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Affective priming of perceived environmental restorativeness

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Research into the perceived restorativeness of environments tends to focus on the Kaplans' Attention Restoration Theory at the expense of the affective considerations of Ulrich's psychoevolutionary model. To better understand the role of emotion, this study used contextual text-based primers (newspaper articles) to manipulate participants' affective state (positive or negative) prior to them rating different environments using the Restorative Components Scale. Sixty-nine participants completed the web-based study, being pseudo-randomly allocated to the positive- or negative-prime condition before rating three natural and three urban environments. Natural environments were rated as more restorative than urban, with negative-priming giving higher mean ratings for all environments. This effect was overall statistically significant for two components (*Being Away* and *Fascination*), but only *Fascination* showed a significant interaction of affective-prime and environment, a larger effect being seen for natural environments. Results are discussed in terms of current understanding of the interrelationship between attentional and affective processes.

Keywords: Affective priming; Psychological restoration; Urban environment; Natural environment.

When determining what makes an environment psychologically restorative, emphasis has been on the features of the environment (type of vegetation, presence of water, artificial structures, etc.) and what they might provide to the perceiver. Much of the research uses rating-scale measures (e.g., Herzog, Black, Fountaine, & Knotts, 1997; Herzog, Maguire, & Nebel, 2003) based on the four components of Attention Restoration Theory (ART; Kaplan & Kaplan, 1989): *Being Away* is "psychological distance" from routine mental tasks and everyday demands; *Extent* refers to an environment of significant scope, having coherent features; *Fascination* is an involuntary, effortless attention to the environment; *Compatibility* refers to the appropriateness of the environments for the desired activity. While the components can relate to more diverse concerns—e.g., compatibility relates to the perceiver's desires—the focus is generally on the perceiver's *attentional* needs. Non-attentional needs are simply side effects of attentional fatigue: Kaplan (1995, p. 172) describes irritability as the "hallmark of a person who cannot draw on directed attention".

This attentional emphasis may be partly due to successful empirical work supporting ART (e.g., Staats, Kieviet, & Hartig, 2003; Berto, 2005) but also due to the practical application of the theory, e.g., workplace planning (Kaplan, 1993) or green-space provision (Coley, Kuo, & Sullivan, 1997). Much of the research into perceived restorativeness (PR) therefore makes the baseline assumption that "restoration is favoured more by attentionally fatigued people than by people who are not" (Staats et al., 2003, p. 148). Studies mostly focus on people who have been made attentionally fatigued through direct manipulation (e.g., Berto, 2005) or who are asked to imagine themselves being in such a state (e.g., Staats et al., 2003). Such studies show that environments with components hypothesised to be restorative are in fact perceived as being more restorative, with natural environments usually being rated higher than urban ones. However, the nature/urban split is not always clear. For example, Karmanov and Hamel (2008) suggest that urban environments which include landmarks, natural elements and interesting layouts can also be restorative, although this was only true based on "anger" and "tension" ratings; depression was improved solely by exposure to natural environments. Yet such variation in results does suggest that factors other than attentional needs are involved.

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In contrast, Ulrich's psychoevolutionary model (Ulrich et al., 1991) gives primacy to our initial— perhaps innate (Balling & Falk, 1982)—*affective* response to an environment: visual features elicit positive-affect responses which influence subsequent cognition (including attentional functions). In an attempt to integrate the two models and unite the attentional and affective components, Kaplan (1995) proposed a framework suggesting that an individual having insufficient psychological resources will develop both attentional fatigue *and* a general stress response, the latter being associated with an affective state. However, he goes on to suggest that the key psychological resource required to cope with any given situation is in fact directed attention, again bringing the focus back to attentional needs.

Returning to Ulrich's model, it is interesting to note his qualifying statement that the positive affect relates to *unthreatening* nature. This suggests a parallel with the ART components in that there will be some individual variation: what constitutes a threat will differ depending on the perceiver's past experiences, and to be perceived as restorative, an environment might also have to meet non-attentional needs relating to affective perceptions. This idea has been addressed in part by research looking at the restorative aspects of favourite places. For example, Korpela, Hartig, Kaiser, and Fuhrer (2001) looked at feelings associated with different places, finding that all of the ART component ratings were significantly different for favourite versus unpleasant places. On the other hand, Herzog et al. (2003) found that the ART components relating to the perceived restorative potential of a place were different from those associated with preference for a place.

Although the findings differ, both studies do make an assumption that is common to ART-based studies: whether affective or attentional, any needs will be met only by the properties of the environment; the perceiver's affective state independent of that environment is not considered. While it is generally recognised that PR might indeed depend on "differences in antecedent mental state" (Staats et al., 2003, p. 155), this is not applied to prior *affective* state. One way of looking at this experimentally is via an affective priming paradigm wherein the presentation of an evaluated affective target-stimulus is preceded by a different affect primer-stimulus. This procedure was used by Korpela, Klemettilä, and Hietanen (2002) to show that environment images primed subsequent forced-choice affective judgements (a nature/positive, urban/negative affect bias), but has not been used to show an effect of an *a priori* affective state on PR.

