

European Review of Applied Psychology

Pro-environmental attitudes, pro-environmental behaviours and nature-relatedness: Differences based on place preference --Manuscript Draft--

Manuscript Number:	ERAPSY-D-20-00035R2
Full Title:	Pro-environmental attitudes, pro-environmental behaviours and nature-relatedness: Differences based on place preference
Secondary Full Title:	Attitudes pro-environnementales, comportements pro-environnementaux et relation avec la nature: différences basées sur la préférence du lieu
Article Type:	Original article
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Abstract:	<p>Introduction: This study explored whether place preference, an individual's relationship with place, differentiated people on pro-environmental attitudes, nature-relatedness and pro-environmental behavior.</p> <p>Objective: The aim was to provide a way to segment people and potentially inform behavior change messaging strategies targeting pro-environmental action.</p> <p>Method: Online participants reported an urban/nature place preference, completed a sense of place measure in reference to this categorisation, followed by counter-balanced nature-relatedness, pro-environmental attitudes and pro-environmental behaviour measures.</p> <p>Results: Participants reported moderate-to-high levels of sense of place generally and place attachment specifically. Positive associations between sense of place, nature relatedness, pro-environmental attitudes and behaviours existed; but differed by place preference. Correlations were positive in the nature preference group but negative or non-significant in the urban preference group. Individuals with a nature preference reported higher nature-relatedness, pro-environmental attitudes and pro-environmental behavior.</p> <p>Conclusion: The results suggest place preference can discriminate individuals on a range of pro-environmental concepts and may have potential for behavior change strategies targeting these outcomes.</p>
Secondary Abstract:	<p>Résumé:</p> <p>Introduction: Cette étude a exploré en quoi la préférence de lieu, c'est-à-dire la relation d'un individu avec un lieu, différencie les gens sur les attitudes pro-environnementales, ainsi que sur les comportements pro-environnementaux et liés à la nature. Objectif: L'objectif était de fournir un moyen de segmenter les gens et d'éclairer potentiellement les stratégies de messages de changement de comportement ciblant l'action pro-environnementale.</p> <p>Méthode: Les participants ont indiqué en ligne une préférence pour les lieux urbains vs naturels, puis ont complété une mesure du sentiment d'appartenance à un lieu en référence à cette catégorisation, suivie de mesures liées à la nature, aux attitudes pro-environnementales et à des comportement pro-environnementaux (l'ordre de passation de ces 3 mesures étaient contre-balancé).</p> <p>Résultats: Les participants ont signalé des niveaux modérés à élevés de sentiment d'appartenance en général et, en particulier, d'attachement au lieu. On a relevé des associations entre le sentiment d'appartenance à un lieu, la relation avec la nature, les attitudes et les comportements favorables à l'environnement, mais ces liens différaient selon la préférence du lieu. Les relations étaient positives dans le groupe de préférences pour la nature, mais négatives ou non-significatives dans le groupe de</p>

	<p>préférences urbaines. Les personnes ayant une préférence pour la nature ont déclaré une plus grande relation avec la nature, des attitudes pro-environnementales et des comportements pro-environnementaux plus élevés.</p> <p>Conclusion: Les résultats suggèrent que la préférence de lieu peut discriminer les individus sur un éventail de concepts pro-environnementaux et peut représenter un potentiel pour des stratégies de changement de comportement.</p>
Keywords:	Place preference; Sense of Place; Nature-relatedness; Pro-environmental attitudes; Pro-environmental behaviour
Secondary Keywords:	préférence de lieu; sentiment d'appartenance à un lieu; lien avec la nature; attitudes pro- environnementales; comportement pro-environnemental

Running head: PLACE PREFERENCE

Pro-environmental attitudes, pro-environmental behaviours
and nature-relatedness: Differences based on place
preference

Attitudes pro-environnementales, comportements pro-
environnementaux et relation avec la nature: différences
basées sur la préférence du lieu

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Résumé:

Introduction:

Cette étude a exploré en quoi la préférence de lieu, c'est-à-dire la relation d'un individu avec un lieu, différencient les gens sur les attitudes pro environnementales, ainsi que sur les comportements pro-environnementaux et liés à la nature.

Objectif:

L'objectif était de fournir un moyen de segmenter les gens et d'éclairer potentiellement les stratégies de messages de changement de comportement ciblant l'action pro-environnementale.

Méthode:

Les participants ont indiqué en ligne une préférence pour les lieux urbains vs naturels, puis ont complété une mesure du sentiment d'appartenance à un lieu en référence à cette catégorisation, suivie de mesures liées à la nature, aux attitudes pro environnementales et à des comportement pro-environnementaux (l'ordre de passation de ces 3 mesures étaient contre-balancé).

Résultats:

Les participants ont signalé des niveaux modérés à élevés de sentiment d'appartenance en général et, en particulier, d'attachement au lieu. On a relevé des associations entre le sentiment d'appartenance à un lieu, la relation avec la nature, les attitudes et les comportements favorables à l'environnement, mais ces liens différaient selon la préférence du lieu. Les relations étaient positives dans le groupe de préférences pour la nature, mais négatives ou non-significatives dans le groupe de préférences urbaines. Les personnes ayant une préférence pour la nature ont déclaré une plus grande relation avec la nature, des attitudes pro-environnementales et des comportements pro-environnementaux plus élevés.

Conclusion:

Les résultats suggèrent que la préférence de lieu peut discriminer les individus sur un éventail de concepts pro-environnementaux et peut représenter un potentiel pour des stratégies de changement de comportement.

Mots clés : préférence de lieu; sentiment d'appartenance à un lieu; lien avec la nature; attitudes pro- environnementales; comportement pro-environnemental

Pro-environmental attitudes, pro-environmental behaviours
and nature-relatedness: Differences based on place
preference

Abstract

Introduction: This study explored whether place preference, an individual's relationship with place, differentiated people on pro-environmental attitudes, nature-relatedness and pro-environmental behavior.

Objective: The aim was to provide a way to segment people and potentially inform behavior change messaging strategies targeting pro-environmental action.

Method: Online participants reported an urban/nature place preference, completed a sense of place measure in reference to this categorisation, followed by counter-balanced nature-relatedness, pro-environmental attitudes and pro-environmental behaviour measures.

