations are corrected for subtest-length and self-correlation. Fas = Fascination; Nov = Novelty; Esc = Escape; Coh = Coherence; Com = Compatibility.

place to relax". Again a seven point Likert scale was used, varying from 1 (totally disagree) to 7 (totally agree). Cronbach's alpha for the preference scale was acceptable ($\alpha = .77$, $M = 4.77$, $SD = 1.31$, see Table 1).

6. Results and discussion

The multiple group method (MGM) was used to verify whether the data supported the grouping into the five restorative characteristics: novelty, escape, fascination, coherence and compatibility. Mean scores of the items that were supposed to measure each restorative component were calculated, correlations between the items and the five restorative characteristics were computed, and corrections for self-correlation and subscale-length were carried out.

Results of Study 2 support the notion that fascination, novelty, escape, and coherence are distinct components. All but two fascination items correlated strongest with the fascination scale (see Table 5). Two items correlated slightly higher with the escape scale than with the fascination scale. However, the content of these items "Being at Baboon island makes me wonder about many things", and "I find behaviour of baboons interesting", clearly refer to aspects of fascination. Moreover, the Cronbach's alpha of the fascination scale is high ($\alpha = .88$, $M = 5.11$, $SD = 1.20$, see Table 1), and removing any item would not affect the Cronbach's alpha significantly, so we decided to keep all items in the fascination scale. The novelty scale improved significantly compared to results from Study 1. All novelty items correlated highest with the novelty scale ($.45 < r < .62$), and the reliability of the scale was high ($\alpha = .85$, $M = 4.09$, $SD = 1.35$). Similar results were found for the escape scale. All escape items correlated strongest with the escape scale ($.71 < r < .79$), and Cronbach's alpha for the escape scale was high ($\alpha = .90$, $M = 4.98$, $SD = 1.54$). All but two coherence items correlated highest with the coherence scale ($.24 < r < .47$). One coherence item correlated equally high with the coherence scale ($r = .49$) as with the novelty ($r = .49$) scale. A second coherence item correlated slightly higher with the novelty scale ($r = .45$) than with the coherence scale ($r = .42$). Reliability of the coherence scale was good ($\alpha = .78$, $M = 4.93$, $SD = 1.04$), and removing any item would not affect the Cronbach's alpha, so we decided to keep all items in the coherence scale. Although the reliability of the compatibility scale was high ($\alpha = .76$, $M = 4.74$, $SD = .94$), the MGM did not support the notion that compatibility is a distinct component. All seven compatibility items correlated higher with other scales than with the compatibility scale. Because we found that fascination, novelty, escape and coherence were distinct components, we carried out further analyses with these four factors. Table 3 shows that perceived restorative characteristics, preference, and pleasure were significantly related. Especially correlations between fascination and preference, and escape and preference were high.

Regression analyses were carried out to examine how well fascination, novelty, escape and coherence could predict preference, and pleasure (see Table 6). Fascination, novelty, escape and coherence explained 60% of the variance in preference (F (4, 122) = 45.42, $p < .001$). Fascination, and escape were significant predictors of preference. Higher evaluations of perceived fascination and escape went along with higher preference ratings ($\beta = .41$, $t = 5.00$, $p < .001$, and $\beta = .34$, $t = 4.78$, $p < .05$ respectively, Table 6

Table 6
Simultaneous regression analyses for restorative characteristics of the baboon island predicting preference, and experienced pleasure ($N = 158$).

	ß	t	95% Confidence Intervals for ß				
			Lower Bound	Upper Bound	R^2	*df*	*F*
Dependent Variable:							
Preference							
Fascination	.41	5.00**	.25	.58			
Novelty	.16	1.90	−.01	.31			
Escape	.34	4.78**	.19	.47			
Coherence	.01	.16	−.14	.16			
					.60	4.122	45.42**
Dependent Variable							
Pleasure							
Fascination	.17	1.41	−.07	.40			
Novelty	.01	.06	−.23	.24			
Escape	.25	2.41*	.04	.44			
Coherence	.06	.58	−.15	.28			
					.16	4.120	5.76**

* $p < .05$. ** $p < .001$.

provides confidence intervals). Fascination, novelty, escape, and coherence explained 16% of the variance in pleasure ($F(4, 120) = 5.76$, $p < .01$). Only, escape appeared to be a significant predictor of pleasure ($\beta = .25$, $t = 2.41$, $p < .05$). Higher evaluations of perceived escape resulted in higher pleasure ratings.

7. General discussion

Knowledge about which characteristics of the attraction positively influence visitor experience, and, especially, being able to measure characteristics that can predict preference and experienced pleasure would be very helpful for zoos. This study aimed at developing a new instrument to measure perceived restorative characteristics of attractions in zoos. As a starting point for this study, we used the attention restoration theory (Kaplan & Kaplan, 1989), because previous research showed that perceived restorative characteristics are associated with preference for environments (Laumann et al., 2001; Purcell et al., 2001), and positive affect (Hartig et al., 2003; Hartig et al., 1991). Research on perceived restorativeness has focused mainly on natural and urban environments. We think that it is important to examine restorative potential of other environments through evaluation of perceived restorative characteristics. We hypothesized that the degree to which zoo attractions incorporate restorative characteristics can predict how much pleasure visitors will experience, and their preference for the attraction. To examine this hypothesis, we developed the Perceived Restorative Characteristics Questionnaire (PRCQ), a new instrument to evaluate perceived restorativeness of attractions in zoos. The PRCQ was applied to a butterfly garden (Study 1), and a baboon attraction (Study 2) in a Dutch zoo. The underlying factor structure of the PRCQ was examined. We expected a distinction of five separate restorative characteristics: novelty, escape, fascination, coherence, and compatibility. Also, we examined how perceived restorative characteristics were related to experienced pleasure and preference for the attractions.

