Environment Preference and Environment Type Congruence: Effects on Perceived Restoration Potential and Restoration Outcomes

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Abstract

The study aims were to replicate initial findings of an environmental preference/environment type "congruence effect" on judgements of perceived restoration potential (Wilkie and Stavridou, 2013) and explore if this congruence influenced restoration outcomes. University students (*N* = 120) categorized themselves as 'country' *or* 'city' persons to indicate environmental preference (nature, urban), viewed an imagery slideshow of one environment (nature, urban green space, urban street), and completed pre-post imagery measures of directed attention, mood, and fatigue. They also rated environments like those in the slideshow for perceived restoration potential and then completed a place identity measure in reference to their preferred environment. The use of the dichotomous environmental preference variable as an indicator of place identity was supported with equal, moderate-to-high levels of place identity reported by both groups. An environment type main effect indicated better positive/negative mood and fatigue outcomes for those in the nature condition compared to the urban street condition. Urban green space exposure resulted in a better improvement to negative mood compared to urban street exposure. Nature and urban green spaces provided equivalent changes in direct attention, mood, and fatigue. There was no environment type effect on directed attention or perceived restoration potential. The environmental preference/environment type congruence findings replicated the previously reported effect on perceived restoration potential (Wilkie and Stavridou, 2013). The highest ratings were after exposure to congruent nature environments and the lowest from exposure to urban street imagery incongruent with a nature preference. A pattern of both significant and non-significant results across outcomes indicated the congruence effect was more evident in those who preferred nature; urban preferences resulted in similar benefits outcomes across environments. These findings support growing evidence urban green spaces provide a range

of benefits; and suggest person-place concepts such as place identity should also be considered in restoration research.

Keywords: Directed attention, environmental psychology, place identity, mood

Environmental Preference and Environment Type Congruence: Effects on Perceived Restoration Potential and Restoration Outcomes

The link between the environment and our well-being is robustly established, with an emphasis placed on nature's benefits over urban locales (Bowler, Buyung-Ali, Knight, and Pullin, 2010; Beute and de Kort, 2014; Beyer, Kaltenbach, Szabo, Bogar, Nieto, and Malecki, 2014; Pasenen, Tryväinen, and Korpela, 2014). Yet, even when encouraged to do so, people often do not use available nature resources in need of cognitive or emotional restoration (Eriksson and Nordlund, 2013; Herzog, Chen, & Primeau, 2002).

Wilkie and Stavridou (2013) proposed a possible explanation for this lack of engagement with nature in these circumstances. They found the interaction between an individual's environmental preference, which they considered representative of place identity, and environment type influenced judgements of the potential for directed attention restoration to occur. Specifically, persons who preferred nature judged the restoration potential of incongruent urban locations lower than for nature settings congruent with their preference, while those with urban preferences perceived equivalent opportunities for restoration in both congruent urban and incongruent nature environments. Wilkie and Stavridou concluded the variations in perceived restoration potential due to this congruence effect may explain when nature locations are not always chosen when in need of restoration; and speculated persons with an urban preference do not seek nature because they perceive the city as restorative. This preliminary 'congruence effect' finding also reinforced the importance of considering individual-level person-place factors in studies of restorative environments (Smith, Davenport, Anderson, and Leahy, 2011; Jun, Kyle, Vlachopoulos, Theodorakis, Absher, and Hammitt, 2012).

The current study was a conceptual replication (Schmidt, 2009) of Wilkie and Stavridou (2013). The aims were to replicate the environmental preference/type congruence

effect on judgements of perceived restoration potential and extend this research through three modifications: confirmation environmental preference can represent place identity, introduction of an urban green space condition, and the addition of measures of restoration outcomes.

Environmental preference represents place identity

Typically environmental preference has been grounded in attention restoration theory (Kaplan, 1995). It is defined as liking an environment or finding it attractive (White and Gatersleben, 2011; Eriksson and Nordlund, 2013) and viewed as a consequence of directed attention fatigue (Herzog et. al, 2002; Joye and van den Berg, 2011). Wilkie and Stavridou (2013) challenged this definition in two ways. They suggested environmental preference represented the individual's place identity, or the part of the self-concept inextricably linked to place (Proshansky, Fabian, and Kaminoff, 1987); and that preference has a causal influence on environmental perception. However, environmental preference was operationally defined by asking participants to categorize themselves as a 'country or city person' without confirming if this categorization reflected place identity. Therefore, it was important to rectify this methodological concern in the current study.