Results: Participants reported moderate-to-high levels of sense of place generally and place attachment specifically. Positive associations between sense of place, nature relatedness, pro-environmental attitudes and behaviours existed; but differed by place preference. Correlations were positive in the nature preference group but negative or non-significant in the urban preference group. Individuals with a nature preference reported higher nature-relatedness, pro-environmental attitudes and pro-environmental behavior.

Conclusion: The results suggest place preference can discriminate individuals on a range of pro-environmental

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concepts and may have potential for behavior change strategies targeting these outcomes.

Keywords: Place preference, Sense of place, Nature-relatedness, Pro-environmental attitudes, Pro-environmental behaviour

Mots-clés: préférence de lieu; sentiment d'appartenance à un lieu; lien avec la nature; attitudes pro-environnementales; comportement pro-environnemental

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International agencies have called for increased pro-environmental action to achieve a variety of environment-related targets. For example, the World Health Organization's (WHO) specified sustainable development goals including the production and use of clean energy, reduced air pollution, and greater uptake of active transportation (WHO, 2019). National strategies include elimination of single use plastics (Department for Environment, Food, and Rural Affairs, DEFRA, 2019; EU Parliament, 2019) and promotion of 'greener living' (Environmental Protection Agency, 2019). Increasing pro-environmental behaviour is considered "a grand challenge for environmental psychologists" (Sörqvist, 2016, p. 5) but if ambitious targets are to be achieved then behaviour change is needed to increase pro-environmental behaviour.

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Pro-environmental behaviour (PEB) has been defined as "behaviour that harms the environment as little as possible, or even benefits the environment" (Steg & Vlek, 2009, p. 309). PEBs range from relatively easy actions such as household food or plastic waste recycling to high effort actions such as a change to non-motorised transportation or involvement with political initiatives to reduce climate change. Various factors influence PEB (Gifford & Nilsson, 2014; Moore & Boldero, 2017; Steg & Vlek, 2009) and psychological approaches to understanding them are often based on social psychological models linked with behaviour change. These include the theory of planned behaviour or the norm activation model, both

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of which typically assess the effectiveness of values, attitudes, social norms or moral norms to impact PEB (Lee et al., 2013; Moore & Boldero, 2017). Evidence supports the influence of these socio-psychological factors on the intentions and motivations complete pro-environmental behaviours (Bamburg & Möser, 2007; Midfodzyeva & Brandt, 2013).

within these models, attitudes and values are often differentiated between a more general, pro-environmental one focused broadly on environmentally-related world views and those more specific to the role of the environment in defining the self (Brügger et al., 2011; Nisbet et al., 2009). In the current study, general pro-environmental attitude was operationalised using the New Ecological Paradigm Scale (Dunlap et al., 2000). This measure represents the individual's ecological view and beliefs about limits to growth, human "exceptionality" and their central importance (i.e., anti-anthropocentrism), fragility of nature's balance, and eco-crises such as climate change (Dunlap et al., 2000). Nature-relatedness captured the extent to which a person views "their interconnectedness to the natural world (Nisbet et al., 2009; Nisbet & Zelenski, 2013, p. 718). Both the NEP and nature-related identity were associated with higher levels of pro-environmental behaviour (Brick et al., 2017; Brügger et al., 2011; Gatersleben et al., 2000; Mackay & Schmitt, 2019; Tam, 2013).

It could be argued to improve pro-environmental behaviour and sustain these actions over the long-term,

1
2 it is important to use effective messaging strategies
3 (Leung et al., 2015; Moore & Boldero, 2017; Kidd et al.,
4 2019; Ramikissoon et al., 2013; white et al., 2019).
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6 Several studies suggested factors such as social or
7
8 individual identity, emotion, and environmental attitudes
9
10 have an important role to play in this regard (Moore &
11 Boldero, 2017; Steg & Vlek, 2009; white et al., 2019; Xu
12 et al., 2015) However, interventions to increase pro-
13 environmental behaviour often use a 'one size fits all'
14 approach designed to increase audience knowledge about
15 climate-related issues; and Kidd and colleagues (2019)
16 argue it is crucial to segment audiences based on
17 individual differences to develop different messaging
18 strategies.
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30 Understanding an individual's place preference may
31 be an efficient method to segment audiences in order to
32 effectively target behaviour change campaigns or message
33 framing. In person-environment studies, place preference
34 represents the place meanings linked with the self-
35 concept and an individual's broad preference for nature
36 or urban settings (Wilkie & Stavridou, 2013; wilkie &
37 Clouston, 2015; Morton, van der Bles & Haslam, 2017).
38
39 wilkie and Clements (2018) suggested that underlying
40 place preference is sense of place and its cognitive,
41 affective, and behavioural components (Budgen & Stedman,
42 2019). The cognitive component is place identity, "a
43 sub-structure of the self-identity of the person
44 consisting of broadly conceived cognitions about the
45 physical world which relate to the variety of complexity
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1 of physical settings that define the day-to-day existence
2 of every human being” (Proshansky et al., 1983, p. 59).
3 Place attachment, the affective component, represents
4 “bonding that occurs between individual and meaningful
5 environments (Scannell & Gifford, 2010a, p. 1). Both are
6 considered to be linked with the behavioural component,
7 place dependence, or “how well a setting serves goal
8 achievement given a range of existing alternatives”
9 (Jorgensen & Stedman, 2001, p. 234). Collectively, these
10 three components contribute to sense of place, a higher-
11 order concept that reflects the broader place meaning to
12 the individual (Budgen & Stedman, 2019; Jorgensen &
13 Stedman, 2001, 2006).