The PRCQ was inspired on two existing instruments; the PRS (Hartig et al., 1997b) and the RCS (Laumann et al., 2001). The PRCQ includes only positively worded items, and the items clearly represented the underlying theoretical constructs. In two studies, we examined the hypothesized five factor structure of the PRCQ. In Study 1 three factors emerged: fascination, escape and coherence. Novelty and compatibility could not be distinguished as separate components. For novelty, this might be a measurement problem, as the reliability of the novelty scale used in Study 1 was low. We think that compatibility could not be distinguished as a separate factor due to a conceptual problem. Compatibility is a very broad concept, specifying four different aspects of compatibility. There might be situations where some aspects of compatibility are met, and others are not. In Study 2 four factors could be distinguished as separate factors: fascination, novelty, escape, coherence. We successfully improved the novelty scale as the scale appeared to be very reliable, and clearly distinguishable as a separate factor. In Study 2 compatibility could again not be distinguished as a separate factor. Previous research did find that compatibility could be distinguished as a separate factor (Laumann et al., 2001). However, the definition of compatibility that was used in the study by Laumann et al. was more narrow than our definition. The definition of Laumann et al. (2001) did not entail all four compatibility aspects, but focused on the motivation-fit and a competence-fit between the person and environment. Future research should reconsider the concept of compatibility, and develop more accurate definitions and measures of this multidimensional concept.

The perceived restorative characteristics of the attractions examined in this study were successful in predicting pleasure and preference. In Study 1, we found that fascination, escape, and coherence could explain a large amount of variance in preference, and a reasonable proportion of the variance in experienced pleasure. In Study 2 we found that fascination, escape, coherence, and novelty could predict preference, and experienced pleasure. The results are encouraging, but more data are needed to further validate the questionnaire.

In both studies, we could predict preference better than pleasure. This might be due to the fact that perceived restorative characteristics and preference evaluations are both cognitive evaluations of the environment. These concepts may therefore be more closely related than perceived restorative characteristics and judgments about experienced pleasure, which is an affective evaluation. Preference was measured using three items (X is my favourite place in the zoo, I like X, X is a good place to relax). Although the reliability of the scale was good, the item "X is a good place to relax" might better reflect restorativeness than preference. Future research should consider separate scales for preference and restorativeness.

Fascination (in Study 1 and 2) and escape (in Study 2) appeared to be significant predictors of experienced pleasure and preference for the attraction. Laumann et al. (2001) also found that fascination was a significant predictor of preference for natural environments. The two factors, fascination and escape, describe a psychological evaluation of the interaction between a person and a environment (such as an attraction in a zoo). Coherence and novelty, on the other hand, are more related to characteristics of the environment (or attraction) itself. In Kaplan and Kaplan's (1989) model all perceived restorative characteristics are considered to be on the same hierarchical level. But it is possible that perceived characteristics of the environment influence the psychological evaluation of the person-environment interaction. In other words, coherence and novelty might influence fascination and escape, which in turn influence preference. Future research should examine the causal relationships among perceived restorative characteristics.

A possible limitation of the present study is that with on site data collection, it remains difficult to control for factors that might influence the data, like for example weather conditions. In order to minimize weather influences, both studies were conducted on clear days. There are important benefits of on site data collection. First, participants do not have to rely on memory or imagination, rather they can evaluate the environment directly as they experience it. Second, external validity is high because actual visitors of Emmen Zoo participated in this study, instead of university students.

Another issue is that evaluating one single attraction might be difficult, because the experience might be affected by surrounding attractions or previous experiences. Immersive attractions, like the butterfly garden, might be easier to evaluate, because there are no distractions from surrounding attractions. However, we found similar results for both the butterfly garden and the baboon attraction. This suggests that people are still able to focus on one single attraction despite possible distractions.

This research is very valuable both for zoos and for research on restorative environments. Most studies on restorative environments are restricted to natural or urban environments. This is the first study that has applied the attention restoration theory to a zoo context. We have developed an instrument to measure perceived restorative characteristics of zoo attractions, and gained more knowledge about the positive relationship between perceived restorative characteristics, experienced pleasure, and preference for these attractions. Knowledge about which factors positively influence visitor experience, and being able to measure these factors, could ultimately provide useful guidelines for designing

new attractions or improving existing attractions in zoos. This is particularly relevant because competition between zoos and other attraction parks is growing. Zoos seek new ways to distinguish themselves from other zoos and attraction parks. Once the PRCQ has been validated it can be easily adapted and applied to different fields in order to assess perceived restorative characteristics. Restorative characteristics can, for example, also be relevant for museum designers, city planners, and any other person involved in designing environments.

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