In the present study, I manipulated participants' affective state prior to them rating the PR of different environments. To ensure that the affect manipulation was contextual and ecologically valid, two recent newspaper articles relating to current environmental issues were selected, one with overall negative affective tone and the other a positive tone. I predicted that prior affective state would modify subsequent affective reactions to environment images: besides the expected higher PR for natural versus urban images, there would be a differential in PR that was greater for the negative-priming. This differential prediction was two-tailed, as it was unclear whether the negative-affect state would make people see natural environments as becoming more (an "escape") or less appealing (a "loss"). Given that previous research has shown often contradictory overlaps between PR and place attachment, exploratory questions relating to feelings of Connectedness to Nature (CNS; Mayer & Frantz, 2004) and childhood environment were added, to see if they influenced any affective interactions.

METHOD

Design and participants

Eighty-five volunteer participants took part in the study via a website interface, recruited via word of mouth and e-mail list announcements. Of these, 69 (33 females, $M = 39.8$ years, ranging from 19–69 years) completed all responses and were included in the analysis. Owing to the pseudo-random group allocation, 36 participants were in the negative-affect condition (23 females) and 33 were in the positive-affect condition (14 females).

Affect manipulation

Two recent newspaper reports on environmental global concerns were chosen, one negative, detailing how catastrophic climate change was unavoidable ("'Too late to avoid global warming', say scientists": C. Milmo in *The Independent*, 19th September 2007), and one positive, emphasising autonomy and self-empowerment via community and individual initiatives ("You are now entering an oil-free zone": J. Ferry in *The Guardian*, 19th April 2007). Participants were aware of and read only one article. Responses were via an on-screen version of the Self Assessment Manikin (SAM; Lang, 1985), a culturally non-specific and intuitively understood measure of affective state which uses a graphic character arrayed along a 9-point Likert scale to visually represent three affective dimensions of pleasure, arousal and dominance (e.g., arousal ranges from an excited figure with eyes open to and unexcited figure with eyes closed).

Environment images

Six images were used, obtained via public-domain image repositories from "Nature" and "Cities" categories. Natural images were: a woodland path, a tropical beach and a mountain lake. Urban images were: an intricate white-marble building, city skyscrapers and a

Mediterranean town seen from a brick-arched balcony. Images were chosen to be attractive, with the majority of features being category-compatible e.g., no artificial structures were visible in natural images, but dominated urban images. No human or animal life was visible in any image.

PR ratings

This study used the Restorative Components Scale (RCS; Laumann, Gärling, & Stormark, 2001, p. 34), developed to meet shortcomings of Hartig, Korpela, Evans, and Gärling's (1997) scale. RCS items 1–3 (termed "Novelty") were shown by Laumann to be unrelated to restorativeness, so only items 4–22 were used in this study, presented in pseudo-randomised order for each participant. One extra item "I would feel very relaxed in this environment" was added.

Procedure

The experiment, written using PHP 5.2.6 and Javascript, was accessible via any graphical web-browser at http://study.ecopsych.info/. An initial webpage described the study remit–people's relationship to nature and how media reports about environmental problems makes them feel–along with general instructions. Participants were told that all answers were valid, the task was self-paced, and they could stop at any point by closing their browser, thereby deleting their results. After entering personal details and clicking "start", they were pseudo-randomly assigned to the negative or positive condition and presented with the relevant article. They were instructed to read the article then indicate their concurrent emotional state on SAM scales. Below this were CNS items plus two exploratory items concerning their childhood environment ("Growing up, I lived mainly in an urban environment"/"As a child, I tended to play in green spaces") which they responded to via a 5-point Likert scale.

After clicking "Next", they were shown the first environment image and instructed to "Imagine that you are standing in the place shown in the photo below", then respond to pseudo-randomised RCS statements on a 7-point Likert scale. Clicking "Next" presented another image with response statements. Image order was pseudo-randomised for each participant. After all six images, a thank-you screen appeared with experimenter contact information, a comments box and further reading links.

RESULTS

The .05 level of significance was adopted throughout all analyses.