More than nature OR built environments

Comparisons of nature vs. urban street environments have been criticized as an extreme dichotomy (Velarde, Fry and Tviet, 2007); especially since studies indicate quite varied urban green spaces can positively influence restoration outcomes. Using the same validated measures as the current study, Tryväinen and colleagues (2014) compared participant's mood and perceived restoration potential judgements across three urban conditions: street, park, and forest. They found perceived restoration potential was highest for urban forests, followed by the urban park and city streets; and that both urban park and forest exposure resulted in equal improvements in positive mood. In another study using

different mood and state-level restoration measures to the current study, three urban nature locations which varied in naturalness (urban parkland, tended and untended urban woodlands) provided equivalent benefits to mood and better than the least natural urban street setting (van den Berg, Jorgensen, and Wilson, 2014). Both the criticisms of the nature/urban street dichotomy and the findings of these two studies suggest an urban green space condition would enhance the current study and naturalness should be incorporated into the research design.

Restoration as well as restoration potential

Wilkie and Stavridou (2013) presented preliminary evidence of an environmental preference/environment type "congruence effect" on perceptions of an environment as potentially restorative; but restoration outcomes associated with such environments were not measured. It is useful to understand how perception shapes the consideration of environmental resources, particularly given other factors such as priming (Stevens, 2014) and setting attitudes (Staats, Kieviet, and Hartig, 2003) can influence the expectation of restoration; but it is also necessary to determine if congruence also affects outcomes such as directed attention, mood, and fatigue previously associated with exposure to nature (e.g. Hartig, Mang, and Evans, 1991; Berman, Jonides, and Kaplan, 2008; Tyrväinen et. al., 2014; van den Berg et al., 2014).

Study hypotheses

This study aims were to replicate the environmental preference/environment type congruence effect on perceived restoration potential and extend the study with the addition of an urban green space condition and restoration outcomes. It was also important to determine whether environmental preference represented place identity.

The following hypotheses were tested:

- H_1: Nature and urban environmental preference groups will report equal levels of place identification with their preferred location.
- $H_{2:}$ Environment type will influence restoration outcomes and judgements of perceived restoration potential.
    - H_{2A}: Exposure to nature environments will result in the highest restoration outcomes/perceived restoration potential.
    - H_{2B}: Exposure to urban green spaces will result in similar outcomes/perceived restoration potential to nature.
    - H_{2C}: Exposure to urban street images will result in the worst restoration outcomes/perceived restoration potential.
- H_3: Environmental preference/environment type congruence influences restoration outcomes and perceived restoration potential.
    - H_{3A}: Exposure to congruent environments provides the highest outcomes/perceived restoration potential and incongruent ones the least.
    - H_{3B}: The congruence effect will be more evident in persons with a nature preference.

Method

Sample characteristics

University students received class credit for participation as part of a research engagement scheme in first and second year undergraduate research methods (N = 120; 74% female; M_{age} = 23.70, SD = 7.26). Participation was considered voluntary because students could choose from a large number of projects and/or complete written journal summaries to fulfil requirements.

Environmental preference

Participants were asked '*Do you consider yourself as a city person or a country person?'* to capture environmental preference as a representation of their place identity. 'Country persons' were categorized as having a nature preference (n = 47) and the others an urban preference (n = 73). No other criteria were used to categorize environmental preference.

They also completed Drosletis and Vignoles' (2010) 7-item place identity scale. Sample items included 'This place reflects the type of person I am' and 'I feel this is the place where I fit.' Items were rated on a scale from 0 (*not at all true of this place*) to 10 (*completely true of this place*); and place identity was calculated as the mean of all items. Cronbach's alpha for the scale was .92 with this sample. This scale was chosen instead of the connectedness to nature scale (CNS, Mayer and Franz, 2004) or the environmental identity scale (EID, Clayton, 2003). The CNS shares some conceptual overlap with place identity (Perrin and Bennassi, 2009); but is not grounded in social identity theory (Tam, 2013), which is integral to place identity theory (Proshansky, et al., 1987; Drosletis and Vignoles, 2010). The EID, although based on a social identity framework, only focused on identification with nature settings and does not consider identification with other locations (i.e. cities). Therefore, Drosletis and Vignoles' measure was considered best suited to the current study because it captured the importance of place to identity, whether urban or nature.

