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Research Note: Further exploration of environment preference and environment type
congruence on restoration and perceived restoration potential

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Abstract

Previously, 'environmental preference as place identity' interacted with environment type impacting perceived restoration potential and positive mood; this was called the congruence effect. These studies were replicated with two modifications. Place attachment and dependence, in addition to place identity, were used to investigate the convergent validity of environmental preference. Stimuli were modified to increase presence and determine whether prior null effects on restoration were stimuli-based. Participants ($N = 88$) indicated environmental preference (nature/urban), rated it on place attachment/identity/dependence, viewed one of three walks, and completed restoration and perceived restoration potential measures. Evidence for convergent validity between environmental preference and place identity/attachment/dependence was found. The positive potential for urban green space was reinforced; it equalled nature in influencing fatigue and perceived restoration potential compared to urban streets. Congruence impacted two aspects of perceived restoration potential but not restoration; suggesting it may only affect perceived restoration potential but not restoration.

Keywords:

Urban green space, Nature, Environmental preference, Perceived restoration potential, sense of place

1.0 Introduction

Environmental preference is often defined as ‘liking’ (Pescharadt & Stigsdotter, 2013) or finding locations aesthetically pleasing (Hartig & Staats, 2006); and considered a result of perceived restoration potential (PRP), the belief locations restore depleted cognitive resources (van den Berg, Koole, & van der Wulp, 2003). Yet, environmental preference may *influence* PRP and represent something other than a general positive evaluation. In two studies, environmental preference (nature/urban) was treated as a quasi-independent variable representing place identity that interacted with environment type to influence PRP (Wilkie & Stavridou, 2013; Wilkie & Clouston, 2015). The environment preference/environment type congruence effect was most evident on PRP in the nature preference group; its effect on restoration was mixed. Because few studies have defined environmental preference in this way, the current study replicated earlier work with two modifications.

Since ‘environmental preference as place identity’ challenges common definitions of environmental preference, it was important to further explore its convergent validity. Wilkie and Clouston (2015) found place identity, the part of self that is linked to place (Proshansky, Fabian, & Kaminoff, 1983), was moderately high with the preferred environment, did not vary by preference, and concluded preference represented place identity. However, person-place relationships are complex and environment researchers consider two other concepts important to understanding this complexity. Place attachment is an emotional bond towards an environment (Lewicka, 2011). Place dependence is the extent environments supports goal attainment (Stokols & Shumaker, 1981). Attached individuals find places restorative with/without natural components (Korpela, Ylén, Tyrväinen, & Silvennoinen, 2008); place dependence reduces consideration of viable alternatives (Kyle, Graefe, Manning

& Bacon, 2004). The first modification was to include place attachment and dependence to further investigate the convergent validity of environmental preference. Convergent validity was examined through analyses of differences in place identity/attachment/dependence by environmental preference.

Wilkie and Clouston (2015) found nature and urban green spaces equally influenced mood and fatigue but not directed attention compared to urban streets. Congruence affected positive mood, but not negative mood, fatigue, or directed attention. Stimuli were modified to establish if these earlier mixed restoration findings were stimuli-based. Images from similar locations were replaced with images of a walk through a nature, urban green space, or urban street to invoke a sense of movement and presence, the “experience of being in one place...when physically situated in another” (p. 225, Witmer & Singer, 1998). Presence correlated with mood (deKort, Meijnders, & Sponselee, & IJsselsteijn, 2006), suggesting it may impact other restoration outcomes. In the current study, the following hypotheses were tested:

H₁: As evidence of convergent validity:

H_{1A}: Place identity ratings towards the preferred environment will be above scale mid-point and similar irrespective of preference.

H_{1B}: If environmental preference *also* has convergent validity with place attachment and place dependence, similar patterns to place identity would be expected.

H₂: Restoration and PRP will be equivalent after nature/urban green space exposure and both higher than urban street exposure.

H₃: Environmental preference/environment type congruence will influence restoration and PRP; the largest variability will be in those with a nature preference.

H₄: If earlier null-effects on restoration were stimuli-related, increased stimuli presence will increase the number of outcomes influenced by environment type and congruence.

2.0 Method

2.1 Participants

Students ($N = 88$, $M_{\text{age}} = 25.27$, $SD = 8.85$, female = 74%) at a university in an English city centre close to coastline and countryside received course credit.