14 The underlying facets of place preference (sense of
15 place, place attachment, place identity, and place
16 dependence) influence pro-environmental behaviour both
17 directly and indirectly. Self-identities associated with
18 nature predicted increased PEB (Gatersleben et al., 2014;
19 Whitmarsh & O’Neill, 2010). People reporting a higher
20 nature-related identity also reported greater intention
21 to engage in conservation activities (Lokhorst et al.,
22 2014). Place attachment was highlighted as an important
23 contributor to pro-environmental concern (Gifford &
24 Nilsson, 2014) and PEB (Lee et al., 2013; Ramkissoon et
25 al., 2013); and place dependence influenced PEB directly
26 (Halpenny, 2010) and indirectly via its influence on
27 place identity (Vaske & Korbin, 2001) and place
28 attachment (Ramkissoon et al., 2013). Sense of place
29 also resulted in higher likelihood to use active
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1 transportation (Chen & Sekar, 2018), a type of pro-
2 environmental behaviour. Collectively, these findings
3 indicate using a nature/urban place preference to
4 categorise an individual has the potential to be an
5 effective way to differentiate them on multiple
6 attitudinal characteristics linked to PEB. However, we
7 are unaware of any prior studies that investigated this.
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10 The aim of the current study was to explore the
11 suitability of place preference to differentiate
12 individuals on attitudes linked with PEB. Specifically,
13 place preference was expected to discriminate individuals
14 on two pro-environmental attitudes and self-reported pro-
15 environmental behaviour. The following hypotheses were
16 tested:
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19 HY₁: Supporting its construct validity of the
20 dichotomous nature-urban definition of place
21 preference, participants generally would report high
22 levels of sense of place, place attachment, place
23 identity, and place dependence associated with their
24 preferred type of place.
25

26 HY₂: The profile and strength of inter-correlations
27 between sense of place, nature relatedness, pro-
28 environmental attitude, and pro-environmental
29 behaviour would also differentiate preference
30 groups, with the nature preference group reporting
31 stronger associations.
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33 HY₃: General pro-environmental attitude, nature-
34 relatedness and pro-environmental behaviour will be
35 higher in persons reporting a nature preference.
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Methods

Participants

Participants were recruited from online psychology research sites, social media requests and a research participation scheme at the host university. Of those who started the survey, 48 exited early (e.g. after the first screen) or had extensive missing data. This resulted in 211 participants with data suitable for further analysis. The average age was 26.57 years old ($SD = 11.15$; range = 16 - 68) and 73.10% were female.

Design

The study employed both correlational and quasi-experimental designs. Sense of place, its three subscales (place identity, place attachment, and place dependence), nature relatedness, pro-environmental attitude and pro-environmental behaviour were all included in correlational analyses. In a set of comparative analyses, nature relatedness, pro-environmental attitude and pro-environmental behaviour were dependent variables and place preference (nature/urban) was the quasi-independent variable. (See Results for a full explanation of the analysis strategy.)

Materials

Place preference

Participants were asked to read the following text: "People who most enjoy spending time in a natural environment may consider themselves 'country people' whereas individuals who most enjoy spending time in an urban environment may consider themselves 'city people'."

1 They then categorised themselves as either a city ($N =$
2 105) or country ($N = 106$) person based on this
3 description. 'City persons' were categorized as having
4 an urban place preference and 'country persons' as having
5 a nature preference. This dichotomous operational
6 definition of place preference has been successfully
7 implemented in prior studies (Knez, 2005; Morton et al.,
8 2017; wilkie & Stavridou, 2013; wilkie & Clouston, 2015;
9 wilkie & Clements, 2018).

18 **Measures**

20 Measures were chosen because they have been widely
21 implemented in research exploring linkages between
22 persons and place. For each, overall scale and subscale
23 (where appropriate) scores were calculated as the mean of
24 its items. Cronbach's alpha statistics were compared
25 with published criterion, with a minimum of value of .70
26 considered suitable for group comparisons (Bland &
27 Altman, 1997).

37 ***Sense of Place***

39 Sense of place (Jorgensen & Stedman, 2001) was
40 measured using a 12-item Likert measure (1 = *strongly*
41 *disagree*; 7 = *strongly agree*). This measure has been
42 found to represent both a higher-order construct of sense
43 of place, as well as underlying constructs of place
44 attachment, place identity and place dependence
45 (Jorgensen & Stedman, 2001). Items originally referred
46 to a specific setting (lakeshore home) but were modified
47 to refer to 'that environment' to encompass a range of
48 places that may be consistent with the individual's self-

1 reported place preference. Three items were reverse
2 coded. Sample items included: *That environment says*
3 *very little about who I am* (identity), *That environment*
4 *is my favourite place to be* (attachment), *That*
5 *environment is the best place for doing the things I*
6 *enjoy most* (dependence). Cronbach's alpha was .90
7 for the overall scale score and ranged from 0.73 - .87
8 for the subscales.

16 ***Nature Relatedness***

17 The 6-item short form of the nature relatedness
18 scale was used to determine how participants perceived
19 their personal relationship with nature (Nisbet &
20 zelinski, 2013). The short form was chosen over the
21 original 21-item version (Nisbet, et al., 2009) to reduce
22 participant burden. Sample items included: *My ideal*
23 *vacation spot would be a remote, wilderness area, I take*
24 *notice of wildlife wherever I am, and I feel connected to*
25 *all living things and the earth.* Ratings were on a 5-
26 point Likert scale (5 = *strongly agree*). A single nature
27 relatedness score was calculated; Cronbach's alpha was
28 0.87.

44 ***Pro-environmental Attitude***

45 The revised version of the New Environment Paradigm
46 scale (Dunlap et al., 2000) measured an individual's
47 ecological worldview, as a general pro-environmental
48 attitude of environmental concern¹. It consists of 15

56
57 ¹A critique of the NEP is that it was not developed using social
58 psychological attitude theory (Dunlap, 2008) so does not measure all
59 attitude components. The NEP is widely used as an environmental
60 attitude measure (e.g., Brick et al., 2017; Colléony et al., 2019;
61 Kaiser et al., 2014; Leung et al., 2015; Miafodzyeva & Brandt, 2013;

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2 items capturing attitudes towards the consequences of
3 human behaviour on nature and the limitations of existing
4 natural resources. Sample items include: *We are*
5 *approaching the limit of the number of people the earth*
6 *can support, The so-called “ecological crisis” facing*
7 *humankind has been greatly exaggerated, and Humans were*
8 *meant to rule over the rest of nature.* Items were rated
9 on a 5-point Likert scale (5 = *strongly agree*), with
10 higher values indicating stronger endorsement of an
11 ecological world view and concern. Seven items were
12 reverse coded. Internal consistency was 0.84.

23 ***Pro-environmental Behaviour***

25 A measure of the frequency of engaging in 22 pro-
26 environmental behaviours was used (Capstick et al.,
27 2017). This measure includes a range of behaviours such
28 as simple actions such as turning off lights or taking
29 short showers to making monetary donations for
30 environmental campaigns to high-effort actions such as
31 protesting environmental issues. It has been
32 successfully used in cross-cultural contexts.
33 Respondents rate the frequency from 1 (*not at all in the*
34 *past year*) to 10 (*at least once a day*). The mean
35 calculated indicates the average frequency of engagement
36 across all behaviours. The scale’s internal consistency
37 was 0.89.

