

Thinking of nature

Citation for published version (APA):

Beute, F., & de Kort, Y. A. W. (2019). Thinking of nature: associations with natural versus urban environments and their relation to preference. *Landscape Research*, 44(4), 374-392. Advance online publication. <https://doi.org/10.1080/01426397.2018.1457144>

DOI:

[10.1080/01426397.2018.1457144](https://doi.org/10.1080/01426397.2018.1457144)

Document status and date:

Published: 19/05/2019

Document Version:

Typeset version in publisher's lay-out, without final page, issue and volume numbers

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

www.tue.nl/taverne

Take down policy

If you believe that this document breaches copyright please contact us at:

openaccess@tue.nl

providing details and we will investigate your claim.



Thinking of nature: associations with natural versus urban environments and their relation to preference

Femke Beute & Yvonne A. W. de Kort

To cite this article: Femke Beute & Yvonne A. W. de Kort (2018): Thinking of nature: associations with natural versus urban environments and their relation to preference, Landscape Research, DOI: [10.1080/01426397.2018.1457144](https://doi.org/10.1080/01426397.2018.1457144)

To link to this article: <https://doi.org/10.1080/01426397.2018.1457144>



© 2018 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



[View supplementary material](#)



Published online: 15 May 2018.



[Submit your article to this journal](#)



[View related articles](#)



[View Crossmark data](#)

Thinking of nature: associations with natural versus urban environments and their relation to preference

Femke Beute  and Yvonne A. W. de Kort

Human Technology Interaction, Eindhoven University of Technology, Eindhoven, The Netherlands

ABSTRACT

People generally prefer natural over urban environments, but little is known about what people think about when they see these environments. The aim of the present study was to investigate the associations with these scenes and their relation with preference. In a series of three studies 336 participants were asked to generate associations with photos. Study One manipulated naturalness of the environment as well as weather type. The data were analysed quantitatively by asking participants to rate the associations on valence, and qualitatively by a post hoc pile-sorting task on the associations. We found that associations with natural and sunny environments were more positive than those with urban and overcast environments. Natural scenes seem to elicit mainly positively valenced associations, whereas associations with urban environments were mixed. Content analyses confirmed these outcomes, indicating that how we experience an environment as well as its restorative potential are important for preference formation.

KEYWORDS

Associations; preference; nature; urban; restoration


Introduction

Nature visits or wilderness experiences often leave pleasurable memories—of the peace and quiet of a solitary stroll through a park, of the song of birds and the smell of pine trees during a vigorous hike, or of a convivial picnic in the grass. But we also know that the benefits of nature go well beyond pleasure: favourable health effects of natural environments have been widely established (for reviews see Beute & de Kort, 2014; Tzoulas et al., 2007).

People generally prefer natural over urban environments (e.g. Hartig & Staats, 2006; van den Berg, Koole, & van der Wulp, 2003). Preferences are often thought to serve adaptive purposes, helping us to avoid detrimental environments and approach beneficial ones (Kaplan, 1987; Ulrich, 1983). The preference for natural over urban environments has generally been attributed to evolutionary processes, varying from pre-cognitive reactions based on certain 'preferenda' (Ulrich, 1983) to a more cognitively based intrinsic human need for understanding and exploring our environments (Kaplan, 1987).

The human mind was not passively moulded by the environments in which it evolved (Heft, 2013). Instead, the human perceptual system and human behaviour evolved as a function of *mutual* transactions between us and our environments (e.g. Barker, 1968; Gibson, 1979; Heft, 2013). Therefore, we argue that our actions in—and interactions with—natural environments are of equal importance to environmental preferences as the perceptual properties of that environment. Recent research further

CONTACT Femke Beute  F.Beute@tue.nl

 Supplemental data for this article can be accessed at <https://doi.org/10.1080/01426397.2018.1457144>.

© 2018 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group. This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

substantiates the link between experiences in a given environment and how we evaluate it as the type of work or upbringing influences the perceived restorative potential of natural environments. More specifically, it was found that people working in forestry (von Lindern, Bauer, Frick, Hunziker, & Hartig, 2013) and children of a farming background (Collado, Staats, & Sorrel, 2016) perceive natural environments as less restorative than those who spend less (or no) time working in nature. In a similar vein, Tuan (1974) suggested that beneficial effects of nature stem from the learned associations that we have with it and also Ulrich (1983) points to a potential role of learned associations in explicit preference formation. For these reasons, we wanted to explore the type of associations that people have with natural and urban environments and how the valence of these associations relates to preference for these respective environments.

Associations and preference

Associative patterns are an important component explaining the mechanisms behind the formation of implicit and explicit evaluations. Associative evaluations can be defined as 'automatic affective reactions resulting from particular associations that are activated automatically when one encounters a relevant stimulus' (Gawronski & Bodenhausen, 2006, p. 693). Which association is activated by a given stimulus depends on how associative networks are represented in the brain and on the context in which the association is presented.

A distinction has been made between associative and propositional processes in evaluation (Gawronski & Bodenhausen, 2006; Strack & Deutsch, 2004). Associative patterns robustly affect implicit evaluations, which, in turn, form the basis for further evaluative actions. These associative patterns are transferred to what Strack and Deutsch (2004) refer to as the reflective system. The reflective system forms relational schemata to derive propositions as 'I like this environment'. As opposed to implicit evaluations, their explicit counterparts are dependent on 'truth values' and are adjusted accordingly.

Rationale

Associative patterns are thought to form an important basis for evaluations. This link between associative patterns and evaluations has mainly been investigated for social psychological constructs such as stereotypes (see, e.g. Blair, 2002). Previous research mainly treats preference as an expression of scenic beauty, and a reflection of past positive experiences, and restorative potential (see, e.g. Purcell, Peron, & Berto, 2001; Staats, Kieviet, & Hartig, 2003; van den Berg et al., 2003). Evaluations of environmental scenes could therefore be highly coloured by the associations a person has with that environment. However, little knowledge exists about what people *exactly* think about when they view natural or urban scenes. This is one important motivation behind the current research. In addition, criticism has been expressed regarding the strict dichotomy between natural and urban environments in restoration research (see, e.g. Karmanov & Hamel, 2008). The domain would therefore benefit from knowing exactly what it is in an environment that makes it restorative (see, e.g. Pearson & Craig, 2014). Even though it may appear trivial that different scenes elicit different associations, knowing the exact associations with natural versus urban environments could be a first step in breaking with the prevailing nature–urban dichotomy. It may provide insights on whether it is the 'mere' categorisation as natural versus man-made that may suffice to explain preferences (e.g. Ulrich, 1983) or information processing demands (e.g. Kaplan, 1987), or whether preferences and restorative effects may also—if only in part—be explained by the thoughts, experiences or activities environments offer to us in daily life (e.g. Collado, Staats, & Corraliza, 2013; Tuan, 1974; van den Berg et al., 2003).

In a series of three studies, we investigated the associations people have with photos displaying natural versus urban environments and how these associations related to preference. The question addressed in this paper is whether associative patterns differ between scene types (natural vs. urban), how they are related to preference for these respective scenes, and whether they differ in valence. Moreover, content analyses on all associations were performed to reveal underlying semantic clusters.

Here, we expected to find distinct categories containing positive and negative associations with natural and urban scenes. In addition, to facilitate causal inferences, we asked participants to generate only positive or negative associations with the scenes displayed in Studies Two and Three. Besides replicating earlier research with regards to preference (higher preference ratings for natural as compared to urban environments), we hypothesised that: (1) associations with natural environments would be more positively valenced than associations with urban environments), (2) the valence of associations would be significantly correlated with preference ratings, and (3) if participants are instructed to generate only positive or negative associations with a displayed environment this would significantly affect their preference ratings of this environment.