Restoration Outcomes

Directed attention. A proof-reading task requiring identification of the letter 'a' in English text was used to measured directed attention (maximum score = 41; Healy, 1994). It was chosen as an ecologically valid task for the student sample and a similar task has been used in previous studies (Hartig, et al., 1991; Bowler, et al., 2010).

Mood. The Positive and Negative Affect Scale (PANAS, Watson, Clark, and Tellegen, 1988) is a self-report scale of 10 positive (e.g. excited) and 10 negative (e.g. upset) states (1 = *very slightly or not at all*; 3 = *moderately*; 5 = *extremely*). Positive and negative mood scores were calculated as the sum of appropriate scale items (maximum = 50). The PANAS has been used in prior nature research (Berman et al., 2008; Tyräinen, et al., 2014). In the current study, the internal consistency for the sub-scales ranged from .70 - .89.

Fatigue. One item assessed current fatigue level 'Please indicated how mentally fatigued do you feel right now?' using a rating scale from 1 (*no fatigue*) to 4 (*somewhat fatigued*) to 7 (*completely fatigued*). A similar single-item measure was used by Staats and Hartig (2004).

Perceived restoration potential. The 12-item version of the Perceived Restoration Scale (Hartig, Korpela, Evans, and Gärling, 1997) measured the extent to which environments similar to those in study were perceived as likely to provide directed attention restoration (1 = *not at all*; 7 = *completely*). A mean scale score was generated. Cronbach's alpha indicated good internal consistency (.91).

Experimental stimuli

Sets of 10 images represented three environment conditions (Fig. 1): nature, urban green space, and urban street. The non-water nature and urban street images from Wilkie and Stavridou (2013) were used in the current study. Urban green space images were chosen from freely available stock photographs with some showing people, automobiles, or physical structures such as bridges or buildings. Images were not assessed for specific characteristics such as the ratio of green space.

A separate volunteer sample (N = 12, demographics not obtained) of research staff and students enrolled in an undergraduate environmental psychology class were randomly allocated to one condition and rated rated the naturalness of each image 1 = *urban* to 7 =

natural. No credits were awarded for participation. Nature images were significantly more natural (M = 5.86*; SD* = .38) than urban green space images (M = 3.10*; SD* = .80), which were more natural than urban street images rated as urban ($M = 1.78$*; SD* = .45), F (2, 11) = 52.97, $p < .001$.

Design and procedure

The quasi-experimental 2 x 3 design consisted of two independent variables: environmental preference (nature/urban) and environment type (nature/urban green space/urban street). A six-level congruence variable was created for post-hoc analyses: nature preference/nature imagery (n = 16), nature preference/urban green space imagery (n = 7), urban preference/urban green space imagery (n = 13), urban preference/urban street imagery (n = 26), urban preference/nature imagery (n = 34), and nature preference/urban street imagery (n = 24). There was no difference in participant's reported nature/urban preference across environment types (x^2 = 2.86, p = .24).

The dependent variables were place identity, directed attention, mood (positive/negative), fatigue, and perceived restoration potential. The change in restoration outcomes was calculated so that positive values indicated an improvement. For directed attention and positive mood, change was calculated as post imagery – baseline and baseline – post imagery for negative mood and fatigue. The exceptions were place identity and perceived restoration potential, which were only measured post-imagery.

British Psychological Society ethics guidelines (BPS, 2010) were implemented. Environment type conditions were allocated prior to participant arrival by alternating conditions; environment preference was categorized after the study based on participant responses. The 30-minute session took place during a normal university day in the second academic term; daily academic demands were considered an indicator of likely cognitive fatigue (e.g. Karmanov and Hamel, 2008). In order to provide students with a range of

research engagement opportunities, sessions were offered throughout the day and week. Most participants completed the study in the afternoon (n = 67%), with fewer in the late afternoon (n = 24%), or morning (n = 9%). There was no significant difference in environment type (x^2 = 0.93, p = .92) or environment preference (x^2 = 4.21, p = .12) by time of day. Participation mostly occurred Monday – Wednesday (94%).

