

## Noticing nature: Individual and social benefits of a two-week intervention

Holli-Anne Passmore and Mark D. Holder

Department of Psychology, University of British Columbia, Kelowna, Canada

### ABSTRACT

We examined the effects of a two-week nature-based well-being intervention. Undergraduates ( $N = 395$ ) were randomly assigned to one of three conditions: nature, human-built or a business-as-usual control. Participants paid attention to how nature (or human-built objects, depending on assignment) in their everyday surroundings made them feel, photographed the objects/scenes that evoked emotion in them and provided a description of emotions evoked. Post-intervention levels of net positive affect, elevating experiences, a general sense of connectedness (to other people, to nature and to life as a whole) and prosocial orientation were significantly higher in the nature group compared to the human-built and control groups. Trait levels of nature connectedness and engagement with beauty did not moderate nature's beneficial impact on well-being. Qualitative findings revealed significant differences in the emotional themes evoked by nature vs. human-built objects/scenes. This research provides important empirical support for nature involvement as an effective positive psychology intervention.

### ARTICLE HISTORY

Received 3 February 2016  
Accepted 5 July 2016

### KEYWORDS

Nature involvement; positive psychology intervention; connectedness; qualitative research; elevating experiences

I found that nature gave me an underlying appreciation for both the people I have in my life and the world in which I live in. (Participant N155)

Several theoretical models and perspectives have been developed to describe and explain how our relationship with nature plays a fundamentally important role in our well-being. For example, Attention Restoration Theory (Kaplan, 1995; Kaplan & Kaplan, 1989) details how natural environments are rich in stimuli that effortlessly engage our involuntary attention ('soft fascination') and thus restore our directed attention/cognitive capabilities. Additionally, the biophilia hypothesis (Shepard, 1982; Ulrich, 1983; Wilson, 1984) sets forth that we have an evolved inclination to affiliate with, and respond with emotional intensity to, the non-human natural world. Expanding on this hypothesis, the Eco-Existential Positive Psychology (Passmore & Howell, 2014a) perspective proposes that cultivating our innate biophilic tendencies through involvement with the natural world increases our well-being by helping address existential anxieties, such as those concerning isolation and happiness.

A solid, and growing, body of empirical studies supports these theoretical positions. Contact with nature has been shown to enhance a variety of aspects of well-being, including life satisfaction, positive affect, meaning in life, feelings of elevation, vitality and both psychological and social well-being (see literature reviews by Capaldi, Passmore, Nisbet, Zelenski, & Dopko, 2015;

Howell & Passmore, 2013; McMahan & Estes, 2015; Russell et al., 2013). Even after controlling for variables including weather, time of day, activity, companionship, location type and day of the week, people are, in general, substantially happier when they are in nature, compared to when they are in a human-built environment (MacKerron & Mourato, 2013).

Nature's beneficial influence appears to extend beyond the individual. Evidence in support of a positive relationship between exposure to natural environments and other-oriented prosocial behaviour is also accumulating. For example, in laboratory experiments, participants in nature conditions – who rested in plant-filled rooms (Weinstein, Przybylski, & Ryan, 2009) or watched a brief nature video (Zelenski, Dopko, & Capaldi, 2015) – exhibited more generous behaviour towards others, compared to participants in control conditions. Prosocial effects of immersion in nature have also emerged in field experiments. For example, Guéguen and Stefan (2016) reported that individuals who were leaving a heavily treed urban park, and thus had been immersed in nature, helped a passer-by (in reality, a confederate) more frequently and more readily than those who were entering the park, and thus had not been immersed in nature.

Although an increasing number of counselling professionals are, as Milton (2009) phrased it, 'waking up' to the importance of the natural environment to their clients'

well-being (Berger, 2008; Berger & McLeod, 2006; Besthorn, 2002; Buzzell & Chalquist, 2009; Hasbach, 2012; Jordan, 2009; Rollins, 2009), nature involvement is under-utilized as a well-being activity (Walsh, 2011). One reason for this under-utilization could be that, as McMahan and Estes (2015) noted in their recent meta-analysis examining the effect of contact with nature on positive and negative affect, most experimental studies have used only brief, single exposures to natural environments and assessed well-being directly after exposure to nature. They called for, as did Capaldi et al. (2015), experimental studies assessing the positive effects of nature involvement on well-being over more extended periods of time. One such study was a two-week nature intervention conducted by Passmore and Howell (2014b), in which participants were randomly assigned to either a control or nature intervention condition. They reported that, at the end of the two-week period, well-being (i.e. net-positive affect, feelings of elevation and sense of meaning in life) was higher for those in the nature condition.