Residential location was not obtained. A student sample ($N = 45$) rated stimuli naturalness but did not participate in the main study

2.2 Environment stimuli

Regional locations were selected based on prior research (e.g. Beil & Hanes, 2013; van den Berg, Jorgensen, & Wilson, 2014). Nature was a 16.04-acre woodland six miles from the city with varied vegetation and little sign of human influence. The urban green space was a Victorian park. Urban streets were in the city centre with few natural elements. Photography occurred in early summer in similar weather. Naturalness (1 = *urban*; 7 = *nature*) varied across environments ($M_N = 5.07$, $SD = 0.67$; $M_{UGS} = 4.17$, $SD = 0.76$; $M_{US} = 2.21$, $SD = 1.23$; $F(2, 42) = 37.12$, $p < .001$, $\eta_p^2 = .64$, all post-hoc $p < .01$).

2.3 Environmental preference

Participants indicated if they were a "country person or a city person" based on where they most enjoyed spending time. Country persons ($n = 49$) were categorized with a nature preference. Despite issues with urban/rural categorizations

(Nairn, Panelli, & McCormack, 2003), this categorization has been implemented (Knez, 2005).

2.4 *Convergent validity*

The 12-item sense of place scale captures affective (attachment), behavioural (dependence) and cognitive (identity) aspects of person-place relationships, all distinct concepts important to environmental engagement (Jorgensen & Stedman, 2001, 2006). 'Environment' replaced 'lake property' in all items. Participants responded *considering the preferred location* (1= *strongly disagree*; 5 = *strongly agree*). Cronbach's α values were: place attachment (0.81), place dependence (0.73), and place identity (0.72). Correlations ranged from 0.62 - 0.71 (all $p < .001$).

2.5 *Restoration and perceived restoration potential*

Change was calculated so positive values indicated improvement. Correlations between restoration outcomes ranged from -0.01 ($p = .48$) to 0.32 ($p < .01$). PRP was only measured post-imagery.

2.5.1 *Directed Attention*

Participants were presented with 80 colour words printed in incongruent colours (*pink* in blue ink) and named the ink colour as quickly as possible (Stroop, 1935). Completion time (seconds) and errors were recorded.

2.5.2 *Mood*

The Positive and Negative Affect Scale (Watson, Clark & Tellegan, 1988) consisted of 10 positive and negative mood states (1 = *very slightly/not at all*; 5 *extremely*). Cronbach's α was .88 for positive mood .86 for negative mood.

2.5.3 *Fatigue*

Participants were asked "how mentally fatigued you feel right now" (1 = *no fatigue*, 7 = *completely fatigued*).

2.3.4 Perceived restoration potential

The PRS-11 Perceived Restoration Scale has advantages over earlier PRP scales (Pasini, Berto, Brondino, Hall & Ortner, 2014). Responses *for the walk location* were on a scale modified so the lowest anchor was consistent with other measures (1 = *not at all*, 10 = *very much*). Cronbach's α varied from .89 (fascination, being away) to .78 (coherence) and .63 (scope). Correlations ranged from 0.14 ($p = .09$) to 0.66 ($p < .001$).

2.6 Design and procedure

Place attachment/dependence/identity were dependent variables in a multivariate design. Environmental preference ($n_N = 49$; $n_U = 39$) was the between-subjects independent variable. A 2 x 3 design tested the congruence effect. Environmental preference and environment type ($n_N = 32$; $n_{UGS} = 29$; $n_{US} = 27$) were between-subjects independent variables. Restoration outcomes and PRP were dependent variables. A six-level preference/type congruence variable was created for post-hoc analyses with Bonferroni correction: nature/nature ($n = 20$), nature/urban green space ($n = 19$), nature /urban street ($n = 10$), urban/nature ($n = 12$), urban/urban green space ($n = 10$), and urban/urban street ($n = 17$).

British Psychological Society ethics (2010) were implemented. Participants were allocated to environment type prior to arrival to minimize the impact of cancellations. They completed baseline restoration measures and viewed a 7-minute slide show presented a 0.35-mile walk (Fig. 1) consistent with average adult walking speed (Waters & Mulroy, 1999). Participants completed convergent validity, PRP, restoration measures, and demographics including familiarity with the viewed location.

3.0 Results

Familiarity could not affect convergent validity variables, which referred to preferred locations. Most (67%) were familiar with the walk location; few (12%) visited weekly or more. Only PRP 'being away' and 'scope' varied. Being way was lower in those familiar with the walk location ($M = 4.91, SD = 2.78$) compared to unfamiliar participants ($M = 6.16, SD = 2.25, t(86) = -2.12, p = .03$). Scope was also lower for the familiar group ($M = 5.80, SD = 2.06$) compared to the unfamiliar ($M = 7.30, SD = 1.81, t(86) = -3.36, p = .001$).