After consenting to participate, participants provided fatigue and mood ratings, completed the directed attention task, and viewed an E-prime slideshow. Each image presented for 15 seconds on a loop over 7 minutes (Berto, 2005). They provided demographics, completed the perceived restoration scale with clear instructions to rate environments like those they had just viewed, repeated fatigue/mood/directed attention tasks, and then completed the place identity scale in reference to the place consistent with the type of person they were (city or country). Finally, a video of a laughing baby was shown to counteract any negative effects from viewing non-preferred environments.

Results

Descriptive statistics for place identity and restoration outcomes overall, by environmental preference, and environment type are provided in Table 1. At baseline, participants were "*somewhat*" fatigued, in a "*moderately*" positive mood, and in "*not at all*" to "*a little bit*" of a negative mood. After exposure to the environment imagery, participants were slightly less fatigued, reported a small reduction in negative mood, but also a slightly lower level of positive mood. The level of performance on the directed attention task was high at baseline and post-imagery. Study participation generally improved these outcomes except positive mood, which was reduced (all $p \leq .01$).

There were no gender differences in the restoration outcomes (all t (118), $p > .19$). Separate one-way analyses of variance (ANOVA) were implemented to determine if time of day influenced restoration outcomes; outcome correlations were not suited to multi-variate

ANOVA (MANOVA). Only negative mood (F (2, 119) = 5.44, p = .01) and perceived restoration potential ratings (F (2, 119) = 4.26, p = .02) differed by time of day (all other p > .22). Late afternoon participants reported more improved negative mood (M = 3.10, SD =3.51) compared to afternoon participants (M = 1.08, SD =2.68; p = .004). Morning participants rated environments as potentially more restorative (M = 5.73, SD =0.79) than afternoon participants (M = 4.79, SD =1.08; p = .02). However, because of unequal distributions across environmental preference and environment type, time of day could not be included in further analyses.

Environmental preference represents place identity

Overall, mean ratings indicated the sample did have moderate-to-high place identity associated with their preferred location. The comparison between those with nature and urban preferences indicated their levels of place identity were equal, t (75.43) = 0.34, p = .74.

The effect of environment type

To test the remaining hypotheses, separate 2 x 3 (Environmental Preference x Environment Type) analyses of variance (ANOVA) were implemented for each outcome variable; outcome correlations were not suited to MANOVA. In this section, the main effects of environment type on restoration outcomes and perceived restoration potential are presented. There was no *a priori* expectation environmental preference should independently influence any outcomes and none of the environmental preference main effects were significant (all $p \geq .10$). These results are not reported further. Environmental preference/environment type interactions resulting from these ANOVA's follow in the section focused on the hypothesized congruence effect.

Directed attention. The main effect of environment type on directed attention was not significant, F (2, 114) = 1.54, p = .22, η^2_p = .03). There was a general improvement of approximately two to three points on the task by all groups.

Mood. Environment type impacted changes in positive mood ratings, F (2, 114) = 4.60, p = .01, η^2_p = .08. Nature imagery exposure resulted in small improvements to positive mood that were significantly higher after exposure to urban street images (p < .01), whose positive mood declined by approximately 4 points. Changes in positive mood did not differ between participants in nature and urban green space conditions (p = .54); or between urban green space and urban street conditions (p = .11). Environment type affected negative mood (F (2,114) = 3.54, p = .03, η^2_p = .06). Significant improvements resulted from either urban green space or nature imagery exposure when compared to urban street imagery exposure (both p < .05). Nature and urban green space conditions did not differ (p = .81)

Fatigue. Perceived level of fatigue was significantly affected by environment type, F (2,114) = 5.58, p < .01, η^2_p = .09. Post-hoc analyses indicated that both nature and urban green space images provided equivalent, small improvements to fatigue (p = .10); fatigue after viewing urban green space or urban street images was also similar (p = .42). Only nature image exposure significantly improved fatigue compared to urban street imagery exposure (p = .001).

Perceived restoration potential. A Kruskal-Wallis analysis was conducted after a 2 x 3 ANOVA indicated inequality of variances. The environment type main effect was non-significant (x^2 = 4.71, df = 2, p = .10); all environment types were rated as *rather* restorative.

The effect of environmental preference/environment type congruence

In this section, the environmental preference/environment type interactions are presented to test the hypothesized congruence effect. The results were generated from the 2 x 3 ANOVA's used to test for the main effect of environment type. Post-hoc analyses were conducted using the 6-level congruence variable described in the method section. These interactions are presented in Figs. 2 a – e.