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whitburn et al., 2018). A recent study further supported its use as
a general attitude measure (Cruz & Manato, 2020).

Procedure

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2 The findings presented here were collected as part
3 of a larger online investigation of place and wellbeing.
4 It was approved by the University of Sunderland ethics
5 committee (ID: 002582) and conducted in adherence to the
6 British Psychological Society Code of Ethics (BPS, 2014,
7 2018). The entire study took approximately 20-30 minutes
8 to complete. After providing informed consent,
9 participants indicated their place preference and
10 completed the sense of place scale with specific
11 instructions to rate the items consistent with their
12 place preference: *For example if you responded you were*
13 *a “country person” answer the following items in*
14 *reference to a natural environment; if you indicated you*
15 *were a “city person” please answer them in reference to*
16 *an urban environment. As part of the larger study, they*
17 *were randomly allocated to one of three imagery*
18 *conditions (nature, urban green space, urban street)*
19 *which they viewed for 30 seconds, followed by several*
20 *wellbeing measures (not presented here). Participants*
21 *were then presented with the remaining measures relevant*
22 *to the validity findings presented here. They completed*
23 *nature relatedness, pro-environmental attitudes and pro-*
24 *environmental behaviour measures; the order of these was*
25 *counter-balanced. The imagery conditions did not prime*
26 *respondent responses on these measures (all $p > .11$).*
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Results

Data Preparation and Analysis Strategy

Single item missing values were imputed with the median based on guidelines for Likert item imputation (Widaman, 2006). Across all measures, there were 55 items generating over 11,660 data points. Only 19 values were imputed (0.002%). The percentage of missing values imputed on each measure ranged from .001-.003%.

Ratings on sense of place, its 3 subscales, nature relatedness, pro-environmental attitudes and pro-environmental behaviour were transformed to facilitate comparisons across outcomes. Total scale and subscale mean scores were transformed to percent scale maximum (International Wellbeing Group, 2013). Percent scale maximum was calculated using the following formula: $[(X - k^{min}) / (k^{max} - k^{min})] * 100$ where X = the participant rating, k^{min} = the minimum value of the Likert scale, and k^{max} = the maximum value of the Likert scale. The resulting scale allowed interpretation across measures by transforming them to a range of 0-100%.

A series of t-tests were implemented to determine whether gender differences existed. The results were non-significant (all $p > .09$) except for nature relatedness; males reported higher levels ($M_{Male} = 65.33$, $SD = 19.82$; $M_{Female} = 59.42$, $SD = 25.32$), $t(123.99) = 1.77$, $p = .04$.

Insert Table 1 About Here

Correlations (Table 1) were reviewed to determine whether multi-variate analysis of variance (MANOVA) or

1 analysis of variance (ANOVA) was the most appropriate
2 inferential test (Field, 2018). All associations between
3 sense of place, nature-relatedness, pro-environmental
4 behaviour, and pro-environmental attitude were
5 significant and positive but did not meet the
6 requirements for MANOVA. Therefore, separate t-tests
7 were used to compare nature relatedness, pro-
8 environmental attitude and pro-environmental behaviour by
9 place preference. As a construct validity check, a t-
10 test was used to compare sense of place by place
11 preference. Additionally, place preference
12 (nature/urban) was the quasi-independent variable in a 2
13 (preference) x 3 (sense of place subscale) mixed-
14 factorial analysis of variance (ANOVA). Sense of place
15 subscales were treated as levels of a repeated-measures
16 independent variable to determine if a within-subjects
17 main effect existed. These subscales were also used to
18 test the preference x subscale interaction.

19 To control the experiment-wise Type 1 error rate,
20 the α level was set *a priori* to 0.01 for these five
21 inferential analyses. All post-hoc analyses used
22 Bonferroni adjustment. An *a priori* power analysis using
23 G Power indicated recommended sample sizes of $N = 120$ for
24 the ANOVA and $N = 170$ for the t-tests based on an effect
25 size of .50, adjusted $\alpha = 0.01$, and $\beta = .80$.

26 Mean percent scale maximum ratings on sense of place
27 was 66% and its subscales ranged from 72% (place
28 attachment) to 62% (place identity), indicating
29 endorsement in reference to places consistent with their
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preference. Overall sense of place was higher in the nature preference group ($M_N = 73.16$, $SD = 13.68$; $M_U = 59.03$, $SD = 15.88$), $t(210) = -6.94$, $p < .001$, Cohen's $d = 0.95$. This difference was also present in the significant between-subjects main effect of place preference from the 2 (place preference) x 3 (sense of place subscale) mixed-factorial ANOVA, $F(1,210) = 48.16$, $p < .001$, $\eta^2_p = .19$.

There was a significant within-subjects main effect on sense of place subscale ratings, $F(2,420) = 50.08$, $p < .001$, $\eta^2_p = .19$. Post-hoc comparisons indicated place attachment was higher than place identity and place dependence (both $p = .001$); the latter two were equal ($p = .06$).

The significant place preference x subscale interaction is presented in Figure 1, $F(2,420) = 15.64$, $p < .001$, $\eta^2_p = .07$. A series of post hoc pairwise comparisons was implemented to minimise the Type 1 error rate. The first significant contrast indicated place attachment was higher than place identity for the urban preference group, $t(104) = -4.46$, $p < .001$, Cohen's $d = 0.44$. The second contrast indicated no difference in place attachment and place dependence for this group, $t(104) = 1.12$, $p = .13$. The third comparison between the highest rating of the urban preference group (place attachment) and the lowest rating of the nature preference group (place identity) was significant, $t(210) = -2.93$, $p < .01$, Cohen's $d = 0.40$. Together, these results indicated urban preference group subscale ratings

1 were significantly lower than any subscale ratings by
2 those reporting a nature preference. The final contrast
3 compared differences in place attachment and place
4 dependence within the nature preference group. Their
5 place attachment was higher than their place dependence,
6 $t(106) = 8.73, p < .001$, Cohen's $d = .85$. Due to similar
7 means, differences between place identity and place
8 dependence were not analysed in the nature preference
9 group.