Correlations between convergent validity variables were appropriate for MANOVA (Tabachnick & Fidell, 2014). Restoration-related correlations were not and separate ANOVAs conducted. Familiarity could not be included because its addition resulted in small cell sizes. Descriptive and inferential statistics for main effects are in Table 1. Environmental preference did not affect restoration or PRP.

3.1 *Convergent validity of environmental preference*

Both preference groups reported mid-to-moderate place attachment, place dependence and place identity towards the preferred environment. There was a multivariate effect. Place attachment and identity were higher in the nature preference group. Place dependence did not differ.

3.2 *Environment type*

Environment type did not influence directed attention or positive mood. Negative mood differed by environment type but post-hoc results were all non-significant. Fatigue varied by environment type. Urban green space and nature equally reduced fatigue compared to urban streets, which increased it.

Environment type affected PRP. Urban green spaces and nature were perceived equal and higher than urban streets in fascination, being away, and scope. Urban green spaces were perceived higher in coherence than nature and urban streets.

3.3 Environmental preference/environment type congruence effect

The preference x type interaction did not affect directed attention speed ($F(2,77) = 0.17, p < .42, \eta_p^2 = .01$) or errors ($F(2,76) = 1.39, p < .13, \eta_p^2 = .04$), positive mood ($F(2,81) = 0.80, p < .23, \eta_p^2 = .02$), negative mood ($F(2,81) = 0.77, p < .24, \eta_p^2 = .02$), or fatigue ($F(2,79) = 0.21, p < .40, \eta_p^2 = .01$). Figure 2 illustrates the congruence effect on PRP and includes interaction inferential statistics. No congruence effect was observed on coherence or scope. It did effect fascination. Post-hoc analyses using the preference/type variable confirmed variability amongst those with a nature preference (see Fig. 2 for significant p values). Urban streets were less fascinating to nature preference groups compared to counterparts exposed to urban green spaces or nature. The urban preference group rated all environments equally. Congruence also significantly affected being away. Having a nature preference and being exposed to nature or urban green spaces increased being away compared to either preference exposed to urban streets. An urban preference combined with urban green space exposure also resulted increased being away compared to either preference in urban street conditions. Being away was equal between the urban preference/nature combination and all other preference/type combinations.

4.0 Discussion

Participants reported mid-to-moderate place attachment, place dependence, and place identity towards preferred environments. The level of place identity was lower than the moderately high levels reported by Wilkie and Clouston (2015).

Similar levels of identity/attachment/dependence were anticipated irrespective of preference; however, attachment and identity were higher in the nature preference group. This may be due to experience with nature, which can increase both (Kudryavtsev, Krasny, & Stedman, 2012; Moore & Graefe, 1994; Ryan, 2005). The findings provided evidence for convergent validity between environmental preference and place identity, as well with place attachment and place dependence, to support the use of the urban/nature environmental preference variable and provide a fuller account of relationships with *place*. However, the variability in these three concepts reported here both in level and by preference reinforces the need to distinguish between them (Jorgensen & Stedman 2006; Tam, 2013) in place research. Future studies should investigate the directional relationship between environmental preference and these concepts and whether it is divergent/convergent with common definitions (e.g. liking) or concepts like connectedness to nature (Brügger, Kaiser, & Roczen, 2010; Tam, 2013).

Wilkie and Clouston (2015) found environment type affected mood and fatigue, not directed attention or PRP. The impact on fatigue was replicated here, indicating nature and urban green spaces were again equally beneficial. In the current study, environment type affected all PRP subscales. Specifically, nature and urban green spaces were equivalent in fascination, being away, and scope; urban green spaces were higher in coherence than nature or urban streets. The current findings add to the evidence of the positive impact of well-designed urban green spaces including improved wellbeing (Carrus et. al, 2015) and public health outcomes such as physical (Akpınar, 2016) and mental health (van den Berg et al., 2016).

Previously, a congruence effect on PRP (Wilkie & Stavridou, 2013; Wilkie & Clouston, 2015) and positive mood (Wilkie & Clouston, 2015) was presented. In

those studies, ratings were highest with nature preference/nature image congruence and lowest with nature preference/urban street image incongruence. In the current study, there were no congruence effects on restoration; only the congruence effect on PRP was partially replicated here. Fascination and being away varied, were again more pronounced with a nature preference, and further supports congruence as an influence on PRP. The results raise the possibility congruence only affects specific aspects of PRP and may have limited, if any, impact on restoration. Whether it directly influences behaviours like location choice, use frequency/duration, and restoration in situ should be explored.