Directed attention. The environmental preference/environment type interaction was non-significant (F (2, 114) = 0.99, p = .38, η^2_p = .02). However, the pattern of results suggested the congruent nature preference/imagery condition realized slightly better gains compared to both incongruent nature preference/urban imagery conditions (Fig. 2a).

Mood. Environmental preference/environment type interacted to significantly to effect positive mood, F (2, 114) = 3.96, p = .02, η^2_p = .07 (Fig. 2b). A post-hoc ANOVA (Bonferroni adjustment) was conducted using the 6-level congruence variable. The only significant difference was between the congruent nature preference/nature imagery condition compared to the incongruent nature preference/urban street imagery condition (d = 7.54; p < .01). The environmental preference/environment interaction did not affect negative mood (F (2,114) = 0.61, p = .54, η^2_p = .01); all conditions reported improved negative mood outcomes even after exposure to non or moderately congruent imagery (Fig. 2c).

Fatigue. There was no environmental preference/environment type interaction on fatigue levels, F (2,114) = 1.98, p = .14, η^2_p = .03. All participants reported small improvements to fatigue levels except those in the incongruent nature/urban street imagery group, who reported a small increase in fatigue (Fig. 2d).

Perceived restoration potential. Due to the inequality of variances identified in the main effects analyses, a Kruskal-Wallis analysis was conducted using the 6-level post-hoc variable. The environmental preference/environment type interaction was significant (x^2 = 33.53, df = 5, p < .001, see Figure 2e). Six post-hoc analyses (Mann-Whitney, Bonferroni adjusted p = .008) were conducted:

1. Perceived restoration potential ratings by the congruent nature preference/nature imagery group were higher than the:
    a. the congruent urban preference/urban street group with the next highest rating (z = -3.28, p < .001); and

b. the incongruent urban preference/nature imagery group with the second lowest rating (z = -4.74, p < .001).

2. The congruent urban preference/urban street group with the second highest perceived restoration potential ratings were:
   a. equal to the incongruent urban preference/nature imagery group (z = -1.64, p = .05; but were
   b. higher than the incongruent nature preference/urban street imagery group with the lowest perceived restoration potential rating (z = -2.53, p = .005).
3. A comparison of the three groups with the lowest perceived restoration potential lowest indicated:
   a. the moderately congruent nature preference/urban green space imagery and incongruent urban preference/nature imagery groups provided equivalent ratings (z = -1.15, p = .07); and
   b. the incongruent urban preference/nature imagery group's did not differ from the incongruent nature preference/urban street imagery group (z = -1.61, p = .05).

The results indicated a mixed congruence effect. The congruent nature preference/nature imagery group reported higher perceived restoration potential ratings compared to all other conditions. Experience of the congruent urban preference/urban street imagery resulted in equivalent perceived restoration potential ratings to the moderately congruent urban preference/urban green space imagery, nature preference/urban green space imagery, and incongruent urban preference/nature imagery. The lowest perceived restoration potential was from participants who experienced urban street images incongruent to their nature preference.

In figures 2a-e, both the significant and non-significant results illustrated different patterns of restoration outcomes and perceived restoration potential as a result of the

congruence effect. Nature persons were more varied across environment types, while people with an urban preference were generally consistent in their outcomes. The only exception was change in negative mood; both groups were variable across environments.

Discussion

This study was a conceptual replication of Wilkie and Stavridou (2013). The primary aims were to replicate the environmental preference/type congruence effect on judgements of perceived restoration potential and to establish whether this effect influenced three restorative outcomes. A secondary aim was to confirm whether environmental preference represented place identity.