TABLE 1
Mean ratings for the SAM evaluation (pleasantness, arousal, dominance) by affect-prime (Positive, Negative)

	Positive-affect		*Negative-affect*	
	M	SD	M	SD
Pleasantness	6.21	1.22	2.94	1.61
Arousal	4.85	1.46	5.53	2.36
Dominance	4.68	1.85	3.17	2.27

Affect manipulation check

Wilcoxon two-sample tests compared SAM ratings (see Table 1) for positive versus negative affect-primes. As expected, Pleasantness was significantly greater for the positive-affect primer, $W = 71.5$, $p = 8 \times 10^{-13}$, $r = .8$ as was Dominance, $W = 282.5$, $p = .003$, $r = .4$. Arousal was greater for negative-affect primer, $W = 610$, $p = .04$, $r = .2$. These results indicate that the manipulation was successful.

Effect of environment and affect-prime on PR

Table 2 shows the mean PR (and subscale) ratings for different environments and affect-primes. A 2×2 mixed-design ANOVA, using affect-prime as a between-subject variable and environment as a within-subject variable, confirmed the primary effect of environment (Natural, Urban) on PR: $F(1, 67) = 119.87$, $p = 2 \times 10^{-16}$, $\eta^2 = .46$, and showed an overall affective-priming (Positive, Negative) effect: $F(1, 67) = 5.07$, $p = .03$, $\eta^2 = .02$. However, the interaction of environment × affect-priming did not reach significance: $F(1, 67) = 3.74$, $p = .06$, $\eta^2 = .01$. Comparing the effect of the prime on PR, Cohen's d (Cohen, 1988) was 1.34 for positive priming and 1.74 for negative priming (i.e., both large effects).

For the RCS subscales, 2×2 mixed-design ANOVAs showed that the affective-priming effect on PR was via the factors of *Being Away*, $F(1, 67) = 6.34$, $p = .01$, $\eta^2 = .03$ and *Fascination*, $F(1, 67) = 5.40$, $p = .02$, $\eta^2 = .02$. However, only *Fascination* yielded a significant environment × affect-priming interaction: $F(1, 67) = 4.35$, $p = .04$, $\eta^2 = .02$.

The remaining single item on perceived relaxation showed only an effect of environment: $F(1, 67) = 82.66$, $p = 1.2 \times 10^{-15}$, $\eta^2 = .4$.

Two further exploratory analyses were performed on PR, both using a three-way mixed-design ANOVA. Affective-priming × environment × childhood-experience (high–low median split) yielded no significant interaction effects. Affective-priming × environment × CNS yielded a significant interaction of environment and nature-connection: $F(1, 65) = 11.62$, $p = .0009$, $\eta^2 = .04$. Spearman correlations of CNS versus mean PR gave

TABLE 2
PR and relaxation mean ratings (1–7) for the two environments (Nature, Urban) split by affect-prime (Positive, Negative)

		Natural			*Urban*		
		All	*Positive*	*Negative*	*All*	*Positive*	*Negative*
PR	*M*	5.65	5.40	5.9	4.35	4.33	4.37
	SD	0.67	0.58	0.76	0.73	0.69	0.77
Escape	*M*	5.67	5.44	5.89	4.44	4.35	4.52
	SD	0.68	0.61	0.75	0.75	0.75	0.74
Fascination	*M*	5.65	5.37	5.93	4.37	4.35	4.38
	SD	0.69	0.58	0.79	0.77	0.68	0.86
Compatibility	*M*	5.60	5.33	5.87	4.26	4.26	4.25
	SD	0.77	0.74	0.80	0.85	0.80	0.89
Extent	*M*	5.69	5.46	5.92	4.33	4.34	4.32
	SD	0.73	0.61	0.84	0.76	0.75	0.76
Relaxation	*M*	5.71	5.52	5.90	4.23	4.17	4.29
	SD	0.98	0.87	1.08	0.92	0.80	1.03

$\rho = 0.47$, $p = .00004$ for the natural environments, and $\rho = -0.26$, $p = .03$ for the urban environment.

DISCUSSION

The present research aimed to move away from an attentional focus by looking for possible effects on PR of the perceiver's affective state prior to their experience of the environment. The affect-manipulation check showed that the newspaper articles had their intended effect, the positive article being associated with slightly increased feelings of empowerment and the negative article with a marked decrease. There was an overall affect-priming effect where negative-primed participants tended to give higher and more variable PR ratings of any environment: $M_{\text{NEGATIVE}} = 5.13$ ($SD = 1.08$) versus $M_{\text{POSITIVE}} = 4.86$ ($SD = 0.83$).

In agreement with previous studies, natural environments were perceived as being more restorative than urban ones, though it is worth noting that even urban environments had a mean PR rating close to the midpoint of the scale. However, the interaction of affective-priming with environment did not quite reach statistical significance, despite large effect sizes. Analysis of the RCS subscales indicated that this was due to any effect of priming occurring only with two of the ART components: *Being Away* and *Fascination*. Furthermore, the interaction of affect and environment only significantly influenced the restorativeness rating for the *Fascination* component.