4.1 *Methodological considerations*

Stimuli were modified to increase presence; yet, no additional effects on restoration were observed despite being hypothesized. It may be presence was not increased. Factors such as multimodal presentation were not used and experience of presence not confirmed (Witmer & Singer, 1998). The lack of effect on directed attention may also be due to the Stroop task, which is commonly used in research so the sample may have been practiced. Better real-world cognitive tasks should be identified. Location familiarity impacts PRP (Hartig & Staats, 2006) and restoration (Korpela et al., 2008); therefore should be better controlled (e.g. geographically distant stimuli). However, using nearby locations meant we were able to determine most outcomes were not affected by familiarity. The sample was small, predominantly female, and university students; findings should be interpreted considering these limitations.

5.0 **Conclusion**

‘Environmental preference as place identity’ was previously proposed. The current results support the convergent validity of this definition; but suggested it

should also be broadened to include two other widely used concepts in person-place studies: place attachment and place dependence. These findings also highlight an alternative to the more common ‘preference resulting from need for restoration’ definition used in person-place research. Urban green spaces again equalled or bettered nature in their impact on fatigue and perceived restoration potential, reinforcing their potential as a nearby wellbeing resource. The congruence effect was replicated on fascination and being away aspects of perceived restoration potential. Landscape and urban design professionals may find the results relevant to understanding user perceptions of location characteristics (Kyle et. al, 2004), perceived restoration potential judgements of managed nature (Korpela et al, 2008), use (Lin, Fuller, Bush, Gaston & Shanahan, 2014), and differing views on urban green space management approaches (Ryan, 2005).

6.0 References

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Table 1

Environmental Preference Convergent Validity Comparisons and Environmental Preference and Environment Type Main Effects on Restoration and Perceived Restoration Potential

Outcome	Overall			Environmental Preference ^a						Environment Type								
	Baseline	Post imagery (N = 88)	Change ^b	F	p	η^2_p	Urban (n = 39)	Nature (n = 49)	F	p	η^2_p	Nature (n = 32)	Urban Green Space (n = 29)	Urban Street (n = 27)	F	p	η^2_p	Post hoc
<i>Convergent Validity</i>				21.2	***	.43												
Place Attachment	-	14.58 (3.47)	-				13.00 (3.26)	15.84 (3.13)	17.2	***	.17	-	-	-				
Place Dependence	-	14.07 (3.13)	-				14.23 (3.39)	13.94 (2.94)	0.19	.00		-	-	-				
Place Identity	-	12.75 (3.02)	-				11.36 (2.81)	13.86 (2.72)	17.7	***	.17	-	-	-				
<i>Restoration Outcomes</i>																		
Directed Attention Time ^d	78.35 (19.73)	68.79 (17.18)	9.01 (9.74)				8.02 (8.87)	9.77 (10.39)	0.12	.00		11.20 (9.53)	9.30 (7.39)	5.99 (11.67)	1.84		.05	
Directed Attention Errors ^d	1.85 (1.90)	1.45 (2.00)	0.34 (1.88)				0.25 (1.90)	0.41 (1.88)	0.04	.00		0.70 (1.60)	0.19 (2.11)	0.08 (1.94)	0.41		.01	
Positive Mood ^e	29.32 (7.63)	28.24 (8.24)	-1.05 (4.73)				-0.71 (4.94)	-1.31 (4.59)	0.75	.01		-0.45 (4.40)	-0.97 (4.64)	-1.81 (5.23)	1.03		.03	
Negative Mood ^e	15.71 (6.00)	14.63 (6.03)	1.08 (4.15)				1.16 (3.85)	1.02 (4.04)	0.38	.01		0.61 (5.00)	2.45 (3.67)	0.15 (3.22)	2.96	*	.07	all NS
Fatigue ^f	3.42 (1.47)	3.43 (1.59)	0.06 (1.14)				0.11 (1.17)	0.02 (1.12)	1.53	.02		0.20 (1.30)	0.45 (0.83)	-0.54 (1.03)	6.67	***	.15	UGS = N UGS > US** N > US*
<i>Perceived Restoration Potential^g</i>																		
Fascination	-	5.92 (2.37)	-				5.26 (2.40)	6.44 (2.24)	2.04	.02		6.22 (2.40)	6.86 (1.79)	4.54 (2.32)	8.23	***	.17	UGS = N UGS > US*** N > US**
Being away	-	5.33 (2.66)	-				4.47 (2.44)	6.02 (2.66)	2.42	.03		6.18 (2.49)	6.60 (2.07)	2.98 (1.83)	22.8	***	.36	UGS = N > US***
Coherence	-	5.82 (1.91)	-				5.36 (2.12)	6.18 (1.67)	2.87	.03		5.24 (1.96)	6.92 (1.29)	5.32 (1.96)	7.79	***	.16	UGS > N*** UGS > US** N = US
Scope	-	6.31 (2.10)	-				6.27 (2.10)	6.34 (2.11)	0.59	.01		7.11 (1.90)	6.53 (2.10)	5.13 (1.83)	7.62	***	.16	N = UGS N > US*** UGS > US*