Environmental preference as an indicator of place identity

Although it was a secondary aim, it was important to first clarify if the nature/urban environmental preference variable used by Wilkie and Stavridou (2013) represented place identity. In the current study, participants in both categories reported equal, moderate-to-high levels of place identity with their preferred location; this supports this dichotomous variable as an indicator of place identity. Previously, the self-extension/identity affirmation component of place identity predicted desires to fulfil lifestyle outcomes in (Smith et al., 2011) and involvement with (Jun et al., 2012) nature; and suggests environmental preference here probably represents this aspect of place identity. This dichotomous variable is also useful to captures relationships to *place*, not only to nature. With limited exceptions (e.g. Korpela, Ylèn, Tryväinen, and Silvonnoinen, 2008; Smith et. al., 2011), studies implement the Connectedness to Nature Scale (Mayer and Franz, 2004) or the Environmental Identity Scale (Clayton, 2003) when exploring the relationship between environments and restorative outcomes. Mayer and his colleagues (2009) provided evidence the congruence between nature connectedness and nature exposure explains a large proportion of the positive ‘nature’ effect. However, using these two scales renders it impossible to explore whether a

connection/identification with urban environments has a similar influence. For this reason, we recommend the integration of *place* identity in environment-wellbeing studies; and propose the urban/nature preference variable can be an efficient method to achieve this.

Urban green spaces can equal nature for restoration outcomes

The *a priori* expectations of better restoration due to nature exposure and lower restoration after urban street exposure were confirmed. There were greater improvements to positive mood, negative mood, and fatigue after viewing nature imagery compared to urban street imagery. These results are consistent with findings that nature is better than urban street settings for our well-being (e.g. Berman et. al, 2008; Berman et. al, 2012; Bowler et. al, 2010; Hartig et. al, 1991; Ulrich, 1979). However, we also presented evidence exposure to urban green spaces resulted in similar effects to nature on some outcomes. Considered along with recent reports of improved restoration from urban green spaces compared to urban street settings (Tryväinen, et al., 2014; van den Berg et al., 2014), the current findings strengthen the case for positive potential of urban green environments.

The environmental preference/environment type congruence effect

In Wilkie and Stavridou (2013), experiencing nature imagery congruent to a nature preference resulted in the highest restoration potential ratings; and the incongruent nature preference/urban street imagery experience was rated as the least restorative. These findings were replicated in the current study. The congruent nature preference/nature imagery group rated the nature environment higher than all other preference/environment type combinations, including the congruent urban preference/urban street imagery group. The lowest rating was from those exposed to urban street images incongruent with their nature preference. The congruence effect was also expected to similarly influence actual restoration outcomes, but this was only partially supported. The only outcome significantly affected by

congruence was positive mood; and then only the congruent nature preference/nature imagery and incongruent nature preference/urban street imagery groups differed.

However, a pattern of non-significant results suggested there was more variability in perceived restoration potential from individuals with a nature preference across the three environment conditions compared to those with an urban preference, who rated all three locations similarly in restorative potential. Similar non-significant data trends also suggested greater variability between 'nature lovers' and 'city persons', particularly for positive mood. The exception was the non-significant trend in negative mood that indicated more variability amongst 'city persons' than the others.

Overall, the results indicate a congruence effect may be more substantive in individuals with a nature-related place identity. This replicated Wilkie and Stavridou's findings and supports the suggestion people with urban preferences may not need to seek out nature for restoration. However, this explanation should be specically tested in future studies.

Methodological reflections

The sample was predominantly female university students in emerging adulthood. Although there were no gender differences on any variable, future samples should better represent the general population. This is particularly important in regards to age since both restorative experiences (Scopellitti & Guiliani, 2004) and place identity vary over the life span (Rollero and De Picolli, 2010). Time of day should also be systematically incorporated into the research design, given the findings of its significant effect on some outcomes.

Proof-reading was used to measure directed attention because it was considered to be a real-world task relevant to the sample; but its needs further consideration due to a clear ceiling effect at baseline. Although our null findings replicated Emfield and Neider (2014), who found environment type did not affect performance on a range of cognitive tasks,

researchers conducting future studies may consider using a cognitive test battery to more robustly test for any influence of congruence on directed attention.

The level of naturalness was varied across imagery conditions and the findings, both here and elsewhere (van den Berg et al., 2014), highlight naturalness as an important characteristic of restorative environments. Yet what makes a specific setting *natural enough* is not clear. This should be a explored in future research along with other factors such as the presence of water (White et al., 2010; Wilkie and Stavriou, 2013;) or usability features like seating (Abuldkarim and Nasar, 2014). Finally, the use of imagery in the current study further illustrated that simulation rather than actual environmental exposure can be beneficial (Kjellgren and Buhrkall, 2010); but it is also important to extend research on the congruence effect into real-world situations.