The current study helped address the need for further experimental research examining the effects of longer-term nature involvement. Our study differs from previous studies in a number of ways. Rather than simply measuring the immediate 'stimulus-response' effect on well-being of a brief, single exposure to nature, we measured effects of a longer duration, ongoing nature intervention, similar to Passmore and Howell (2014b). However, the control group employed by Passmore and Howell (i.e. solving anagram puzzles) may have biased results in favour of the nature condition; therefore, we utilized two control conditions which included a business-as-usual condition. Previous studies have encouraged participants to spend more time in nature, taken participants to natural areas or incorporated nature into indoor environments. We employed a unique methodology that involved participants merely noticing and attending to the nature they encountered during their everyday routines.

Specifically, we examined whether, at the end of a two-week period, participants in a noticing-nature condition experienced greater individual and social benefits compared to participants in control conditions. We hypothesized that levels of individual well-being (net-positive affect, elevation, meaning), a general sense of connectedness (to other people, to nature and to life as a whole) and prosocial orientation would be higher in participants who were randomly assigned to pay attention to how the natural objects they encountered in their daily lives made them feel (and then to photograph those objects/scenes), compared to participants randomly assigned to a similar condition but with a focus on human-built objects and scenes and compared to participants randomly assigned to a condition akin to a wait-list control.

Although some research suggests possible moderators for the effects of nature involvement on well-being, additional studies examining individual difference measures as potential moderators of nature's beneficial effects are needed (Zhang, Howell, & Iyer, 2014). This is particularly the case given inconsistent findings across studies. For example, Nisbet, Nealis, and Zelenski (2011) found that, following 15 min of relaxing in a nature setting, people who scored high in trait nature-relatedness reported a greater increase in positive affect than did individuals who were less related to nature. However, Passmore and Howell (2014b) did not find that connectedness to nature moderated the relationship between longer-term exposure to nature and well-being. Correlational research by Zhang et al. (2014) evidenced a moderator effect of engagement with natural beauty on the relationship between connectedness to nature and life satisfaction and self-esteem. Therefore, we tested whether trait levels of connectedness to nature or engagement with beauty moderated the effect of longer-term nature involvement on well-being.

In order to gain insight into the emotions evoked by natural objects/scenes compared to human-built objects/scenes, and in line with McMahan and Estes' (2015) recommendation to examine 'a more nuanced picture of the effect of nature on emotional well-being' (p. 516), we asked participants to upload photos they took of the objects/scenes that had evoked emotion in them and to provide a brief description of those emotions. These emotional descriptions were coded for valence and theme, and analyses were conducted to examine differences evoked by nature compared to human-built objects/scenes.

## Method

### Participants

A total of 395 undergraduates participated in the study for partial credit in a psychology course. Data from 31 participants were excluded from analyses due to missing information or substantial non-conformance to instructions. Of the remaining 364 ( $n$  control condition = 133;  $n$  human-built condition = 110,  $n$  nature condition = 121), 67.6% were female. The mean age of participants was 20.09 years ( $SD = 4.08$ , range: 17–52); 78.8% of participants identified English as their first language.

### Measures

#### Well-being

Three scales were used to assess well-being.

**Positive and negative affect.** The Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988) is a 20-item scale which lists 10 words each pertaining to

positive and negative emotions (e.g. strong, enthusiastic, irritable, guilty). Respondents rate the extent to which they experienced each of the listed emotions over the past two weeks on a five-point Likert-type scale ranging from 1 = *very slightly or not at all* to 5 = *extremely*. In order to provide an overall assessment of mood, a single index of affect balance, net positive affect (netPA), was calculated by subtracting the sum of the ratings of the negative affect items from the sum of the ratings of the positive affect items (Baumeister, Vohs, Aaker, & Garbinsky, 2013). The PANAS is a widely used measure that has been validated on both student and psychiatric inpatient samples. Watson et al. reported Cronbach's  $\alpha$  ranging from .84 to .90 ( $\alpha$  in the current study was .76).

**Elevation.** The Elevating Experiences Scale (EES; Huta & Ryan, 2010) is a 13-item scale in which items are either words or phrases that describe feelings related to elevation (e.g. inspired, in wonder). Respondents rate each item using a seven-point Likert-type scale with endpoints 1 (*not at all*) and 7 (*extremely*), according to the degree to which each item describes how they typically felt during the past two weeks. The EES was validated on samples of undergraduate students; principal component analyses showed that elevating experience was a distinct aspect of well-being. Huta and Ryan reported a Cronbach's  $\alpha$  of .93 ( $\alpha$  in the current study was .92). In order to avoid cross-contamination between measures, three items from this scale were removed that pertain to a sense of meaning.