Note: Sample sizes varied across analyses (Directed Attention $N = 83$ to $PRP N = 88$). Values in parentheses indicate the standard deviation. p values are one-tailed, for the main effects of MANOVA for convergent validity comparison and ANOVA for all other outcomes. Post-hoc comparisons were conducted using Bonferroni correction. * $p < .05$, ** $p < .01$, *** $p < .001$.

^aThe main effect of environmental preference on restoration outcomes was non-significant. Environmental preference was not hypothesized to influence restoration.

^bAll values except baseline and post imagery indicate change, except convergent validity variables and perceived restoration potential which were only measured post imagery. Changes in positive mood were calculated post imagery - baseline scores, all other change scores were calculated baseline - post imagery scores. A positive number number indicated an improved outcome.

^cMeasured using Jorgensen & Stedman, 2001. 5 = *strongly agree*. Maximum score = 20.

^dDirected attention was measured using the Stroop Task (1935). Time is in seconds.

^eMood was measured used the Positive and Negative Affect Scale (Watson, Clark and Tellegen, 1988). Maximum score = 50.

^fFatigue refers to a single-item rating of perceived level of general fatigue. 7 = *completely fatigued*.

^gPerceived restoration potential was measured using the 11-item version of the PRS (Pasini, Berto, Brondino, Hall, & Ortner, 2014). 10 = *completely*. Maximum score = 10.

Fig. 1
Sample environmental stimuli.

A Nature



B Urban green space



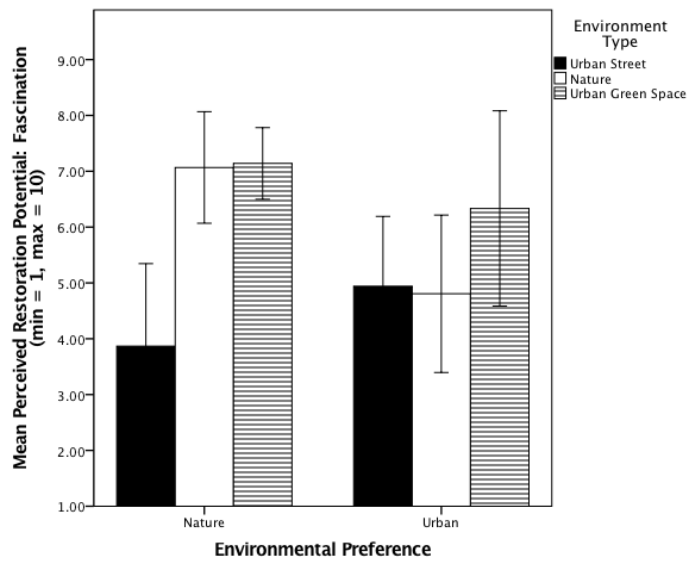
C Urban street



Fig. 2: Environmental preference/environment type congruence effects on perceived restoration potential.