Study One

Method

Participants generated associations with environmental scenes and subsequently rated these associations on valence. The environmental scenes were then, in a separate run through the images, scored on two dimensions of preference: aesthetics and attitude. In addition to the environment manipulation, we also manipulated weather type (sunny vs. overcast weather), as previous research indicated that besides a consistent preference for natural over urban environments, similar preferential patterns exist for sunny versus overcast and light versus dark environments (Beute & de Kort, 2013; White, Cracknell, Corcoran, Jenkinson, & Depledge, 2014). We expected that natural and sunny environments would evoke more positive associations as well as receive higher preference ratings than urban and overcast environments, respectively. We further expected that valence of associations mediated the effect of scene type on preference.

Design

A within-subjects design was employed. Each subject viewed 12 pictures (of which 4 were filler photos). The experimental photos differed in Environment type (Natural vs. Urban scenes) and Weather type (Sunny vs. Overcast).

Participants

Thirty-eight participants (21 female) completed the study. Their mean age ranged between 19 and 56 years old ($M = 23.29$, $SD = 5.82$). Participants (mostly students) were recruited through an email invitation via our participant database.

Procedure and tasks

Participants read and signed the informed consent form. Then, 12 photos were presented in random order and participants were asked to view the photos and write down all associations that came to mind, even if they were strange or unusual, in the text field below the photo. They were assured that associations are personal and therefore their answers were neither right nor wrong. The associations could be single words or a sentence. A minimum of five associations was required and a maximum of ten associations per photo was allowed.

During the second task, all the associations they had produced were presented to them one by one in the produced order and they rated each on valence. To help participants, the corresponding photos were displayed on the screen. Third, they revisited the photos again—in random order and without the associations they had produced—and rated them on preference. The duration of the experiment was approximately 30 min. Participants were thanked afterwards and received €5.00 compensation.

Manipulation—photos

The stimulus set consisted of 12 photographs. Four photos depicted natural environments and four depicted urban environments¹; all eight photos were taken in, or close to, the same Dutch city. For each environment, two photos were taken in sunny weather and two in overcast weather. To not disclose

Table 1. Frequencies, mean valence, and proportions of each association category per scene and weather type.

Word category	%	Mean valence	Mean valence nature	Mean valence urban	Mean valence sunny	Mean valence overcast	% N	% U	% S	% O
Locations	23.4	4.36	5.09	4.17	4.36	4.37	21.6	78.4	46.5	53.5
Experiential	21.5	4.24	5.01	3.54	4.88	3.35	49.1	50.9	58.6	41.4
Objects	17.7	4.85	5.29	3.97	5.40	4.47	67.5	32.5	59.7	40.3
Activities	13.0	5.04	5.43	4.47	5.37	4.75	60.4	39.7	45.8	54.2
Descriptor	10.9	3.80	3.81	3.79	4.22	3.31	44.3	55.7	54.5	45.5
Temporal	7.6	5.40	5.83	4.63	5.66	4.89	65.2	34.9	67.0	33.0
Animals	3.0	5.03	5.03	–	5.00	5.06	100	0	48.8	51.2
People	1.0	4.18	6.50	3.67	3.80	4.50	18.8	81.2	45.8	54.2

Note: Ratios at least 50% higher in one category than in their counterpart printed in bold.

the contrast between urban and nature scenes as our core interest, four filler photos were added. They depicted holiday-related environments: a city in a tropical country, a tropical city park, a mountaintop, and a busy beach.

Measures

Association valence. Participants rated each association on valence (how negative or positive is this association for you?) using a scale from 1 (very negative) to 7 (very positive). This enabled testing differences in valence of the associations and helped establishing the meanings of the verbal or written responses (Osgood, 1957). On these same associations a content analysis was also performed.

Preference. Preference ratings for each picture were obtained on two dimensions: Aesthetics and Attitude (Staats et al., 2003). Participants rated the aesthetic value ($Preference_{aes}$) on three aspects: *beautiful*, *appealing*, and *pleasant* for aesthetics. For attitude ($Preference_{att}$), they indicated how [*attractive*, *pleasant*, *positive*] it would be to spend an hour in the displayed environment. Response scales ranged from 1 (not at all) to 7 (extremely). Reliability of both dimensions was good (α between .89 and .96 for Attitude and between .83 and .94 for Aesthetics).

Data analysis

For each category (Nature Sunny vs. Nature Overcast vs. Urban Sunny vs. Urban Overcast) the mean scores for preference and association valence were calculated. Subsequently, effects of Environment and Weather types were investigated using repeated measures ANOVAs, with Environment and Weather types as within-subjects variables.

Results

In total, 1550 associations were generated for pictures 1 to 8. Most were very brief, that is, single words or sometimes two or three words. Nine types of associations were collected: locations (e.g. city centre, square); descriptors (e.g. shadow, modern); experiential words (e.g. scary, happy); activities (e.g. hiking, picnic); objects (e.g. tree, cycle); people (e.g. family; grandma); animals (e.g. deer, bird); temporal words (e.g. holiday, summer); and miscellaneous (e.g. fire, test). The majority of associations were locations, experiential words, or objects. See Table 1 for the frequencies, mean valence, and proportions of each association category per scene type.

Content analysis

For the content analysis, a cluster analysis was performed in Anthropic 4.0 (Borgatti, 1996). First, the word set was reduced by only including words that were mentioned at least twice, by two different

participants. In total, there were 186 unique words in the pile, representing 1104 associations (71% of the total set). Words that were entered both in single and plural form (e.g. *car* and *cars*) were collapsed.

This reduced word set was sorted using a pile-sorting task, performed by five persons naïve to the study's purpose. They were instructed to generate between 8 and 10 piles. This restriction was given because the number of categories generated can vary substantially and sorts with fewer categories contribute more to the cluster structure than those with more categories (Alvarado, 1998). The categories were analysed using average linkage cluster analysis, their consensus ranging between .546 and .647. The results of the cluster analyses, including the proportions of association category per cluster are displayed in Table 2.

Several clusters mainly consisted of either nature (Good times & leisure; Nature & animals) or urban scenes (Urban elements; Residential area; Unclutteredness/emptiness), other clusters contained similar amounts of both (Twilight; Under pressure). For the weather manipulation, the distinction was less pronounced, but still some distinct clusters appeared for sunny weather (Good times & leisure) and overcast weather (Urban elements & traffic). Importantly, associations with both natural environments and good weather were coupled with associations with leisure time. Larger proportions of activities and temporal words were found in the more positively valenced clusters. Activities were mentioned more frequently for natural scenes and more temporal words were expressed for both natural and sunny scenes. Experiential words, on the other hand, were found mostly in the clusters scoring highest and lowest in valence and were almost equally divided between the two environment and weather types. Descriptors were mentioned more frequently in the urban scenes and more negatively valenced clusters, whereas the majority of objects and animals were uttered while viewing nature scenes.

Two urban dominated clusters with a relatively positive score also surfaced, although both were quite small ($N < 10$). Surprisingly, little mention was made of people, but if they were mentioned it was much more likely to be for urban scenes. Here, locations were also mentioned more frequently.