**Meaning.** The Sense of Meaning Scale (SMS; Huta & Ryan, 2010) is a 12-item scale in which items are either words or phrases that pertain to elements of meaning and purpose in life (e.g. meaningful, fitting into the bigger picture). Using a seven-point Likert-type scale with endpoints of 1 (*not at all*) to 7 (*extremely*), respondents rate the degree to which each item describes how they typically felt about their activities and experiences over the past two weeks. The SMS was validated by Huta and Ryan on samples of undergraduate students concurrently with the EES, described above. In these studies, principal component analyses evidenced that a sense of meaning was a distinct aspect of well-being. Huta and Ryan reported a Cronbach's  $\alpha$  of .94 ( $\alpha$  in the current study was .95), and demonstrated convergent validity against related measures.

### **General sense of connectedness**

A composite measure of a general sense of connectedness (GSC) was created by combining four established questionnaires assessing subjective connectedness to other people, to nature and to life as a whole (see below). To create the measure, we standardized scores on each scale

and computed a mean (as per Zelenski & Nisbet, 2014). The composite had acceptable internal consistency ( $\alpha = .91$ ).

The following four questionnaires were used in the GSC composite. The interdependent subscale from Singelis' (1994) Self-Construal Scale assesses the degree to which individuals view themselves as being part of a broader social context ( $\alpha = .77$ ). The Metapersonal Self-Scale (DeCicco & Stroink, 2007) assesses the extent to which individuals feel connected to wider aspects of human-kind and life in general ( $\alpha = .81$ ). Leary, Tipsord, and Tate's (2008) Allo-Inclusive Identity Scale assesses individual differences in self-identification with both the human and the non-human world ( $\alpha = .86$ ); Mayer and Frantz's (2004) Connectedness to Nature Scale (CNS) assesses a sense of unity with the natural world ( $\alpha = .85$ ).

### **Prosocial orientation**

A composite measure of prosocial orientation (PSO) was created by combining two established measures assessing other-oriented prosocial orientation (see below). Similar to the construction of the GSC composite, we standardized scores on each scale and computed a mean (as per Zelenski & Nisbet, 2014). The composite had acceptable internal consistency ( $\alpha = .81$ ).

The following two questionnaires were used in the PSO composite. The Social Value Orientation Slider Measure (Murphy, Ackermann, & Handgraaf, 2011) is a recently developed measure of prosocial orientation akin to classic give-some measures of cooperative or prosocial behaviour; it involves six rounds of a decision-making task in which participants make a resource allocation choice from a pre-defined continuum of joint pay-offs. The Aspiration Index (Kasser & Ryan, 1993, 1996) is a multidimensional measure that assesses the personal importance of several categories of extrinsic and intrinsic life goals. In the present study, the five-item Financial Success (extrinsic) and five-item Community Feeling (intrinsic) subscales were used, as Kasser and Ryan recommended, to assess the relative importance of extrinsic values to intrinsic (socially oriented) values for participants.

### **Moderator measures**

Two measures were utilized to assess potential moderating effects. Trait levels of connectedness to nature were assessed with the CNS (Mayer & Frantz, 2004; see above for description). Trait levels of engaging with beauty were assessed with the Engagement with Beauty Scale (EWB; Diessner, Solom, Frost, Parsons, & Davidson, 2008), a 14-item measure that assesses the individual's self-reported tendency to perceive natural, artistic and moral beauty. For the purposes of this study, the Natural Beauty and the Artistic Beauty subscales were used. Each of these subscales consists of four items (e.g. 'I notice beauty in one

or more aspects of nature'; 'I notice beauty in art or human made objects') that participants rate on a seven-point Likert-type scale with endpoints of 1 = *very much unlike me* to 7 = *very much like me*. The EWB scale as a whole was originally validated on student samples. Diessner et al. reported Cronbach's  $\alpha$ s for the Natural Beauty and Artistic Beauty subscales of .80 and .87, respectively ( $\alpha$ s in the current study were .83 and .85, respectively).

### Procedure

Several initial group sessions were held between mid-September and mid-October; each session consisted of a maximum of 20 people. Participants were given an information package that indicated their random assignment to one of three conditions (i.e. Nature, Human-Built or Control), and included an information sheet explaining the requirements of the study, a consent form and a take-home instruction sheet. Requirements of the study were also explained verbally.