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Insert Figure 1 About Here

Correlations between variables were also explored separately for each place preference group (Table 2). Associations between sense of place and its subscales were similar to those reported in Table 1, which were based on the entire sample. Positive associations between nature relatedness, pro-environmental behaviour and pro-environmental attitudes were also similar across groups; but the nature-relatedness/pro-environmental behaviour link was stronger in the nature preference group ($r^2_N = 0.40, r^2_U = 0.20$). There were also distinct differences in correlations by place preference. Sense of place and its subscales all positively correlated with nature-relatedness for the nature preference group; but these associations were negative in the urban preference group. For persons with an urban preference, pro-environmental attitudes were significantly and negatively correlated with overall sense of place and place dependence, whereas their sense of place and its three subscales all significantly, positively correlated with

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both pro-environmental attitude and behaviour in the nature preference group. Pro-environmental behaviour was not associated with sense of place or any of its components in the urban preference group.

Overall, the level of nature-relatedness reported was approximately 61% ($SD = 24.17$), pro-environmental attitudes was 67% ($SD = 14.67$), and pro-environmental behaviour was only 50% ($SD = 14.75$) of the percent scale maximum. All three differed by place preference. The urban preference group reported significantly lower levels of nature relatedness than the nature preference group, $t(207.18) = -8.51$, $p < .001$, one-tailed, Cohen's $d = 1.17$. Pro-environmental attitude ($t(208) = -2.40$, $p = .01$, Cohen's $d = 0.33$) and pro-environmental behaviour ($t(203) = -4.35$, $p < .001$, Cohen's $d = 0.61$) were both endorsed more by those with a nature preference. See Figure 2 for an overview.

Insert Figure 2 About Here

Discussion

The study explored the potential for place preference to be used as a method of segmenting individuals based on differences in several pro-environmental outcomes. This was based on self-reported place preference, defined as preferring either nature or urban settings and considered to represent key person-environment concepts linked with sense of place and the self. Overall, the potential validity of place preference for this purpose was supported by the study findings.

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Participants self-categorized as either a “city person” (urban preference) or a “country person” (nature preference). This dichotomous choice represented the current sample well, with equal numbers in each category. This even distribution was similar to prior studies (Wilkie & Clements, 2018; Morton, et al., 2017) but differed to others where an urban preference was more widely reported in laboratory-based studies (Wilkie & Stavridou, 2013; Wilkie & Clouston, 2015). One explanation for the discrepancy between prior studies and the current one may be the online methodology used. It may have captured a more representative distribution of participants compared with studies conducted in laboratory settings in urban locations. However, as hypothesized as evidence for construct validity, reported sense of place was moderate to high towards places consistent with their place preference. Using a percent scale maximum transformation, there was 66% agreement for overall sense of place and 62 – 72% for its subscales. This generally supported the proposed definition of place preference as a representation of place meaning; and indicated it was more pronounced in persons with a self-reported nature preference.

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Underlying place preference, the relative importance of the place identity, place attachment, and place dependence subscales were also investigated. Place attachment was higher than either place identity or dependence. This finding does not support the use of place preference as solely representative of place

1 identity (Wilkie & Clouston, 2015; Morton et al., 2017).
2 This result was interesting given identity should have
3 been the most accessible concept (Brugen & Stedman, 2019)
4 as respondents were asked to indicate the type of
5 “person” they were. The patterns reported in the current
6 study replicated those by several authors using the same
7 sense of place measure (Wilkie & Clements, 2018;
8 Jorgensen & Stedman, 2001, 2006), who found that place
9 attachment was the highest rated subscale. Overall, the
10 findings support the assertion place preference
11 represents all three commonly-used person-place
12 constructs, as well as a broader sense of place.
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25 The significant interaction between place preference
26 and these subscales also merits discussion. In both
27 groups, place attachment was higher than place identity;
28 but for the urban preference group place attachment was
29 significantly lower than *any* subscale rating by those
30 with a nature preference. This is consistent with other
31 reports that place attachment may have more influence
32 than place identity when focused on restoration (Menatti
33 et al., 2019), as well as what appears to be a more
34 pronounced emotional link between person and place for
35 those with a self-reported nature preference. The
36 interaction could also indicate differing underlying
37 influences based on place preference, for example with
38 attachment that is driven by social relationships
39 emphasized in urban contexts and to the physical, natural
40 environment for those with a nature preference (Scannell
41 & Gifford, 2010b). Place preference was previously
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linked with differences in intrinsic motivation (Morton et al., 2017) and future research should explore the range of motives and psychosocial influences underlying the development of both it and sense of place.

Place preference successfully discriminated groups on several key environmental outcomes as hypothesized. Nature-relatedness, pro-environmental attitude and pro-environmental behaviour were higher in those self-categorizing as having a nature preference. Higher nature-relatedness in this group illustrates the link between an individual's connectedness to the natural world based on emotion and experience (Nisbet et al., 2009, p. 718) with place preference, which was also strongly grounded in affect in the current study. There was also a distinct difference in the pattern of associations between sense of place and these three outcomes based on place preference. An urban preference resulted in negative associations between nature relatedness with sense of place and its subscales, between pro-environmental attitude with sense of place and place dependence, and indicated no link of any sense of place construct to pro-environmental behaviour. Conversely, sense of place and its subscales were all positively correlated with all three pro-environmental outcomes in the nature preference group. A potential explanation for the findings could be due to differences in experience with nature, as one would expect a nature preference to be associated with greater engagement with natural settings that, in turn, increases valuing nature

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(Soga et al., 2016), nature relatedness (Colléony et al., 2019; Nisbet & Zelensky, 2013), as well as pro-environmental attitudes and behaviours (Colléony, et al., 2019; Gifford & Nilsson, 2014; Nisbet et al., 2011; Tam, 2013). One limitation of the current study is that information regarding prior and current nature experiences were not collected. What the findings do suggest is that sense of place is inextricably and positively linked with these outcomes when nature is preferred but can be a negative influence when urban settings are preferred.