Valence of associations

On average, participants generated 42.7 ($SD = 2.62$) associations for eight photos, see Table 3. Significant main effects of Environment and Weather types on the valence of the associations were found. The interaction of Environment * Weather was not significant. As we expected, the Natural scenes induced more positive associations than the Urban scenes did, and the Sunny scenes evoked more positive associations than the Overcast scenes did, see Table 3.

Preference

Preference scores were obtained on two dimensions: aesthetics and attitude. Significant main effects of Environment and Weather types were found on both dimensions. Natural and Sunny environments scored higher on preference_{att} and preference_{aes} than did Urban and Overcast environments, respectively. In addition, a significant interaction of Environment * Weather was found for preference_{att} as well as preference_{aes'} with more pronounced effects of Weather type for natural environments than for urban environments. See Table 4 for the statistics.

Together, these outcomes confirm our hypotheses concerning the effects of environment and weather types on preference ratings.

Significant correlations were also found between the valence of the associations and preference ratings, for both preference_{aes} ($r = .480, p < .001$) and preference_{att} ($r = .491, p < .001$).

Studies Two and Three

In Study One, we learned that there is indeed a positive relation between preferences for a scene and the valence of associations with such a scene. It is highly likely that preferred scenes result in more positive affect and hence help induce more positive associations. But our investigation centred on the question



Table 2. The clusters formed with example associations for Study One.

Cluster title	Mean valence	# items	Example items	% N	% U	% S	% O	% Cat
Good times & leisure	5.29	63	<i>Clear, hay fever, ice cream, spring, relax, flowers, photo, afternoon, grass, hiking</i>	64.0	20.4	50.5	33.0	E 31.3 T 16.2 A 14.4 O 24.8 D 8.0 L 2.4 M .9 P .4
Natural elements	5.19	15	<i>Tree, insects, meadow, rabbits, horses, birds, wild animals, cow, deer</i>	17.1	.5	6.9	10.3	L 38.9 AN 31.6 O 27.4 M 2.1 A 47.6 L 38.1
Leisure urban	4.90	6	<i>Library, dogs, lunching, home, dwell, terrace</i>	1.1	2.7	2.9	.9	M 2.1 A 47.6 L 38.1 AN 14.3
Physical activity	4.87	7	<i>Exercise, walking, running, cycling path, climbing, stairs, losing weight</i>	1.3	3.0	2.0	2.3	L 45.8 A 37.5 D 8.4 O 8.3
Urban elements & traffic	4.15	41	<i>Apartments, high, no parking, bus, inner city, shopping, traffic, work, school, city</i>	3.2	46.7	20.4	30.3	L 58.2 A 18.9 O 17.1 D 2.9 P 1.1 M 1.1 E .7
Residential area	3.36	7	<i>Development, inner city, pavement, street, district, residential area, people</i>	.0	5.9	2.2	3.8	L 84.8 P 5.3 O 3.5
Descriptors	3.06	34	<i>Modern, new, purple, dead, arid, empty, bleak, boring, safe, deserted, old, light</i>	9.0	15.8	11.7	13.2	D 49.6 E 43.7 A 2.9 P 2.2 O 1.5
Twilight	2.96	7	<i>Evening, autumn, cold, dark, overcast, clouds, chilly</i>	2.2	2.7	1.8	3.1	E 48.1 T 33.4 D 18.5
Tense events	2.60	6	<i>Fire, test, hurry, pressure (crowded), cluttered, prickly</i>	2.2	2.3	1.5	3.1	E 68.0 M 32.0
Mean valence associations				5.04	4.02	4.88	4.16	

Notes: Valence scores range between 1 (very negative) to 7 (very positive). N = Nature, U = Urban, S = Sunny, O = Overcast. Ratios at least 50% higher in one category than in their counterpart printed in bold. For the word categories: L = Locations, E = Experiential words, O = Objects, A = Activities, D = Descriptors, T = Temporal, AN = ANimal, P = People, M = Miscellaneous.

Table 3. Means, standard errors, and *F*-statistics for the number and valence of associations.

	Mean (SE)				Environment		Weather		Environment * Weather	
	Sunny	Overcast	Nature	Urban	<i>F</i> (1,37)	η_p^2	<i>F</i> (1,37)	η_p^2	<i>F</i> (1,37)	η_p^2
Valence	4.81 (.11)	4.13 (.10)	4.96 (.13)	3.98 (.13)	23.9**	.39	34.5**	.48	2.3	–
Number	5.46 (.08)	5.21 (.05)	5.32 (.06)	5.36 (.06)	.4	–	9.9*	.21	1.3	–

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

Table 4. Means, standard errors, and *F*-statistics for preference scores.

		Mean (SE)		Environment		Weather		Environment * Weather	
		Nature	Urban	<i>F</i> (1,37)	η_p^2	<i>F</i> (1,37)	η_p^2	<i>F</i> (1,37)	η_p^2
Attitude	Sunny	5.27 (.17) ^{a,c}	2.92 (.13) ^{b,c}	86.4**	.70	15.1**	.29	18.2**	.33
	Overcast	4.60 (.17) ^{a,d}	2.93 (.14) ^{b,d}						
Aesthetics	Sunny	5.37 (.13) ^{a,c}	3.27 (.15) ^{b,c}	88.6**	.71	30.9**	.46	19.0**	.34
	Overcast	4.55 (.16) ^{a,d}	3.12 (.13) ^{b,d}						

Note: Means with the same superscript letter are significantly different.

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

whether associations with a setting would also help shape preferences for that (type of) place, that is, the reverse causal relationship. Studies Two (S2) and Three (S3) therefore intended to replicate Study One (S1) with different photosets, but also sought out to extend the findings by guiding the valence of the associations that were produced by means of a valence instruction. This way, we hoped to learn whether preferences for a scene would be based partly on those salient associations people had just produced. In addition, a between-subjects design was employed instead of a within-subjects design.

Method

The outcomes for S2 and S3 are part of a larger study, which not only investigated the relation of associative patterns with preference, but also investigated the restorative outcomes after associating with natural or urban environments. To this end, both experiments started with a stress induction (S2: Markus & Peters Arithmetic Test, Peters et al., 1998; S3: Retail task, adopted from: Häusser, Mojzisch, & Schulz-Hardt, 2011) after which restoration was tested in terms of mood, physiological responses (S2), and cognitive performance (S2: Necker Cube Task, S3: Sustained Attention to Response Task). Only results concerning the associations and preference ratings will be reported here.

Design

Both studies had a 2*3 between-subjects design of Environment type (Natural, Urban) by Valence instruction (Free, Positive, Negative).

Participants

Participants were recruited from a participant database, including mainly students of the university or the adjacent higher education institute. In S2, 120 participants (45 female) completed the study, with a mean age of 23.3 (SD = 3.2; ranging between 18 and 38). In S3, 178 participants (67 female) participated. Their ages ranged between 18 and 43, with a mean of 22.1 (SD = 3.1). Both experiments lasted approximately 45 min and participants received €7.50 compensation.

Procedure

Upon entering the laboratory, participants read and signed the informed consent form after which the experiment started. First were the baseline measurements, the stress induction task, and checks on the

effectiveness of the stress induction (mood and performance task). After this, participants generated associations with photos containing either natural or urban scenes. Stress was again evaluated (mood and performance task) before participants rated the valence of their associations and reported on task difficulty. Their last task was to rate the four photos on preference.

Manipulation—photos

We again used four images of natural scenes and four images of urban scenes in both studies, all taken in clear weather. Two different sets of images were used for S2 and S3.² The photos for S2 were taken in the same region as those of S1. The photos for S3 were taken in a different city and region, located approximately 90 km away and therefore less familiar to the participants. In S2, the images were displayed on a notebook, whereas in S3 the photos were displayed on a wall-mounted 32-inch television screen.