Participants assigned to the nature and human-built conditions were instructed to be mindful, over the next two weeks, of how the natural or human-built objects/scenes (depending on random assignment) they encountered on a daily basis made them feel. Participants were further instructed that when they noticed that a specific object or scene evoked a strong emotion in them, they were to take a photo, and upload it to the study's website along with a brief description of the emotions that were evoked. It was stressed that the researchers were not concerned with the photos *per se* (e.g. quality, creativity), but rather with the participants' emotional experience and reaction to how the objects/scenes made them feel. Based on research utilizing a similar photo methodology (Dollinger & Clancy, 1993; Hull & Stewart, 1995; Steger et al., 2013; Ziller & Lewis, 1981), participants were asked to take, and upload, a minimum of 10 photos spaced over the course of the two-week study. Participants in the control condition were instructed to continue with their regular routine for the next two weeks, at the end of which they would be provided with instructions for the 'emotional photography' portion of the study (in actuality, these participants were merely debriefed). All participants, regardless of condition, were told that they would receive an email in two weeks with a separate link to the study's website where they were to log-in within 24 h and complete a series of questionnaires.

In order to confirm that participants in the different conditions were initially equivalent in emotional well-being, participants completed the PANAS measure at the initial in-person session. Each participant took their study instruction sheet with them when they left the session. Over the course of the next two weeks, participants in

the nature and human-built conditions received reminder emails every second day. At the end of two weeks, all participants logged-in to the study's website and completed the post-intervention measures of affect, elevation, sense of meaning, general connectedness, prosocial orientation and engagement with beauty.

## Quantitative results

### Preliminary analyses

We first examined if pre-intervention levels of affect differed by condition. As expected due to random assignment, pre-intervention netPA was not significantly different across the three conditions (nature:  $M = 12.10$ ,  $SD = 6.41$ ; human-built:  $M = 11.86$ ,  $SD = 8.30$ ; control:  $M = 11.54$ ,  $SD = 8.90$ ),  $F(2, 340) = 0.14$ ,  $p = .866$ ;  $ps = .825, .594, .764$ ;  $ds = 0.03, 0.07, 0.04$ . Nonetheless, in subsequent analyses involving post-intervention levels of netPA, pre-intervention netPA was used as a covariate.

### Hypothesis tests

In order to examine if post-intervention levels of well-being, a general sense of connectedness and prosocial orientation differed between the conditions, we conducted a series of ANOVAs/ANCOVAs with post hoc analyses (see Table 1 for detailed statistics). With regard to individual well-being, post hoc analyses revealed that netPA was significantly higher in the nature condition compared to the human-built ( $d = 0.47$ ) and control ( $d = 0.46$ ) conditions. Levels of elevating experiences were also significantly higher in the nature condition compared to the human-built ( $d = 0.49$ ) and control ( $d = 0.38$ ) conditions. Analyses did not reveal a significant difference in participants' sense of meaning between the nature condition and either the human-built ( $d = 0.07$ ) or the control ( $d = 0.11$ ) condition.

Post hoc analyses revealed that participants' general sense of connectedness was higher in the nature condition compared to the human-built ( $d = 0.29$ ) and control ( $d = 0.42$ ) conditions. Analyses also revealed that prosocial orientation was significantly higher in the nature condition compared to the human-built ( $d = 0.30$ ) and control ( $d = 0.38$ ) conditions. No significant differences were evidenced between the human-built and control conditions for any of the dependent variables ( $.283 < ps < .820$ ;  $0.03 < ds < 0.15$ ).

### Moderation analyses

We examined whether the well-being benefits (i.e. higher levels of netPA and elevating experiences) that participants received from noticing nature were moderated by individual differences in trait levels of connectedness to nature or engagement with beauty. Moderation analyses were