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These findings may be useful in predicting individual differences in pro-environmental attitudes or changing pro-environmental behaviour, which have been linked to affective responses to nature (Brügger et al., 2010; Gifford & Nilsson, 2014; Jorgensen & Stedman, 2006; Mayer & Franz, 2004). For example, behaviour change messages and engagement strategies could be based on these individual's differences. The use of place preference may provide an efficient means of differentiating people in order to specifically target the most effective strategy to invoke the desired change. It may be drawing on place identity and attachment-related motives could be more effective in the nature group, possibly because self-concordant goals are better for behaviour change (Prestwich & Kellar, 2014). When there is an urban preference, practical, non-emotive motives might be more effective (Lokhorst et al., 2014). For example, people with an urban preference might be targeted through other

1 behaviours such as encouraging them to engage in physical
2 activity in urban greenspaces; and this may
3 surreptitiously impact their pro-environmental attitudes
4 and associated behaviours. Message content is also most
5 effective when delivered by a member of the 'in-group'
6 (Fielding & Hornsey, 2016). Therefore, place preference
7 could also be used to identify the most relevant,
8 effective message source to invoke behaviour change.
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16 **Methodological Considerations**

18 The use of an online methodology introduced a lack
19 of experimental control in regards to data collection.
20 Prior studies using the definition of place preference
21 implemented here were conducted in either a university
22 lecture (Morton et al., 2017) or laboratory (Wilkie &
23 Stavridou, 2013; Wilkie & Clouston, 2015; Wilkie &
24 Clements, 2018) settings, thus ensuring that the visual
25 stimuli present during data collection were standardized
26 and the participation setting itself did not include
27 nature. The current sample was evenly distributed
28 between nature and urban preferences. This differed from
29 prior studies and may have potentially been influenced by
30 visual stimuli present during participation which were
31 outside experimenter control. One explanation may be the
32 online methodology introduced a confounding factor. For
33 example, if the participant completed the study in a
34 natural setting or one with a view of nature, this may
35 have resulted in a greater likelihood to indicate a
36 nature preference. Conversely, it could be the case
37 taking part in a setting of the respondent's choice may
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have produced more ecologically-valid and representative sample of place preference than prior studies. Other potential confounds such as current and childhood nature engagement or current urban/rural residential status (Gifford & Nilsson, 2014) and political affiliation (Kim et al., 2021) were not collected; therefore, we were unable to control for their effects. Future research could explore their impact, particularly in regard to how place preference translates into action across a range of pro-environmental behaviours and could also take into consideration the stage of behaviour change that is being targeted (Forward, 2014). There were also no gender differences on any outcome, with the exception of nature relatedness. This is contrary to prior research indicating women reported higher levels of place attachment (Rollero & DiPiccolo, 2010), pro-environmental attitudes (Mayer & Franz, 2004), and pro-environmental behaviour (Gifford & Nilsson, 2014). This should be a consideration in the generalizability of the study findings.

Conclusion

The results supported the potential suitability of a dichotomous place preference variable grounded in environmental and social psychological theory to differentiate people on several key factors related to pro-environmental action. Sense of place overall and its subscales of place identity, attachment, and dependence were stronger in those with a nature preference. However, both groups appeared to be driven by the

1 affective relationship with their preferred place. Place
2 preference also manifested in differences in the
3 associations between sense of place with nature
4 relatedness, pro-environmental attitude and pro-
5 environmental behaviour. Place preference has the
6 potential to facilitate behaviour change messages
7 designed to improve environmentally-friendly actions.
8 Our findings illustrated that, regardless of which
9 setting was preferred, higher nature relatedness was
10 associated with higher pro-environmental attitudes and
11 behaviours. This suggests that fostering nature
12 relatedness in people with a strong urban preference
13 could play an important role in increasing both.
14 Researchers and practitioners need to consider how place
15 preference may potentially influence specific
16 environmental outcomes or behaviours and tailor their
17 intervention and messaging strategies with this in mind.
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Table 1

Correlations between Sense of Place, Nature-relatedness, Pro-environmental Attitudes and Pro-environmental Behaviour

variable	1	2	3	4	5	6	7
1. Sense of place: total	---						
2. Sense of place: place identity	.88 ***	---					
3. Sense of place: place attachment	.90 ***	.71 ***	---				
4. Sense of place: place dependence	.86 ***	.63 ***	.64 ***	---			
5. Nature relatedness	.26 ***	.25 ***	.34 ***	.11	---		
6. Pro-environmental attitude	.12 *	.14 *	.14 *	.03	.43 ***	---	
7. Pro-environmental behaviour	.26 ***	.23 ***	.26 ***	.20 **	.59 ***	.30 ***	---

Note. N varied from 205 - 212 due to missing data that could not be imputed.

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$.

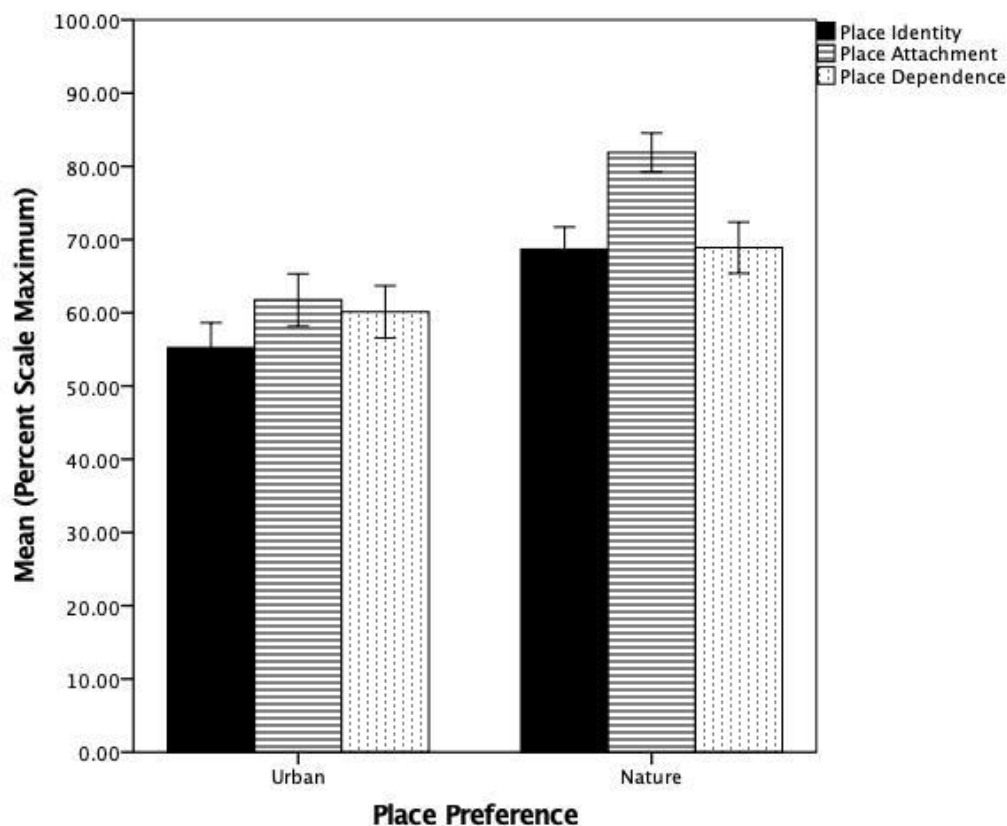
Table 2

Correlations Between Sense of Place, Nature Relatedness, Pro-environmental Attitude and Pro-environmental Behaviour by Place Preference