Manipulation—association generation

In both studies, depending on the experimental condition, participants were either asked to freely associate with the photos (Free), to generate only positive associations, suppressing any negative ones (Positive), or to generate only negative ones, suppressing all positive ones (Negative). The instructions for participants were exactly the same in both studies, but in S2, participants wrote their associations on paper, whereas in S3, participants expressed them verbally (they were recorded using Audacity[®]). Participants listened back to their own associations at the end of the experiment, wrote them down, and rated them on valence at the same time. The reason for changing from written to verbal associations was that verbally expressing associations allowed for more viewing time for the images. No restrictions on the number of associations were given.

Measures

Preference. The photos were rated on preference very similar to S1 (S2: aesthetics & attitude, S3: only attitude), again with good reliabilities (Cronbach's alpha ranging between .88 and .97).

Valence. The associations were rated on valence in a similar way as in S1.

Task difficulty. One item measured how much effort participants felt they had put into the generation of associations (effort) and one measured how difficult participants felt generating the associations had been (difficulty), both on a scale of 1 (not at all) to 7 (very much). In the guided associations conditions, participants were also asked how often they had had to suppress oppositely valenced associations (suppression) on a scale ranging from 1 (never) to 7 (very often).

Data analysis

Preference and valence of the association were calculated by computing the mean over all four photos in a category. ANOVAs were run with Environment and Valence instruction as independent variables and preference and valence of association as dependent variables.

Results

A very similar pattern in association type was found as in S1 with two exceptions: (1) in the guided associations conditions, locations were mentioned less frequently; (2) one additional association type surfaced concerning events (e.g. fire, murder). See Tables 5–8.

Content analysis

For the content analysis, two unique piles of associations were extracted for each study: one for the free condition and one for the guided valence conditions. Table 9 displays the number of words in each

Table 5. Frequencies, mean valence, and proportions of each association category per scene for the free associations of S2.

Word category	%	Mean valence	Mean valence nature	Mean valence urban	% N	% U
Locations	17.7	4.89	5.23	4.65	33.6	66.4
Experiential	22.4	5.20	5.63	4.39	56.6	43.4
Objects	17.7	4.46	4.94	3.86	46.2	53.8
Activities	16.5	5.37	5.64	4.67	63.7	36.3
Descriptor	11.2	4.15	5.21	3.47	31.9	68.1
Temporal	8.2	6.00	6.05	5.78	77.3	22.7
Animals	2.5	5.00	5.00	–	100	0
People	2.3	5.43	5.57	5.29	44.3	55.7

Note: Ratios at least 50% higher in one category than in their counterpart printed in bold.

Table 6. Frequencies, mean valence, and proportions of each association category per scene and valence instruction for the guided conditions of S2.

Word category	%	Mean valence	Mean valence nature	Mean valence urban	Mean valence		% N	% U	% P	% N
					pos	neg				
Locations	4.2	5.24	5.93	4.89	5.50	3.40	33.0	67.0	83.5	16.5
Experiential	37.9	4.76	5.17	4.34	6.14	2.55	48.5	51.5	46.8	53.2
Objects	13.9	4.62	4.97	4.20	5.86	2.38	50.9	49.1	54.1	45.9
Activities	10.7	5.22	5.53	4.57	5.48	2.70	64.4	35.6	86.9	13.1
Descriptor	17.0	4.38	4.42	4.34	5.83	3.24	43.4	56.6	33.1	66.9
Temporal	7.1	6.20	6.26	6.11	6.23	4.00	57.8	42.2	97.9	2.1
Animals	1.5	4.71	4.71	–	5.88	3.17	100	0	38.7	61.3
People	1.0	3.63	4.20	2.67	4.80	1.67	42.7	57.3	62.7	37.8
Events	5.8	2.24	1.95	2.41	7.00	1.86	40.8	59.2	4.2	95.8

Note: Ratios at least 50% higher in one category than in their counterpart printed in bold.

Table 7. Frequencies, mean valence, and proportions of each association category per scene and for the free associations of S3.

Word category	%	Mean valence	Mean valence nature	Mean valence urban	% N	% U
Locations	18.7	4.77	5.19	4.59	27.6	72.4
Experiential	20.7	5.10	5.54	4.71	44.8	55.2
Objects	19.0	4.61	4.68	4.44	66.0	34.0
Activities	14.0	5.39	5.62	4.90	65.3	34.7
Descriptor	14.2	4.56	4.98	4.27	38.0	62.0
Temporal	7.6	5.62	5.87	4.96	70.0	30.0
Animals	3.3	4.50	4.50	–	100	0
People	2.2	4.00	6.00	3.91	3.6	96.4

Note: Ratios at least 50% higher in one category than in their counterpart printed in bold.

pile and the percentage these unique words represent of the total word set. For the pile sorting task and cluster analysis, the exact same procedure was followed as in S1, except that participants were also asked to make a short description of each pile on a post-it after sorting the words. The results of the cluster analyses are displayed in Tables 10–13.

Similar to S1, in the free association conditions of both studies very distinct categories were found for natural and urban environments. Moreover, associations with nature were often related to leisure time or holiday, which was again also reflected in higher proportions of activities and temporal words mentioned for natural scenes than for urban scenes (see Tables 5–8). This pattern also occurred for mixed categories (Leisure), scoring relatively high on valence. Similar to S1, large proportions of experiential words surfaced for clusters scoring high *and* low on valence.

After guiding the valence of the associations, a clear distinction between natural and urban categories remained. In addition, distinct categories for the valence manipulation surfaced as well and experiential words were equally distributed between the positive and negative association conditions. In S2, more objects were mentioned for natural scenes and in the positive condition, whereas descriptors surfaced

Table 8. Frequencies, mean valence, and proportions of each association category per scene and valence instruction for the guided conditions of S3.

Word category	%	Mean valence	Mean valence nature	Mean valence urban	Mean valence pos	Mean valence neg	% N	% U	% P	% N
Locations	8.6	4.85	5.15	4.81	5.14	3.36	12.5	87.5	77.3	22.7
Experiential	39.9	4.28	4.28	4.29	5.73	2.50	56.6	43.4	44.4	55.6
Objects	10.2	4.58	4.74	4.26	5.27	2.74	65.1	34.9	63.9	36.1
Activities	7.5	5.23	5.23	4.97	5.54	3.48	71.3	28.7	78.3	21.7
Descriptor	24.4	3.92	4.17	3.77	5.18	2.81	35.1	64.9	36.4	63.6
Temporal	3.9	5.81	5.87	5.44	6.02	3.50	86.4	13.6	89.6	10.4
Animals	2.7	4.46	4.43	6.00	5.09	3.24	97.8	2.2	55.2	44.8
People	.9	5.69	5.91	5.20	6.15	3.67	66.2	33.8	73.4	26.6
Events	1.2	2.18	2.22	2.00	–	2.18	80.0	20.0	0	100

Note: Ratios at least 50% higher in one category than in their counterpart printed in bold.

Table 9. Distribution of (unique) words per word pile.