**Table 1.** Between-group differences.

	ANOVA	M (SD)			Post hoc Statistics [95%CI mean difference]		
		Nature	Built	Control	Nature–Built	Nature–Control	Built–Control
netPA	$F(2, 309) = 9.268$ $p < .001$	12.75 (8.35)	8.76 (8.41)	8.50 (9.87)	$p = .001, [1.499, 5.339]$ $d = 0.47, [0.19, 0.76]$	$p < .001, [1.811, 5.462]$ $d = 0.46, [0.19, 0.73]$	$p = .820, [-1.657, 2.092]$ $d = 0.03, [-0.24, 0.30]$
Elvtn	$F(2, 341) = 7.335$ $p = .001$	39.92 (12.22)	34.06 (11.45)	35.12 (12.79)	$p < .001, [2.598, 9.128]$ $d = 0.49, [0.22, 0.76]$	$p = .002, [1.704, 7.901]$ $d = 0.38, [0.13, 0.64]$	$p = .513, [-4.244, 2.125]$ $d = 0.09, [-0.04, 0.17]$
Mng	$F(2, 345) = 0.413$ $p = .662$	48.00 (14.77)	46.99 (13.94)	46.26 (15.98)	$p = .620, [-2.995, 5.014]$ $d = 0.07, [-0.20, 0.34]$	$p = .365, [-2.030, 5.507]$ $d = 0.11, [-0.14, 0.36]$	$p = .714, [-3.174, 4.631]$ $d = 0.05, [-0.21, 0.31]$
GSC	$F(2, 286) = 4.914$ $p = .008$	0.17 (0.66)	-0.02 (0.59)	-0.12 (0.68)	$p = .054, [-0.003, 0.373]$ $d = 0.29, [0.00, 0.59]$	$p = .002, [0.104, 0.465]$ $d = 0.42, [0.14, 0.71]$	$p = .283, [-0.083, .282]$ $d = 0.15, [-0.13, 0.44]$
PSO	$F(2, 288) = 3.408$ $p = .034$	0.30 (0.49)	0.11 (0.69)	0.08 (0.64)	$p = .047, [0.003, 0.367]$ $d = 0.30, [0.01, 0.60]$	$p = .13, [0.047, 0.397]$ $d = 0.38, [0.10, 0.66]$	$p = .668, [-0.134, 0.208]$ $d = 0.06, [-0.22, 0.33]$
Time	$F(2, 231) = 0.17$ $p = .489$	6.05 (4.10)	6.71 (5.22)	5.89 (3.86)	$p = .355, [-0.743, 2.063]$ $d = 0.14, [-0.46, 0.18]$	$p = .815, [-1.505, 1.185]$ $d = 0.04, [-0.27, 0.35]$	$p = .255, [-.595, 2.234]$ $d = 0.16, [-0.14, 0.50]$

Notes: netPA = net positive affect; Elvtn = elevating experiences; Mng = sense of meaning; GSC = general sense of connectedness; PSO = prosocial orientation. Time = hours spent in nature over past 2 weeks.

**Table 2.** Moderation analyses.

	ANOVA	Condition				Connectedness to nature				Interaction term				$\Delta R^2$
		$\beta$	SE	t	p	$\beta$	SE	t	p	$\beta$	SE	t	p	
netPA	$F(4, 171) = 24.954, p < .001, R^2 = .369$	.403	.114	3.540	.001	-.024	.063	-0.384	.702	.062	.123	0.496	.621	.001
Elvtn	$F(3, 189) = 8.386, p < .001, R^2 = .118$	.494	.131	3.786	<.001	.225	.073	3.109	.002	-.067	.145	-0.461	.646	.001

  

	ANOVA	Condition				Engagement with beauty				Interaction term				$\Delta R^2$
		$\beta$	SE	t	p	$\beta$	SE	t	p	$\beta$	SE	t	p	
netPA	$F(4, 184) = 27.273, p < .001, R^2 = .372$	.370	.108	3.442	.001	.124	.056	2.208	.029	.181	.112	1.616	.108	.009
Elvtn	$F(3, 203) = 13.382, p < .001, R^2 = .165$	.443	.126	3.516	.001	.306	.065	4.679	<.001	.133	.130	1.021	.309	.004

Notes: netPA = net positive affect; Elvtn = elevating experiences. Pre-intervention netPA was used as covariable in analyses with netPA.

conducted using Hayes' (2013) PROCESS macro. Given that no significant differences were found between the human-built and control groups, only the human-built and nature groups were included in the moderation analyses. There was no evidence that the relationship between condition and netPA or elevating experiences was significantly moderated by either connectedness to nature ( $ps = .621, .646$ ) or engagement with beauty ( $ps = .108, .309$ ). (See Table 2 for detailed statistics.) Thus, the significant effects of noticing nature on well-being were not dependent upon trait levels of connectedness to nature or engagement with beauty.

### Findings related to time spent in nature

Following the intervention period, participants were asked to estimate the amount of time they had spent in nature over the past two weeks. Post hoc analyses revealed no significant differences between the three groups ( $ps = .355, .815, .255$ ; see Table 1 for detailed statistics). Thus, participants in the nature condition did not spend significantly more time in nature over the course of the two weeks than did participants in either the human-built or control conditions.