Construct	1	2	3	4	5	6	7
1. Sense of place: ^a total	---	.87 ***	.84 ***	.87 ***	.46 ***	.32 ***	.32 ***
2. Sense of place: place identity	.86 ***	---	.66 ***	.60 ***	.39 ***	.32 ***	.26 **
3. Sense of place: place attachment	.89 ***	.66 ***	---	.57 ***	.49 ***	.31 ***	.23 **
4. Sense of place: place dependence	.87 ***	.60 ***	.68 ***	---	.35 ***	.19 *	.33 ***
5. Nature relatedness ^b	-.27 **	-.18 *	-.17 *	-.35 ***	---	.41 ***	.63 ***
6. Pro-- environmental attitude ^c	-.16 *	-.12	-.12	-.19 *	.40 ***	---	.27 **
7. Pro- environmental behaviour ^d	.01	.01	.07	-.04	.45 ***	.26 **	---

Note. Correlations for the nature preference group are above the cross-diagonal. Correlations below the diagonal (italics) are for the urban preference group. ^aJorgensen & Stedman, 2001. ^bNisbet & Zelenski, 2013. ^cDunlap, et al., 2000. ^dCapstick et al., 2017. N varied due to missing data that could not be imputed.

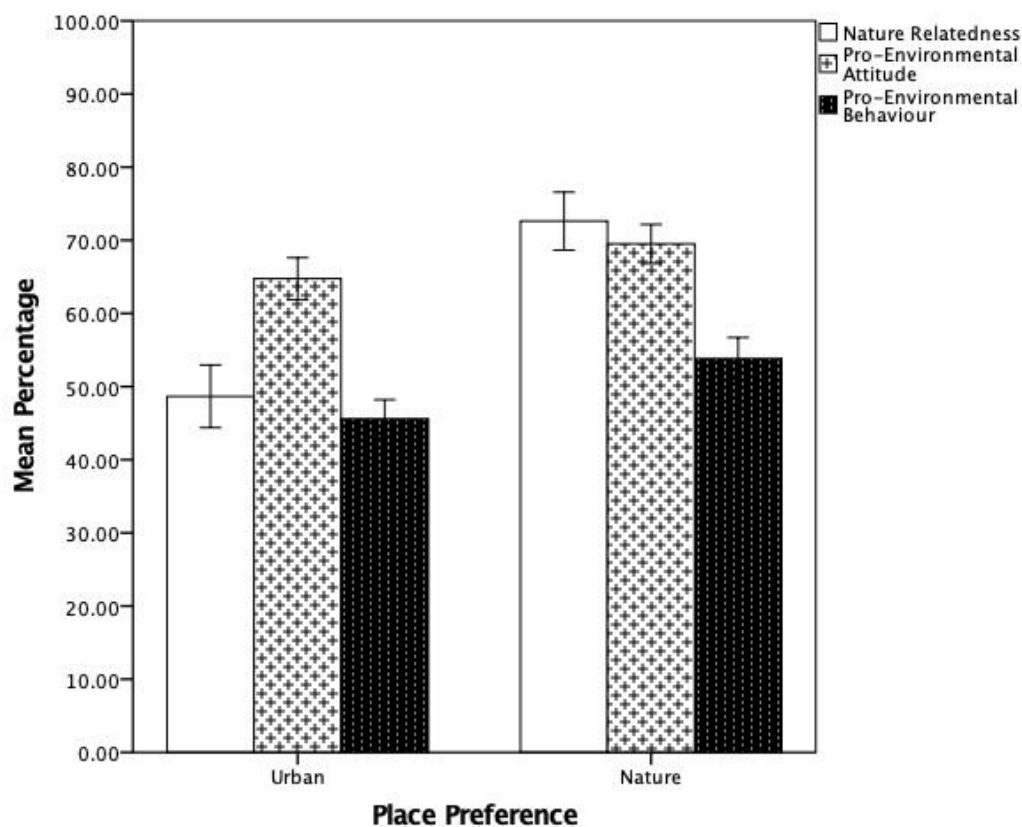
* $p < .05$, ** $p \leq .01$, *** $p \leq .001$.

Figure 1*Sense of Place Subscale Ratings by Place Preference*

Note. Planned comparisons indicated equal levels of place attachment and place dependence in the urban preference group; place identity was lower than both. All three subscales were rated lower by the urban preference group than place identity in the nature preference group, indicating nature preference group ratings were significantly higher overall. Place attachment was higher than place identity or dependence in the nature preference group. Error bars represent 95% confidence intervals.

Figure 2

Nature-relatedness, Pro-environmental Attitude and Pro-environmental Behaviour by Place Preference



Note. All measures were transformed to a 0-100% scale maximum (International wellbeing Group, 2013) in order to facilitate comparison between them.

Table 1

Correlations between Sense of Place, Nature-relatedness, Pro-environmental Attitudes and Pro-environmental Behaviour

variable	1	2	3	4	5	6	7
1. Sense of place: total	---						
2. Sense of place: place identity	.88 ***	---					
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Note. N varied from 205 - 212 due to missing data that could not be imputed.