Word set	# words in total	# words in pile	# piles	# represented words of total set	% represented words of total set
S2 free	985	170	7–9	644	65
S2 guided valence	1483	200	10–12	1069	72
S3 free	2031	126	9–11	1139	56
S3 guided valence	2968	184	6–8	1855	63

more frequently for urban scenes (S2 free & S3) and negative instructions (S2 & S3). Clusters dominant in the positive valence condition were often also dominant in the nature condition and contained relatively high proportions of activities and temporal words. Interestingly, in S3 a compound cluster was formed of negative terms and urban elements. Whereas the negative cluster in S2 contained both natural and urban associations, urban associations dominated the cluster in S3. In all word sets, a traffic cluster surfaced that was dominated by urban associations and had low valence scores.

Even though we did not manipulate weather type on the photos in these studies, in three of the four word sets a weather cluster did surface. In all cases these clusters were comprised of an approximately equal percentage of natural and urban associations. The clusters that were found were largely in line with the labels that sorters had given to their piles in the pile sorting task, with frequently mentioned labels including nature, traffic, leisure, urban, and the weather/seasons.

Valence of associations

The valence of associations was compared between conditions, see Table 14 for the means and *F*-statistics. For both studies, a significant main effect of Valence instruction on the valence of the associations was found. For S2, all planned contrasts were significant ($p < .001$); similar for S3 ($p < .004$). These results indicate that our Valence instruction was successful in guiding the valence of associations, or in other words, that our manipulation was successful.

A significant main effect of Environment as well as a significant interaction of Environment * Valence instruction on valence of the associations were found for both studies. As in Study One, associations with natural environments were more positive than those with urban environments in the free conditions of both studies. For the guided conditions, Environment no longer affected valence of the associations in S3. In contrast, in S2 natural environments, compared to urban environments, resulted in more extremely valenced associations in both guided conditions: more positive in the positive association condition, but also more negative in the negative association condition.

The total number of associations that participants generated with the photos ranged between 4 and 40 in S2 ($M = 20.52$, $SD = 8.15$), and between 4 and 73 in S3 ($M = 28.30$, $SD = 12.46$). The number of

Table 10. The clusters formed for S2 for the free associations.

Cluster title	Mean valence	# items	Example items	% N	% U	%	
Feeling secure	5.75	13	<i>Dogs, choices, new, relaxed, rustic, clear, silence, safe, open, pretty, space, quiet</i>	10.3	6.4	E	79.2
						AN	11.3
						D	7.5
						O	1.9
						T	36.0
Leisure	5.65	12	<i>Beer, going out, fun, friends, glass, night, parents, weekend, Sunday, Dutch Design Week</i>	4.2	3.4	P	32.0
						A	12.0
						O	8.0
						E	4.0
						AN	4.0
Nature & holiday	5.41	75	<i>Evening, grass, hilly, camping, walking, Paris, heat, travelling, leisure, camp fire</i>	75.3	20.1	E	20.4
						O	20.1
						A	19.0
						L	13.3
						T	13.0
						D	10.9
						AN	2.7
						M	.6
Urban & traffic	4.39	49	<i>Car, bicycle, traffic jam, work, reflection, rules, station, grey, students, human, city</i>	7.1	56.8	L	37.3
						O	23.7
						A	22.0
						D	8.5
						E	5.6
						P	2.8
Unpleasant feelings and descriptors	2.77	21	<i>Alone, dark, scary, boring, alley, ugly, thirsty, white, hide, burned, energy waste</i>	3.2	13.3	E	46.8
						D	34.0
						L	6.4
						M	6.4
						P	4.3
						O	2.1
Mean valence associations				5.37	4.34		

Notes: Valence scores range between 1 (very negative) to 7 (very positive). N = Nature, U = Urban, S = Sunny, O = Overcast; Ratios at least 50% higher in one category than in their counterpart printed in bold. For the word categories: L = Locations, E = Experiential words, O = Objects, A = Activities, D = Descriptors, T = Temporal, AN = ANimal, P = People, M = Miscellaneous.

associations in both studies differed significantly between all different valence instruction conditions (*all* $p < .016$).

A number of questions were included to investigate how participants rated the association-generation task. No difference in effort was found between the conditions for either study. In S3, all conditions were also rated as equally difficult, whereas a significant main effect of Valence instruction and a significant interaction of Environment * Valence instruction were found in S2. Planned contrasts revealed significant differences in perceived difficulty between all three Valence instructions (*all* $p < .006$). Table 14 shows that guiding associations led to an increase in perceived difficulty for the urban environments, irrespective of whether these associations had to be positive or negative. For the natural environments, only the negative associations were perceived to be more difficult to generate than the positive and free associations. Furthermore, generating positive associations was perceived to be more difficult in the urban condition than in the nature condition.

In the guided-association conditions, participants were further asked to what extent they had suppressed oppositely valenced associations. This analysis yielded mixed results for the two studies. In both studies a significant main effect of Valence instruction as well as an interaction of Environment * Valence was found. In S2, no main effect of Environment was found, whereas this main effect did reach significance in S3. In both studies, participants in the urban conditions had to suppress roughly equal amounts of associations in the positive and negative conditions, whereas participants in the natural conditions reported having suppressed more associations in the negative than in the positive condition. In other words, participants who were asked to generate negative associations with nature had to suppress many positive associations, whereas those that were asked to generate positive associations

Table 11. The clusters formed for S2 for the guided associations.

Cluster title	Mean valence	# items	Example items	% N	% U	% pos	% neg		%
Holiday and leisure experiences	6.15	24	<i>Family, beer, glass, relaxed, healthy, travelling, leisure, unknown, music</i>	12.6	7.9	15.3	2.7	E	45.9
								T	28.8
								L	7.2
								D	6.3
								P	5.4
								O	3.6
Clarity	6.14	7	<i>Diversity, clear, ordered, clean, happy, free, distinctness</i>	2.3	2.2	3.5	.2	D	54.2
								E	45.8
								A	2.7
Leisure activities	5.71	13	<i>Spring, walking, picnic, fun, scouting, sport, hiking, enjoy, swimming, playing</i>	10.6	2.0	10.7	.0	A	88.7
								T	11.3
Weather & Seasons	5.53	28	<i>Ice cream, light, cold, heat, wind, clouds, summer, sun, hay fever, beach, water</i>	22.7	21.8	26.9	15.0	E	50.0
								O	17.2
								D	16.0
								T	12.6
								M	2.5
								EV	2.5
								A	1.3
Natural elements and experiences	5.34	30	<i>Forest, outdoors, lake, path, animals, nature, open, birds, silence, clean air</i>	27.3	11.1	27.8	6.8	E	36.2
								O	28.1
								D	20.0
								AN	7.6
								L	4.8
								EV	1.9
								A	1.0
								P	.5
								T	44.4
								E	11.1
Nostalgia	5.00	6	<i>Choices, former times, Sunday, reflection, romance, light at the end of the tunnel</i>	.5	1.2	1.4	.0	D	11.1
								E	11.1
								M	33.3
								D	61.8
								E	22.4
Urban experience and descriptors	4.16	14	<i>Evening, night, new, large, cosy, alley buildings, hiding, white, hide, rustic, dark</i>	3.9	10.7	4.0	12.1	L	5.3
								EV	5.3
								T	2.6
								O	2.6
Inner city	3.98	22	<i>Fire, house, students, waste, party, city life, hairdresser, city, narrow, shopping</i>	1.1	10.3	4.9	6.3	L	36.2
								EV	15.5
								A	13.8
								E	12.1
								D	10.3
								O	8.6
								P	3.4
								O	34.0
Traffic	3.44	23	<i>Car, noise, tunnel, red light, traffic, driving licence, curve, scooter, exhaust</i>	3.2	15.0	4.7	15.2	E	25.5
								A	25.5
								D	8.5
								EV	6.4
								E	55.3
Bad events and experiences	2.32	33	<i>Afraid, danger, ugly, accident, murder, boring, deserted, lost, dirty, hunger, tired</i>	15.8	17.8	.9	41.8	EV	21.8
								D	11.2
								A	6.7
								O	3.4
								P	1.1
								L	.6
								Mean valence associations	

Notes: Valence scores range between 1 (very negative) to 7 (very positive). N = Nature, U = Urban, S = Sunny, O = Overcast; Ratios at least 50% higher in one category than in their counterpart printed in bold. For the word categories: L = Locations, E = Experiential words, O = Objects, A = Activities, D = Descriptors, T = Temporal, AN = ANimal, P = People, EV = EVent, M = Miscellaneous.