### Qualitative findings

Participants submitted a total of 2591 photos (nature = 49%, built = 51%). Each photo was accompanied by a

description of the emotions that had been evoked by the object/scene for the participant. While some participants simply listed their emotions (e.g. 'I felt awe, wonder, and strength'; 'Nervous, inspired, Proud'), many provided rich, explanatory details such as:

My friend got me these two bracelets when she went to Africa this summer. They're hand made out of paper! They make me feel happy when I wear them, and they also make me miss my friends back home.

and

I saw this little flower as I was coming back from my class. In the midst of all the other dying roses, this one was holding strong, and it really gave me a strong sense of hope. I had been through a long day and I was really tired, and seeing the flower just gave me a renewed sense of energy for the day.

Responses were first coded for overall valence as either positive (e.g. 'fresh, happy, relaxed') or negative (e.g. 'overwhelmed and stressed'). Photo type (nature vs. human-built) had a significant impact on emotional valence  $\chi^2(1) = 86.10, p < .001, V = .20$ . Examination of the standardized residuals in the contingency table revealed that nature photos were significantly more likely to be associated with positive emotions ( $z = 2.9$ ) and less likely to be associated with negative emotions ( $z = -5.4$ ), while the opposite pattern was evidenced for built photos (positive emotions:  $z = -3.3$ ; negative emotions:  $z = 6.2$ ). These findings are in



**Figure 1.** Wordcloud of emotions significantly more likely to be associated with nature photos. Word size is proportionate to standardized residual from contingency table.



**Figure 2.** Wordcloud of emotions significantly more likely to be associated with built photos. Word size is proportionate to standardized residual from contingency table.

line with the quantitative results demonstrating that netPA was significantly higher in the nature condition than in the built condition.

Responses were then coded for emotional themes; 16 positive and 14 negative themes emerged. There was a significant association between photo type and emotional theme  $\chi^2(29) = 434.33$   $p < .001$ ,  $V = .35$ . Examination of the contingency table revealed that nature photos were significantly more likely to be associated with emotional themes of awe ( $z = 3.6$ ), freedom ( $z = 2.2$ ), hope ( $z = 2.7$ ), peacefulness ( $z = 4.8$ ) and rejuvenation ( $z = 4.0$ ). Examples of such responses are:

In complete awe. Reverence at the vastness and constant flux of life. At peace with my infinitesimally small role in the universe.

It made me feel free because the sky is endless.

Made me feel hopeful, the Sun never stops rising. Corny I know.

Photos of human-built objects/scenes were significantly more likely to be associated with emotional themes of fashion ( $z = 3.0$ ), safety ( $z = 5.8$ ), pride ( $z = 2.2$ ), disgust ( $z = 2.0$ ), envy ( $z = 2.9$ ), stress ( $z = 6.4$ ), fatigue ( $z = 3.2$ ), guilt ( $z = 2.0$ ) and annoyance ( $z = 5.2$ ). Examples of such responses are:

These are my glasses that I got last month when I was in Taiwan. Jennifer Aniston has the same pair so it makes me feel stylish.

When I look at this bookcase, I feel proud (I designed it – with the assistance of a friend who is a cabinetmaker), and happy. It also makes me feel cosy & at home, and warm and secure.

Jealous, envy, frustration, most emotions due to the fact I cannot afford a vehicle of that sort and see mostly younger individuals driving them.

Stressed, anxious because there are a lot of vehicles/congestion.

I felt guilty for having a closet full of so many clothes yet I continue to buy more to add when others are so underprivileged.

(See Figures 1 and 2 for wordcloud graphics illustrating the prevalence of emotional themes associated with nature photos compared to photos of human-built objects/scenes.)

Descriptions that accompanied the built photos were often emotional reactions that appeared to be a response to a memory, activity or function that the individual associated with the built object/scene, rather than an emotion evoked directly by the built object/scene itself. For example,

Happy and connected to past experiences. Both of these bottles were consumed in celebratory settings and when I look at them I'm instantly brought back to these good times with friends and family.

I felt a sense of freedom associated with this backpack.

I felt very thankful for this whiteout because no matter how many times I mess up or make a mistake, I can always white it out and pretend like it never happened and start over.

In contrast, descriptions associated with nature photos were, for the most part, emotional reactions that appeared to be evoked directly by the nature object/scene. For example:

A chipmunk!! Soo cute and made me happy to see it in my environment.