Fascination is key in ART, providing respite from the use of easily fatigued directed attention. Yet, Herzog et al. (2003) found that *Fascination* was the only factor not significantly different for natural versus urban environments, even though the former had significantly higher PR ratings. Korpela et al. (2001) found that *Fascination* was the least reliably associated with participant's chosen favourite place, despite that environment being associated with higher positive affect. Here, *Fascination* was the only factor which *did* show a significant interaction between affect and environment yet it is hard to argue that participants became attentionally fatigued from the negative-prime but not from the positive-prime. Additionally, the CNS (measuring "emotional connection" to the environment) and PR were positively correlated for natural environments but negatively correlated for urban environments. These results suggest that affect is not a consequence of attentional fatigue (cf. Kaplan, 1995) but something that needs separate consideration.

Perhaps *Fascination* complements other factors which aid attentional restoration, possibly providing "an aesthetic buffer against painful thoughts" (Herzog et al., 1997). People might think about *Fascination* differently depending on the specific environment (e.g., relating it more to available activities than to the environment itself: Laumann et al., 2001). Alternatively, there may be closer ties between affect and attention than is often realised. Attentional processes may be key to understanding an environment's restorativeness but affective processes need not be subsidiary: emotion can both initiate and be guided by attention. With an increased emphasis on affect–attention interactions, and perhaps by considering automatic versus attended emotion as the complements of involuntary versus directed attention, future research may better model the complexities of the restorative environment. The idea that negative affect can promote PR also indicates how the outcome of real-world application might differ from laboratory studies.

As with many such studies, one limitation was that images were chosen for their obviousness of being "natural" or "urban", but were not judged on other factors that they might potentially share (e.g., one reviewer suggested factors such as "safety" and "mystery"). Yet even if the nature/urban split were instead shown to be based on such factors, results would still mean

that prior affective state influences the widely used PR measures *as well as* affecting those other factors. Whether conducting laboratory studies or attempting to communicate environmental ideas in the real-world, our emotional responses about an environment need to be considered as well as its physical features.

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REFERENCES

Balling, J. D., & Falk, J. H. (1982). Development of visual preference for natural environments. *Environment and Behavior*, *14*, 5–28.

Berto, R. (2005). Exposure to restorative environments helps restore attentional capacity. *Journal of Environmental Psychology*, *25*, 249–259.

Coley, R. L., Kuo, F. E., & Sullivan, W. (1997). Where does community grow? *Environment and Behavior*, *29*, 468–494.

Hartig, T., Korpela, K., Evans, G. W., & Gärling, T. (1997). A measure of perceived environmental restorativeness. *Scandinavian Housing and Planning Research*, *14*, 175–194.

Herzog, T. R., Black, A. M., Fountaine, K. A., & Knotts, D. J. (1997). Reflection and attentional recovery as distinctive benefits of restorative environments. *Journal of Environmental Psychology*, *17*, 165–170.

Herzog, T. R., Maguire, C. P., & Nebel, M. B. (2003). Assessing the restorative components of environments. *Journal of Environmental Psychology*, *23*, 159–170.

Kaplan, R. (1993). The role of nature in the context of the workplace. *Landscape and Urban Planning*, *26*, 193–201.

Kaplan, S. (1995). The restorative benefits of nature. *Journal of Environmental Psychology*, *15*, 169–182.

Kaplan, S., & Kaplan, R. (1989). *The experience of nature*. New York, NY: Cambridge University Press.

Karmanov, D., & Hamel, R. (2008). Assessing the restorative potential of contemporary urban environment(s). *Landscape & Urban Planning*, *86*, 115–125.

Korpela, K. M., Hartig, T., Kaiser, F. G., & Fuhrer, U. (2001). Restorative experience and self-regulation in favorite places. *Environment and Behavior*, *33*, 572–589.

Korpela, K. M., Klemettilä, T., & Hietanen, J. K. (2002). Evidence for rapid affective evaluation of environmental scenes. *Environment and Behavior*, *34*, 634–650.

Lang, P. J. (1985). *The cognitive psychophysiology of emotion*. Hillsdale, NJ: Lawrence Erlbaum.

Laumann, K., Gärling, T., & Stormark, K. M. (2001). Rating scale measures of restorative components of environments. *Journal of Environmental Psychology*, *21*, 31–44.

Mayer, F. S., & Frantz, C. M. (2004). The connectedness to nature scale. *Journal of Environmental Psychology*, *24*, 503–515.

Parsons, R. (1991). The potential influences of environmental perception on human health. *Journal of Environmental Psychology*, *11*, 1–23.

Staats, H., Kieviet, A., & Hartig, T. (2003). Where to recover from attentional fatigue. *Journal of Environmental Psychology*, *23*, 147–157.

Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology*, *11*, 201–230.