Table 12. The clusters formed for S3 for the free associations.

Cluster title	Mean valence	# items	Example items	% N free	% U free		% cat
Nature & Leisure	5.21	63	<i>Active, Photography, green, rabbits, hiking, Sunday, leisure, birds, terrace, play</i>	77.1	24.3	A	22.9
						E	22.7
						O	22.1
						L	10.8
						D	8.4
						AN	6.4
						T	5.1
						P	1.2
						M	.5
						Weather & feelings	4.99
Urban locations and descriptions	4.40	27	<i>Flats, glass, farm, cinema, park, shops, living, working, concrete, architecture, empty</i>	3.9	38.3	L	54.7
						D	24.0
						O	9.3
						A	8.4
						E	3.6
Traffic & Urban locations	4.14	11	<i>Village, parking, street, road, bus, car, busy, road works, bump, the Netherlands</i>	.7	14.0	O	44.3
						L	32.9
						E	15.2
						A	5.1
						D	2.5
Elderly	3.80	3	<i>Family, bold, old people</i>	.3	4.3	P	72.0
						D	28.0
Mean valence associations				5.20	4.56		

Notes: Valence scores range between 1 (very negative) to 7 (very positive). N = Nature, U = Urban, S = Sunny, O = Overcast; Ratios at least 50% higher in one category than in their counterpart printed in bold. For the word categories: L = Locations, E = Experiential words, O = Objects, A = Activities, D = Descriptors, T = Temporal, AN = ANimal, P = People, M = Miscellaneous.

with nature had to suppress only a few negative associations. Furthermore, participants had to more frequently suppress negative associations and less frequently suppress positive associations for natural environments than for urban environments.

Preference

In S2, preference was measured on two dimensions; aesthetics and attitude. In S3, only preference_{att} was measured. For preference_{aes} (S2), a significant main effect of Environment was found. Ratings were not affected by Valence instruction nor did they show an interaction of Environment * Valence instruction. Preference_{att}, on the other hand, was affected by both Environment and by Valence instruction in S2. Planned contrasts revealed a significant difference between the positive and negative conditions ($p = .009$), with a higher preference_{att} score in the positive than in the negative condition. No interaction of Environment * Valence instruction was found. Contrary to S2, no main effect of Valence instruction was found in S3, whereas the interaction of Environment * Valence instruction did reach significance. Natural environments scored higher on preference than urban environments did in all conditions. Furthermore, valence instruction affected preference scores for urban, but not for natural environments. For the urban environments, preference scores were lower in the negative condition compared to the free and positive conditions, see Table 15.

Correlational analyses also yielded some mixed results. In S2, even though Valence instruction did not affect preference_{aes} ratings, the valence of the generated associations was significantly correlated with both preference_{aes} ($r = .27, p = .004$) and preference_{att} ($r = .34, p < .001$). When controlling for environment type, the correlation remained significant for preference_{att} ($r = .30, p = .002$) but was only marginally significant for preference_{aes} ($r = .19, p = .051$). These results indicate that environments scored higher on preference when more positive associations were generated with these environments, and



Table 13. The clusters formed for S3 for the guided associations.

Cluster title	Mean valence	# items	Example items	% N	% U	% pos	% neg	% cat
Leisure	5.30	54	<i>Active, relaxed, walking, cosy, family, day out, tired, cheerful, shopping, holiday, freedom</i>	35.8	21.5	32.6	13.6	E 53.0 A 23.6 D 11.8 T 6.1 EV 2.6 P 2.4 O .3 L .2 E 50.3 D 22.1 T 13.6 O 10.9 M 3.1 O 37.6 D 31.0 AN 17.2 E 7.6 A 2.1 L 4.5 O 28.6 E 25.6 D 24.8 L 18.0 P 2.3 A .7 E 41.7 D 33.6 L 20.3 EV 1.3 O 1.3 M .8 A .8
Weather & seasons	4.90	25	<i>Autumn, hay fever, sky, wet, wind, summer, clouds, dry, no sun, light, spring, grey, warm</i>	16.7	14.7	15.3	11.5	
Natural elements and descriptions	4.72	24	<i>Trees, forest, dog, insects, rabbits, nature, plants, green, grass, wild animals, fresh air</i>	24.4	5.0	32.6	13.6	
Traffic	3.80	20	<i>Cars, public transport, no cars, parking, children, bus, many people, busy road</i>	.9	14.8	4.3	9.9	
Urban experiences and descriptions	3.27	61	<i>Dead, dark, dangerous, small, office, modern, old, pain, home, view, shops, no garden</i>	22.2	44.1	15.2	51.5	
Mean valence associations				4.51	4.22	5.47	2.69	

Notes: Valence scores range between 1 (very negative) to 7 (very positive). N = Nature, U = Urban, S = Sunny, O = Overcast; Ratios at least 50% higher in one category than in their counterpart printed in bold. For the word categories: L = Locations, E = Experiential words, O = Objects, A = Activities, D = Descriptors, T = Temporal, AN = ANimal, P = People, EV = Events, M = Miscellaneous.

Table 14. Means, standard errors, and *F*-statistics for preference scores for S2 and S3.

S2		Mean (SE)			Environment		Valence		Environment * Valence	
		Free	Pos	Neg	<i>F</i> (5,114)	η_p^2	<i>F</i> (5,114)	η_p^2	<i>F</i> (5,114)	η_p^2
Attitude	Nature	5.08 (.24) ^b	5.33 (.15) ^c	5.22 (.15) ^d	182.5**	.62	3.8*	.06	.8	–
	Urban	3.50 (.18) ^b	3.53 (.15) ^{a,c}	3.06 (.15) ^{a,d}						
Aesthetics	Nature	5.27 (.16) ^b	5.27 (.15) ^c	5.05 (.15) ^d	173.5**	.60	–	–	–	–
	Urban	3.55 (.15) ^b	3.78 (.15) ^{a,c}	3.18 (.15) ^{a,d}						
S3					<i>F</i> (5,171)	η_p^2	<i>F</i> (5,171)	η_p^2	<i>F</i> (5,171)	η_p^2
Attitude	Nature	5.11 (.15) ^a	5.02 (.15) ^b	5.22 (.14) ^c	164.4**	.49	.7	–	3.1*	.04
	Urban	3.72 (.15) ^{a,d}	3.78 (.15) ^{b,e}	3.31 (.15) ^{c,d,e}						

Note: Means with the same superscript letter are significantly different.
 p* < .05; *p* < .001.

Table 15. Means, standard errors, and *F*-statistics for preference scores for S2 and S3.