Watching the water flow down the creek; it made me feel optimistic for my future. I also enjoyed the sound of the water rushing onwards.

The two rainbows induced feelings of happiness and creativity. Seeing all the colours made me joyous and calm and peaceful.

It appeared that it was nature itself that people were reacting to, rather than, as noted for the human-built condition, a memory, activity or function that the individual associated with the object/scene.

Following the post-intervention assessments, participants in the nature and human-built conditions were asked if they had learned anything from participating in the study. The majority (65.8%) of students responded in the affirmative. Participants in both conditions reported

being more aware of the impact that their immediate environment had on their emotions. Nature was mentioned by one-third of the participants in the human-built condition who indicated that they had learned something from the study. These comments generally expressed the sentiment that human-built objects were not as emotionally evocative or as pleasant as natural objects are. For example:

I realized that the human built objects around me don't move me nearly as much as the mountains and the water and the beauty of nature.

Focusing on human built objects did not have much of an affect on me. I think if I had to focus on nature there would be a positive shift in attitude, happiness, etc.

I definitely felt somewhat neutral to most objects in my environment that were human built, especially structural features or disposable objects. I did feel a connection to human made objects that were from people I loved or that symbolized something greater. I know, though, as I look at natural settings, I get a much more complete feeling.

Post-intervention comments from participants in the nature condition, who had indicated that they had learned something from the study, expressed two common sentiments. One sentiment referred to the reinforcement of previous feelings towards nature. For example:

I was already aware that being in nature made me feel more at ease and happy, so this study just helped reinforce how being in a natural setting can change my day.

I would say the feeling of peacefulness and calming of beauty in nature was reinforced during being in the nature environment.

The other sentiment expressed was that of surprise, at how, and to what degree, nature affected their emotions. This is consistent with previous research (Nisbet & Zelenski, 2011) suggesting that on average, people tend to underestimate the well-being benefits of brief nature contact. For example:

I learnt that nature gave me a sense of relaxation and calm and that i should go to it more often if i'm stressed.

That nature impacts me more than I thought.

I'm a very introverted person and I'm somewhat of a homebody. I actually originally dreaded getting this label-'nature'-because I knew it would make me leave my house! But I was VERY pleasantly surprised and found my anxiety/stress levels decreasingly rapidly the more time I spent outside. Outside seems welcoming now and I look forward to spending more time outdoors with nature and animals. It's fun and relaxing.

## Discussion

We examined the individual and social effects of a two-week nature-based well-being intervention. Undergraduates

were instructed to be mindful of the emotions that everyday natural (or human-built, depending on assignment) objects/scenes evoked in them, and to then photograph evocative objects/scenes. A third group of participants were assigned to a business-as-usual control condition. As predicted, participants in the nature condition reported significantly higher levels of post-intervention net positive affect, feelings related to elevation, a general sense of connectedness and a greater prosocial orientation, compared to those in the human-built and control conditions. Effect sizes (*ds* from 0.29 to 0.49) were at the high end of, or larger than, the average effect size of positive psychology interventions (*ds* from 0.20 to 0.34, Bolier et al., 2013). Paying increased attention to everyday nature significantly increased individual well-being, regardless of trait levels of connectedness to nature and engagement with beauty. Moreover, the beneficial effects on individual well-being, sense of general connectedness and prosocial orientation were evidenced, despite that participants in the nature condition did not report spending more time in natural settings over the course of the intervention than other participants did; they simply noticed, and attended to, the nature they encountered in their daily routines.

Participants also provided descriptions of emotions evoked by the natural and human-built object/scenes they encountered. This provided a rich, qualitative data-set from which a variety of emotional themes emerged. The prevalence of specific themes was different for photos of nature vs. photos of human-built objects/scenes. Positive emotions such as hopefulness, peacefulness, rejuvenation and awe (which includes feelings of wonder, spirituality and transcendence) were significantly more likely to be associated with nature photos, while negative emotions such as disgust, envy, stress and feeling annoyed were significantly more likely to be associated with photos of human-built objects/scenes. These findings are consistent with the quantitative results which evidenced significantly higher levels of post-intervention netPA and feelings related to elevation reported by participants in the nature condition compared to those in the human-built and control conditions. Coupled with the quantitative results demonstrating boosts in a general sense of connectedness and prosocial orientation, these findings lend additional support to the Eco-Existential Positive Psychology (EPPP; Passmore & Howell, 2014a) perspective, which postulates that cultivating our biophilic tendencies through nature experiences can help address existential anxieties, such as those relating to isolation and happiness.