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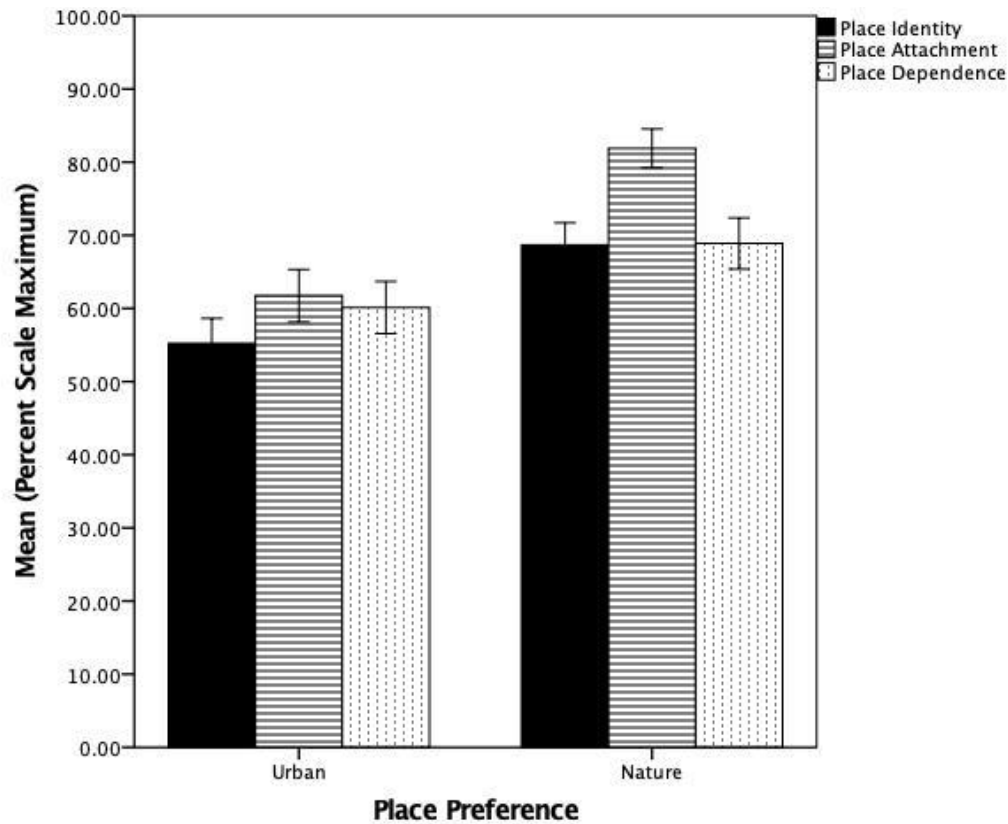
Table 2*Correlations Between Sense of Place, Nature Relatedness, Pro-environmental Attitude and Pro-environmental Behaviour by Place Preference*

Construct	1	2	3	4	5	6	7
1. Sense of place: ^a total	---	.87 ***	.84 ***	.87 ***	.46 ***	.32 ***	.32 ***
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3. Sense of place: place attachment	.89 ***	.66 ***	---	.57 ***	.49 ***	.31 ***	.23 **
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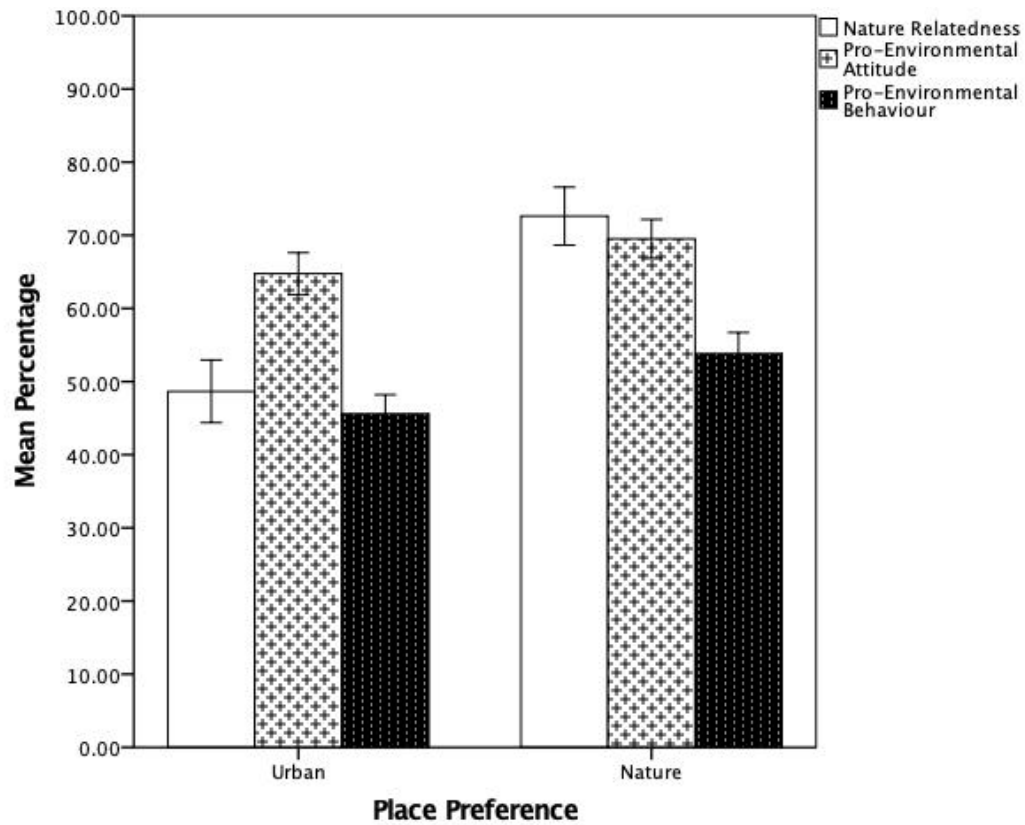
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Figure 2

Nature-relatedness, Pro-environmental Attitude and Pro-environmental Behaviour by Place Preference



Note. All measures were transformed to a 0-100% scale maximum (International wellbeing Group, 2013) in order to facilitate comparison between them.

Response to Editor/Reviewer: ERAPSY-D-20-00035_R2

Comments	Response	Manuscript Location
<i>Editor</i>		
1. Revise the French abstract after viewing the translation.	Complete	New abstract file uploaded with suggested wording. Note: Mots-clés in the full English version of the manuscript were also updated.
2. Replace Revue Européenne de Psychologie Appliquée » by « European Review of Applied Psychology	Three instances of this were found and replaced with the English journal title.	