S2		Mean (SE)			Environment		Valence		Environment * Valence	
		Free	Pos	Neg	<i>F</i> (5,114)	η_p^2	<i>F</i> (5,114)	η_p^2	<i>F</i> (5,114)	η_p^2
Attitude	Nature	5.08 (.24) ^b	5.33 (.15) ^c	5.22 (.15) ^d	182.5**	.62	3.8*	.06	.8	–
	Urban	3.50 (.18) ^b	3.53 (.15) ^{a,c}	3.06 (.15) ^{a,d}						
Aesthetics	Nature	5.27 (.16) ^b	5.27 (.15) ^c	5.05 (.15) ^d	173.5**	.60	–	–	–	–
	Urban	3.55 (.15) ^b	3.78 (.15) ^{a,c}	3.18 (.15) ^{a,d}						
S3					<i>F</i> (5,171)	η_p^2	<i>F</i> (5,171)	η_p^2	<i>F</i> (5,171)	η_p^2
Attitude	Nature	5.11 (.15) ^a	5.02 (.15) ^b	5.22 (.14) ^c	164.4**	.49	.7	–	3.1*	.04
	Urban	3.72 (.15) ^{a,d}	3.78 (.15) ^{b,e}	3.31 (.15) ^{c,d,e}						

Note: Means with the same superscript letter are significantly different.
 p* < .05; *p* < .001.

these effects occurred irrespective of the environment. Counter to our expectations, no significant correlation was found between valence of association and preference_{att} scores (*r* = .10, *p* = .171) in S3.

General discussion

In this paper, the associations with urban and natural environments were explored as well as their relation with preference formation. Consistently across all three studies, we found that natural environments elicited more positive associations than urban environments did. These findings are in line with previous assertions made in restoration theories concerning learned associations with nature (Tuan, 1974; Ulrich, 1983). Furthermore, in Study One a similar outcome was found for weather type, with more positive associations generated for sunny than for overcast weather.

Guiding the valence of associations with natural and urban scenes

In Studies Two and Three, valence of associations was experimentally manipulated by instructing participants to generate either only positive, or only negative associations. In both studies, these manipulations were successful in guiding the valence of associations made. In Study Three, in spite of this valence instruction, environment type still significantly affected valence ratings of the associations in the guided association conditions. Even though participants were instructed to generate positive associations, associations with nature turned out to be more positive in the positive association condition than associations with urban environments. However, the opposite effect was found in the negative condition, where nature elicited more negative associations than urban environments did. The latter is particularly striking, as participants also reported suppressing more positive associations

in the nature negative condition than in the urban negative condition. Because these effects were not found in Study Two, they could be due to the specific photographs used in Study Three with the natural environments possibly eliciting more extreme associations, both positively and negatively.

The relationship between associations and preference

Correlation outcomes signalled a significant relation between the valence of associations and preference. However, the correlations were generally moderate, indicating that both constructs overlap but are not one and the same thing. The guided association conditions were added to shed more light on the exact relation between associations and preference. The results from the valence manipulation rendered mixed results for natural and urban environments. For natural environments, even when participants were instructed to generate negative associations, preference remained unaffected. In other words, even participants that had been instructed to think of negative associations with nature, still scored the natural environments equally high on preference as those that had been instructed to generate positive associations or to associate freely. Interestingly, urban preference ratings *were* affected by valence instruction in both Studies Two and Three, resulting in lower preference scores after generating negative associations than after generating positive associations. These findings could be explained in terms of attitude strength, which is manifested in *durability* and *impactfulness* of the attitude (Petty & Krosnick, 2014). According to Petty and Krosnick (2014), one of the manifestations of durability is resistance to manipulations. Indeed, the more consistent positive attitude towards natural environments could reflect a stronger attitude as it appeared unsusceptible to our manipulation. On the contrary, the attitude towards urban environments appears to be much weaker, as the attitude score was malleable by guiding the valence of the associations.

Additional support for this claim could be found by examining how participants rated the association generation assignment. In Study Two, generating negative associations with natural environments was perceived as more difficult than generating positive associations, but also more difficult than generating negative associations with urban environments. Furthermore, in both studies, participants reported suppressing the highest number of associations in the nature negative condition. Thus, for natural environments the positive associations appeared to be more salient than negative associations, whereas urban environments elicited both positive and negative associations.

Besides investigating the role of valence of associations for environmental preferences, we also wanted to explore the content of the associations in order to progress in the quest to add more nuance to the apparent urban-nature dichotomy. A number of clusters frequently recurred: leisure/holiday, nature, traffic, the weather/seasons, and urban elements.

In all studies, one or more leisure clusters surfaced. These clusters generated the most positive valence scores and were often dominated by natural scenes. These findings are in line with the 'Being Away' component (Kaplan, 1987) central in the cognitive theory of restoration, indicating that the restorative potential of environments rely—at least partly—on the ability to mentally distance visitors from their daily hassles. Similarly, research has indicated that the perceived restorative potential of natural environments is lower for those who work in forestry on a daily basis (von Lindern et al., 2013). In two instances, urban associations were also represented, pointing to the potential of urban leisure environments for restorative urban experiences. Indeed, previous research has already pointed at restorative urban environments that are highly related to leisure, such as urban blue space (Völker & Kistemann, 2013), museums (Kaplan, Bardwell, & Slakter, 1993), and urban parks (Tyrväinen et al., 2014).

Looking into the type of associations in more detail, it was found that leisure clusters generally contained a relatively large proportion of activities which, in turn, were more frequently mentioned for natural scenes (e.g. picnic, hiking, swimming) and generally scored high on positive valence. These findings further stress the importance of another component of Attention Restoration Theory: compatibility (Kaplan, 1987), or the ability of the environment to support restorative activities. This ties well with previous research stating that preference and restorative potential are related (Purcell et al., 2001; van den Berg et al., 2003).

In Study One, besides environment, weather type was also manipulated. In this experiment, few distinct clusters were found for associations with sunny versus overcast scenes. Interestingly though, weather-related clusters were found in Studies Two and Three as well, even though the weather was not formally manipulated. The type of associations that were generated corroborated these findings. A category that generally scored high on valence and that was mentioned more frequently for natural scenes contained temporal words (e.g. summer, Sunday, holiday). These associations were often related to good weather and were therefore also expressed much more often for sunny scenes in Study One. Temporal words related to bad weather (e.g. autumn) surfaced in clusters scoring lower on valence. Together, these findings are in line with previous research stating that weather type matters for the appraisal of environmental scenes (Beute & de Kort, 2013; White et al., 2014). In addition, bad weather can put constraints on restorative potential, leading to higher depression rates (Hartig, Catalano, & Ong, 2007) which again—albeit indirectly—points to the importance of restorative potential for preference ratings.

We hypothesised that experiences shape preference formation. Experiential words were equally divided between environment type, weather type, and valence instruction (in the guided conditions). In fact, looking at the distribution of experiential words over the clusters a pattern emerged with high proportions of experiential words in clusters at both ends of the valence scale: very negative and very positive. Thus, unlike activities and temporal words which were generally related with high valence, experiences appear to influence valence and preference bidirectionally and with no distinction between the environment types.

Like natural associations, urban associations were often clustered together, either within a broad 'urban' category or in smaller clusters related, for instance, to traffic, the inner city, or to urban experiences. When investigating the type of associations made, it became clear that urban scenes were more often related with locations (e.g. library, square, inner city) and often also with people (e.g. skaters, students, cyclists) and descriptors (e.g. modern, shadow, new).