Qualitative findings also demonstrated the intrinsic appeal that nature seems to have for most people. Participants' written comments that accompanied their nature photos tended to describe emotional reactions evoked directly by the natural object/scene, whereas

comments accompanying the photos of human-built objects/scenes tended to describe emotional reactions to a memory, activity or function associated with the built object/scene, rather than an emotion inherently evoked by the built object/scene itself. Furthermore, in post-intervention comments, many participants in the human-built condition expressed their affinity for nature and their difficulty in connecting emotionally with a built environment. These comments generally expressed the sentiment that human-built objects were not as emotionally evocative or as pleasant as natural objects were. These findings are consistent with the biophilia hypothesis (Wilson, 1984), which posits that people are inherently drawn to nature and are inclined to respond with emotional intensity to the greater-than-human natural world. This has practical implications for practitioners who prescribe nature activities to their clients in order to boost well-being. Clients are likely to remain motivated and committed to their nature-guided therapeutic assignments, and are thus likely to experience a boost in mood from which therapists can build upon to address other therapeutic goals (Burns, 1998).

Results generated from this study make a unique contribution to the current literature. In particular, it bears worth repeating that this intervention did not appear to involve an increase in the amount of time spent in nature. Rather, increases in well-being were achieved simply by asking participants to pay attention to, and reflect on, emotions evoked by natural objects/scenes, everyday nature encountered, but so often overlooked. Additionally, our findings suggest that nature-based well-being interventions do not necessarily have to involve whole scale lifestyle changes, travelling to more 'natural' areas, nor modification of one's immediate environment in order to be effective. Thus, there are significant practical implications with regard to ease of implementation for this intervention.

As with all research, limitations of the current study should be considered. The sample was restricted to undergraduate students who were primarily female, possibly limiting the generalizability of the results. However, many positive psychology interventions have been validated on student populations (Bolier et al., 2013; Sin & Lyubomirsky, 2009), and results of this study are consistent with research examining the beneficial effects of brief involvement in nature with non-student samples (e.g. Berman et al., 2012; Guéguen & Stefan, 2016).

Contrary to our prediction, post-intervention levels of meaning did not differ between the three conditions. Given that previous research has linked nature affiliation with higher meaning in life (e.g. Howell, Passmore, & Buro, 2013; O'Connor & Chamberlain, 1996), and that a previous nature intervention study (Passmore & Howell, 2014b) demonstrated an effect size of  $d = 0.37$  of nature

on meaning, this finding was surprising. Further experimental studies are needed to assess the impact of nature involvement on this important dimension of well-being. Perhaps a more traditional, and widely used, measure of meaning in life (e.g. Meaning in Life Questionnaire, Steger, Frazier, Oishi, & Kaler, 2006) would have shown differences between conditions.

Nonetheless, measures used in the current study did demonstrate the individual and social benefits of involvement with nature and were chosen, in part, in order to replicate previous research findings. Future studies could utilize a more comprehensive set of pre-post measures and could incorporate a behaviour-based assessment of prosocial behaviour.

Additional experimental studies are needed to further examine and establish the long-term effects of ongoing nature involvement (or attentiveness to everyday nature) on well-being. For example, studies conducted over a course of two or more weeks, with follow-up assessments, would help determine any lasting effects of nature involvement and would provide additional empirical evidence regarding sustained adherence to therapeutic nature 'assignments'. Nature involvement also needs to be compared directly, in a single study, to established positive psychology interventions in order to ascertain its relative effectiveness in increasing well-being. Further experimental research also should explore in greater depth the prosocial benefits of nature involvement. Longer term studies, with follow-up assessments, are needed to determine how long the prosocial effects (i.e. increases in generosity, kindness and/or helping behaviours) are maintained after exposure to nature.

A growing body of research findings indicates that involvement with nature affords us the opportunity to be more fully flourishing human beings – individually and collectively. Further studies, such as those suggested above, are necessary to augment the current study's findings that, over the course of a two-week period, the simple act of noticing everyday nature significantly increased well-being, a general sense of connectedness and prosocial orientation. Such studies will contribute to validating the effectiveness of exposure to (and perhaps even merely attending to) nature as a simple, inherently enjoyable way to promote both individual and social well-being.

## Disclosure statement

No potential conflict of interest was reported by the authors.

## Funding

This work was supported by the Social Sciences and Humanities Research Council of Canada.



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