Conclusion

The results indicated urban green space can be equally as restorative to nature in some instances; and further substantiated criticisms of the nature vs. urban street dichotomy in environment-wellbeing studies (Karmanov & Hamel, 2008; Velarde et al., 2007). Significant and non-significant findings also suggested variation in both perceived restoration potential and some restorative outcomes were partially due to an environmental preference/environment type congruence effect, especially for nature lovers. Although the congruence effect may (but not necessarily) influence well-being, the antecedent perception of a lack of restoration potential may stop engagement with even the most well-designed urban green spaces. This highlights the role individual factors could play in urban green space usage (James et al., 2009; Jorgensen and Gobster, 2010; Irvine, Warber, Devine-Wright and Gaston, 2013; Zhang, Howell, and Iyer, 2014). Future research should explore systematically how this congruence effect can inform to urban design to enhance well-being and maximize their use.

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Figure 1 Sample environment stimuli.

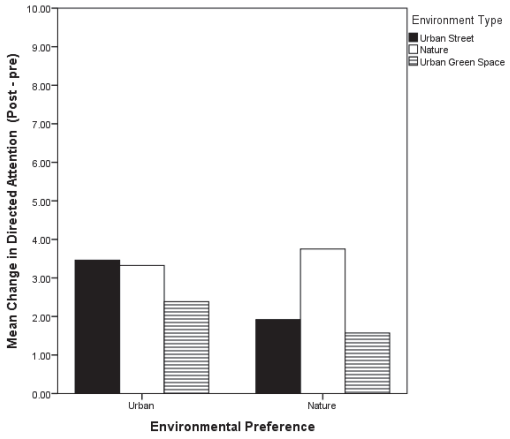
A Nature

B Urban green space

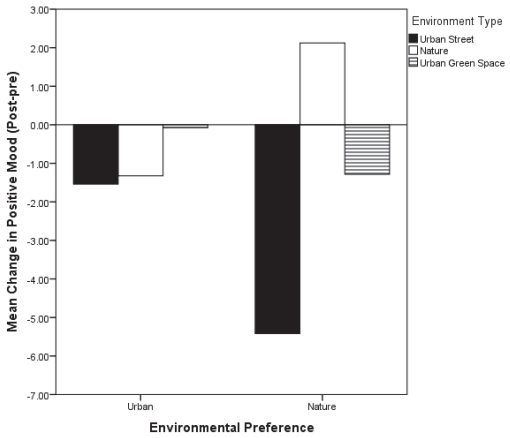
C Urban street

Figure 2 Environmental preference/environment type congruence effects on restoration and perceived restoration potential.

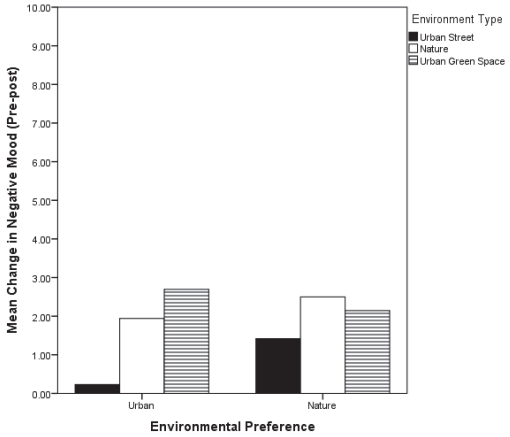
Note: Environmental preference main effects were all non-significant (all $p \geq .10$). M.E. refers to environment type main effect (Nature $N = 47$; Urban $N = 73$). Int. refers to the environmental preference x environment type interaction. Significant post-hoc differences are noted and listed by environmental preference/environment type.



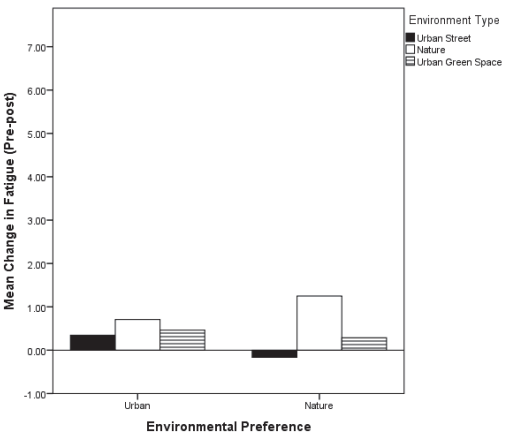
2A) Directed attention (Max. = 41; M.E. p = .22, Int. p = .38).