In the guided valence conditions, distinct clusters were found for the negative versus positive instructions in the guided valence conditions. However, there were also still clusters that were dominated by natural and by urban elements. In addition, these clusters were largely in line with those found in the free association conditions which are in line with our previous assertion that urban environments seem to elicit a mix of positive and negative associations, whereas associations with nature are more dominated by positive associations. This, therefore, is suggestive of the strength of the associations we have with natural and urban scenes but also of the strength of natural and urban as classes of high-level categorisation, that is, the nature–urban dichotomy.

Even though we used a different photoset in each study (24 different photos in total), results may not be generalised to every possible natural or urban environment as the photos were prototypical of the Netherlands. It would be advisable to test whether these relations hold for a larger variety of natural and urban scenes. In addition, previous research has indicated that other senses beside sight could also add to preference perceptions (Kroh & Gimblett, 1992). Therefore, other associations may surface when people are in an actual natural environment instead of looking at the picture.

Our results suggest that—as we hypothesised—the higher preference ratings for natural environments partly stem from the experiences that our participants had had with these environments, but at the same time, further corroborates previous research pointing to the importance of restorative potential of an environment for preference ratings. Crucially, experiences appear to be influential above and beyond the nature–urban divide, whereas restorative potential as expressed in leisure activities and good weather facilitating these—often—outdoor activities did prove highly dependent on environment type.

Notes

1. Example photos can be found in the supplementary materials.
2. Example photos can be found in the supplementary materials.

Disclosure statement

No potential conflict of interest was reported by the authors.

ORCID

Femke Beute  <http://orcid.org/0000-0002-4767-0648>

References

- Alvarado, N. (1998). A reconsideration of the structure of the emotion lexicon. *Motivation and Emotion*, 22, 329–344.
- Barker, R. G. (1968). *Ecological psychology: Concepts and methods for studying the environment of human behavior*. Chicago, IL: University of Chicago Press.
- Beute, F., & de Kort, Y. A. W. (2013). Let the sun shine! Measuring explicit and implicit preference for environments differing in naturalness, weather type, and brightness. *Journal of Environmental Psychology*, 36, 162–178.
- Beute, F., & de Kort, Y. A. W. (2014). Salutogenic effects of the environment: Review of health protective effects of nature and daylight. *Applied Psychology: Health and Well-being*, 6, 67–95.
- Blair, I. V. (2002). The malleability of automatic stereotypes and prejudice. *Personality and Social Psychology Review*, 6, 242–261.
- Borgatti, S. P. (1996). *ANTHROPAC 4.0*. Natick: Analytic Technologies.
- Collado, S., Staats, H., & Corraliza, J. A. (2013). Experiencing nature in children's summer camps: Affective cognitive, and behavioural consequences. *Journal of Environmental Psychology*, 33, 37–44.
- Collado, S., Staats, H., & Sorrel, M. A. (2016). Helping out on the land: Effects of children's role in agriculture on reported psychological restoration. *Landscape and Urban Planning*, 118, 90–97.
- Gawronski, B., & Bodenhausen, G. V. (2006). Associative and propositional processes in evaluation: An integrative review of implicit and explicit attitude change. *Psychological Bulletin*, 132, 692–731.
- Gibson, J. J. (1979). *The ecological approach to visual perception*. Boston, MA: Houghton Mifflin.
- Hartig, T., Catalano, R., & Ong, M. (2007). Cold summer weather, constrained restoration, and the use of antidepressants in Sweden. *Journal of Environmental Psychology*, 27(2), 107–116.
- Hartig, T., & Staats, H. (2006). The need for psychological restoration as a determinant of environmental preferences. *Journal of Environmental Psychology*, 26, 215–226.
- Häusser, J. A., Mojzisch, A., & Schulz-Hardt, S. (2011). Endocrinological and psychological responses to job stressors: An experimental test of the Job Demand–Control Model. *Psychoneuroendocrinology*, 36, 1021–1031.
- Heft, H. (2013). An ecological approach to psychology. *Review of General Psychology*, 17, 162–167.
- Kaplan, S. (1987). Aesthetics, affect, and cognition. *Environment and Behavior*, 19, 3–32.
- Kaplan, S., Bardwell, L. V., & Slakter, D. B. (1993). The museum as a restorative environment. *Environment and Behavior*, 25, 725–742.
- Karmanov, D., & Hamel, R. (2008). Assessing the restorative potential of contemporary urban environment(s): Beyond the nature versus urban dichotomy. *Landscape and Urban Planning*, 86, 115–125.
- Kroh, D. P., & Gimblett, R. H. (1992). Comparing live experiences with pictures articulating landscape preference. *Landscape Research*, 17(2), 58–69.
- Osgood, C. E. (1957). *The measurement of meaning*. Urbana: University of Illinois Press.
- Pearson, D. G., & Craig, T. (2014). The great outdoors? Exploring the mental health benefits of natural environments. *Cognitive Science*, 5, 1178.
- Peters, M. L., Godaert, G. L. R., Ballieux, R. E., van Vliet, M., Willemsen, J. J., Sweep, F. C. G. J., & Heijnen, C. J. (1998). Cardiovascular and endocrine responses to experimental stress: Effects of mental effort and controllability. *Psychoneuroendocrinology*, 23, 1–17.
- Petty, R. E., & Krosnick, J. A. (2014). *Attitude strength: Antecedents and consequences*. New York, NY: Psychology Press.
- Purcell, T., Peron, E., & Berto, R. (2001). Why do preferences differ between scene types? *Environment and Behavior*, 33(1), 93–106.
- Staats, H., Kieviet, A., & Hartig, T. (2003). Where to recover from attentional fatigue: An expectancy-value analysis of environmental preference. *Journal of Environmental Psychology*, 23, 147–157.
- Strack, F., & Deutsch, R. (2004). Reflective and impulsive determinants of social behavior. *Personality and Social Psychology Review*, 8, 220–247.
- Tuan, Y. F. (1974). *Topophilia: A study of environmental perception, attitudes, and values*. New Jersey, NJ: Englewood Cliffs.
- Tyrväinen, L., Ojala, A., Korpela, K., Lanki, T., Tsunetsugu, Y., & Kagawa, T. (2014). The influence of urban green environments on stress relief measures: A field experiment. *Journal of Environmental Psychology*, 38, 1–9.
- Tzoulas, K., Korpela, K., Venn, S., Yli-Pelkonen, V., Kaźmierczak, A., Niemela, J., & James, P. (2007). Promoting ecosystem and human health in urban areas using Green Infrastructure: A literature review. *Landscape and Urban Planning*, 81, 167–178.

- Ulrich, R. S. (1983). Aesthetic and affective response to natural environment. In I. Altman & J. Wohlwill (Eds.), *Human behavior and environment* (pp. 85–125). New York, NY: Plenum Press.
- van den Berg, A. E., Koole, S. L., & van der Wulp, N. Y. (2003). Environmental preference and restoration: (How) are they related? *Journal of Environmental Psychology, 23*, 135–146.
- Völker, S., & Kistemann, T. (2013). "I'm always entirely happy when I'm here!" Urban blue enhancing human health and well-being in Cologne and Düsseldorf, Germany. *Social Science & Medicine, 78*, 113–124.
- von Lindern, E., Bauer, N., Frick, J., Hunziker, M., & Hartig, T. (2013). Occupational engagement as a constraint on restoration during leisure time in forest settings. *Landscape and Urban Planning, 118*, 90–97.
- White, M. P., Cracknell, D., Corcoran, A., Jenkinson, G., & Depledge, M. H. (2014). Do preferences for waterscapes persist in inclement weather and extend to sub-aquatic scenes? *Landscape Research, 39*(4), 339–358.