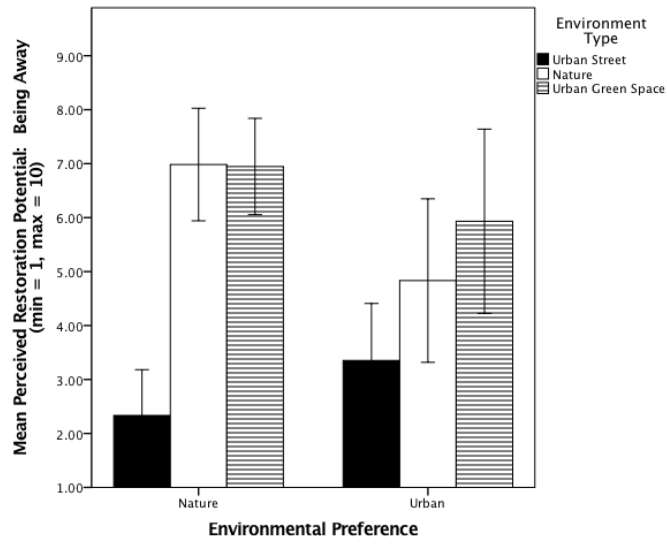
Note: See table 1 for main effects of environmental preference and environment type. Int. refers to the environmental preference x environment type interaction. Significant post-hoc differences (Bonferroni correction) are noted and listed by environmental preference/environment type. Error bars represent 95% confidence intervals. * $p < .05$, ** $p < .01$, *** $p < .001$.

A)



Int. $F(2,82) = 4.35, p < .01, \eta_p^2 = .10$; NP/UGS = NP/N > UP/US* = NP/US*

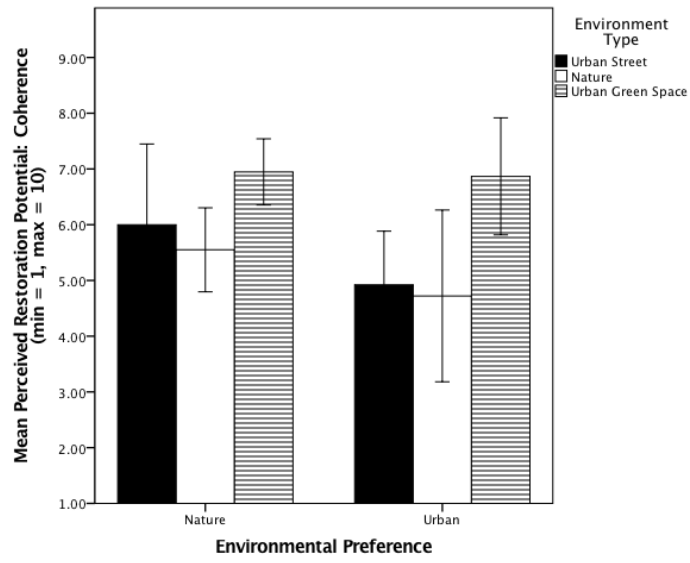
B)



Int. $F(2,82) = 4.07, p = .01, \eta_p^2 = .36; NP/N = NP/UGS > UP/US^{***} = NP/US^{***};$

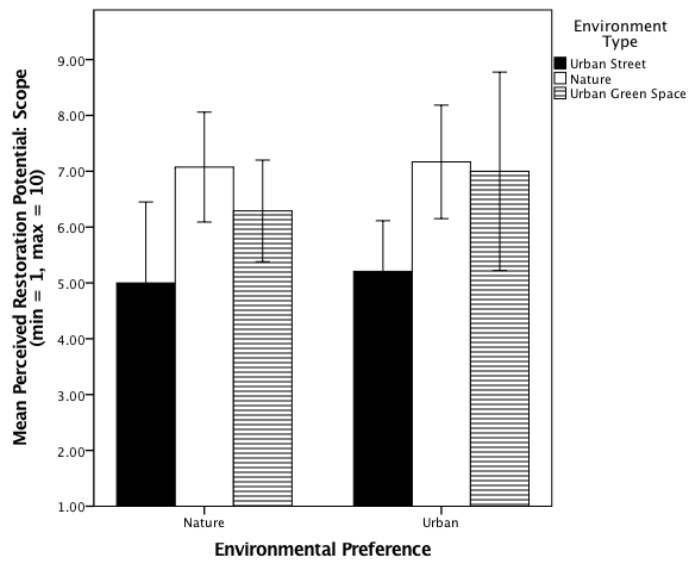
$UP/UGS > U/US^* \& N/US^{**}$

C)



Int. $F(2,82) = 0.57, p < .29, \eta_p^2 = .01$.

D)



Int. $F(2,82) = 0.19, p < .41, \eta_p^2 = .01$.

Highlights:

- Convergent validity of environmental preference and three person-place concepts was presented.
- Environmental preference as person-place concepts is an alternative to common definitions.
- Place attachment and identity were higher in those with a nature preference.
- Urban green space and nature were perceived as equally restorative.
- The congruence effect was further supported on perceived restoration potential.

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