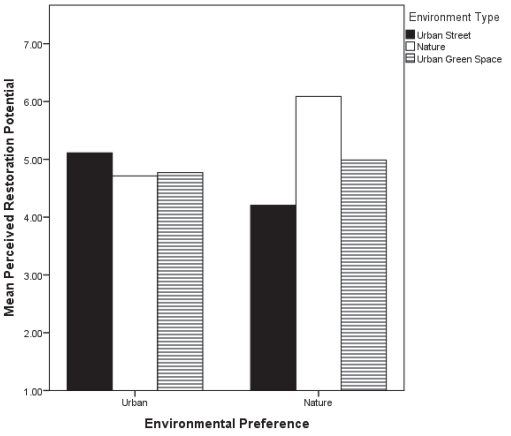
2B) Positive mood (Max. =50; M.E. p =.01, N > US; Int. p = .02, NP/N > NP/US).



2C) Negative mood (maximum =50, M.E. p = .03, UGS = N > US; Int. p = .54).



2D) Fatigue (7 = *completely*; M.E. p < .01, N > US; Int. p = .14).



2E) Perceived restoration potential (7 = *completely*; M.E. p = .10; Int. p < .001; NP/N > all; UP/US = UP/N; UP/US > NP/US).

Table

Table 1

Place Identity and Restoration Outcomes by Environmental Preference and Environment Type

Outcome	Overall			Environmental Preference[a]		Environment Type				
	Baseline	Post-imagery	Change[b]	Urban	Nature	Nature	Urban Green Space	Urban Street	*p*	Post-hoc
Place Identity[c]	-	7.45 (1.95)	-	7.48 (1.65)	7.35 (2.34)	-	-	-		
Directed Attention[d]	35.64 (4.85)	38.57 (3.87)	2.93 (3.40)	3.21 (3.37)	2.49 (3.43)	3.46 (3.63)	2.10 (2.08)	2.72 (3.55)		
Positive Mood[e]	29.27 (6.49)	27.68 (7.65)	-1.59 (6.56)	-1.18 (6.12)	-2.23 (7.22)	-0.22 (6.13)	-0.50 (5.86)	-3.40 (6.93)	**	N > US
Negative Mood[e]	13.54 (4.35)	11.91 (3.04)	1.63 (2.95)	1.47 (3.04)	1.89 (2.82)	2.12 (3.00)	2.50 (3.35)	0.80 (2.55)	*	N = UGS > US
Fatigue[f]	3.71 (1.25)	3.23 (1.36)	0.48 (1.34)	0.53 (1.31)	0.38 (1.38)	0.88 (1.19)	0.40 (1.88)	0.10 (1.43)	**	N > US
Perceived Restoration Potential[f]	-	4.90 (1.07)	-	4.87 (0.91)	4.96 (1.28)	5.15 (1.03)	4.85 (0.51)	4.68 (1.22)		

Note: Values in parentheses indicate the standard deviation. *p* values are for main effects of ANOVA. * $p < .05$; ** $p < .01$

[a]The main effect of environmental preference on all dependent variables was non-significant ($p <= .10$)

[b]Changes in directed attention and positive mood were calculated post - pretest scores; changes in negative mood and fatigue were calculated pre - posttest scores. A positive number number indicated an improved outcome. All values except baseline and post-imagery indicate change, with positive values indicating improvement except place identity and perceived restoration potential which were only measured post-imagery.

[c]Place identity was measured using Drosletis & Vignoles, 2010. 10 = *completely true of this place* .

[d]Directed attention was measured using Heeley's proofreading task. Maximum score = 41.

[e]Mood was measured used the Positive and Negative Affect Scale (Watson, Clark and Telegren, 1988). Maximum score = 50.

[f]Fatigue refers to a single-item rating of perceived level of general fatigue. Perceived restoration potential refers to the perceived likelihood of restoration from directed attention fatigue measured using the 12-item version of the PRS (Hartig, et al., 1997; Han, 2007). Maximum score for both = 7.

Highlights

- Environment preference/type congruence effects perceived restoration potential.
- Environment preference/type congruence effects positive mood.
- The congruence effect is more influential on those with a nature preference.
- Urban green space can equal nature’s influence on some restoration outcomes.
- Environmental preference is representative of place identity.