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Visits to Natural Environments Improve State Body Appreciation:

Evidence from Malaysia, Romania, and Spain

Viren Swami1-2, Nor Azzatunnisak Mohd. Khatib2, Jose Vidal-Mollón3, Mona Vintila4, David Barron2, Cosmin Goian5, Olga Mayoral6-7, Evelyn Kheng Lin Toh2, Otilia Tudorel4, Simran Vazirani8, & Hanoor Syahirah Zahari2

1School of Psychology and Sport Science, Anglia Ruskin University, Cambridge, United Kingdom

2Centre for Psychological Medicine, Perdana University, Serdang, Malaysia

3Department of Research Methods and Diagnosis in Education, University of Valencia, Valencia, Spain

4Department of Psychology, West University of Timișoara, Timișoara, Romania

5Department of Social Work, West University of Timișoara, Timișoara, Romania

6Department of Experimental and Social Sciences Teaching, University of Valencia, Valencia, Spain

7Jardí Botànic de la Universitat de València, Valencia, Spain

8Department of Research Methods and Diagnosis in Education, University of Valencia, Valencia, Spain

Address for correspondence: Prof. Viren Swami, School of Psychology and Sport Science, Anglia Ruskin University, Cambridge, Cambridgeshire CB1 1PT, UK. Email: viren.swami@anglia.ac.uk.

**Abstract**

Recent studies have reported that nature exposure is associated with more positive body image – a multi-faceted construct that includes one’s body-related thoughts, feelings, and behaviours – but are constrained by a focus on limited national contexts and environment types. To rectify this, we examined the impact of nature exposure on state body image in diverse national contexts and across different environment types. In Study 1, 140 Romanian and 161 Spanish adults who visited botanic gardens were asked to complete a measure of state body appreciation on entry and again upon exit, as well as report their visit duration. Analyses indicated that there was a significant increase in body appreciation scores in both subsamples (*d*s = 0.52, 0.68), but exit scores were significantly higher in the Spanish compared to Romanian group (*d* = 0.26). Visit duration was significantly and weakly associated with greater improvements in state body image change only in the Spanish subsample. In Study 2, the same procedures were repeated with Malaysian adults who visited a green-space (*n* = 351) or blue-space (*n* = 351). Analyses showed a significant increase in body appreciation scores in both subsamples (*d*s = 0.66, 0.99), with exit scores being significantly higher in the blue- compared to green-space group (*d* = 0.40). Visit duration was significantly, albeit weakly, associated with greater improvements in state body appreciation in both subsamples. These results support the prioritisation of access to natural environments to promote healthier body image.

**Keywords:** Nature exposure; Positive body image; Botanic gardens; Green-space; Blue-space

**1. Introduction**

 A large body of evidence indicates that exposure to, or contact with natural environments is associated with better physical and psychological health (see Collado, Staats, Corraliza, & Hartig, 2017; Frumkin et al., 2017). Recently, scholars have also begun to examine the impact of nature exposure on *body image*, which refers to a multifaceted construct that includes one’s thoughts, feelings, and behaviours that are related to the body (Cash & Smolak, 2011). Although body image has historically been operationalised in terms of negative indices (e.g., body dissatisfaction), more recent theorising and empirical research has focused on the construct of *positive body image*, which refers to an “overarching love and respect for the body” that includes appreciation of the body and its functions, acceptance of the body despite its imperfections, and body-protective behaviours (Tylka, 2018, p. 9). Here, positive body image is not merely the absence, or the polar opposite, of negative body image (Webb, Wood-Barcalow, & Tylka, 2015). Rather, positive body image is an independent and multi-faceted construct that is uniquely associated with indices of psychological well-being and more positive health behaviours (for reviews, see Tylka, 2018; Tylka & Wood-Barcalow, 2015a), which makes it a potentially important construct to consider in terms of nature exposure.

 Indeed, there is now growing evidence that nature exposure is associated with more positive body image. Thus, cross-sectional studies have reported that nature exposure is significantly and positively associated with indices of trait positive body image, such as body appreciation and functionality appreciation (Swami, Barron et al., 2019; Swami, Barron, Weis, & Furnham, 2016). In addition, experimental studies have shown that exposure to both isomorphic (i.e., photographs or films of nature; Swami, Barron, & Furnham, 2018, Studies 1-3; Swami, Pickering, Barron, & Patel, 2018) and real nature (Swami, 2020; Swami, Barron et al., 2018, Studies 4-5) elevates indices of state positive body image. Drawing on Psychophysiological Stress Recovery Theory (Ulrich, 1983) and Attention Restoration Theory (Kaplan & Kaplan, 1989), it has been proposed that nature exposure directly influences body image by restricting negative appearance-related cognitions and supporting speedier recovery from threats to body image (Swami, Barron et al., 2018). Indirect mechanistic pathways may also exist, with self-compassion (Swami, Barron et al., 2019) and connectedness to nature (Swami, von Nordheim, & Barron, 2016) having been proposed as constructs that mediate relationships between nature exposure and positive body image.

 Although informative, it is noteworthy that the aforementioned studies are limited to English-speaking samples from the United Kingdom and United States. This is important because national groups may differ in their ideas, values, and assumptions about the benefits of natural environments (e.g., Capaldi et al., 2017). For example, national groups differ in their positioning of humans as superior to, or inter-connected with, nature, and may also differ in the degree to which connecting with nature is viewed as important in its own right (Hägerhäll, 2018). It is possible that such differences, in turn, affect relationships between nature exposure and outcomes, although it should also be noted that research on how populations of different national and cultural identities respond to nature remains fragmented and very limited (Hägerhäll, 2018). Indeed, scholars have called for replication work to be conducted in hitherto neglected national groups to determine the extent to which nature exposure may serve as a viable interventionist tool across diverse populations (Swami, Barron et al., 2018; Swami, Barron et al., 2019).

In addition to the national context, the specific type of natural environment – which varies both within and across nations – may have an impact on outcomes. In terms of the broader literature on well-being, for example, it has been shown that woodlands, forests, and coastal areas are perceived as more restorative than urban playing field and playgrounds (White, Pahl, Ashbullby, Herbert, & Depledge, 2013; White, Pahl, Wheeler, Depledge, & Fleming, 2017), which in turn may mean that some natural environments are more psychologically beneficial than others. In terms of the body image literature, specifically, studies to date have relied on urban parks (Swami, Barron et al., 2018, Studies 4 and 5), but have not investigated the impact of other types of natural environment. This is important because ascertaining the extent to which positive outcomes are achieved in a range of natural environments is important before nature exposure can be developed more fully as a viable interventionist method.

 In short, an important next step for ongoing research activities is to examine the extent to which the benefits of nature exposure on body image are robust across different national groups and across different natural environments (Swami, Barron et al., 2018, 2019). To that end, we report on two studies that examined the impact of nature exposure on state body appreciation in diverse national groups and natural environments. In Study 1, we investigated whether visits to botanic gardens (i.e., urban green-spaces) elevated state body appreciation among participants in two European nations, namely Romania and Spain. In Study 2, we extended this by examining the impact of visits to different types of natural environments – that is, green- and blue-spaces – in a distinct national context, namely Malaysia. Our broad hypothesis was that visits to natural environments would result in elevated state body appreciation and that these effects would be robust across nations. Specific hypotheses and secondary study objectives are discussed below.

**2. Study 1**

**2.1. Background and Hypotheses**

Study 1 was designed to examine the impact of visits to green-spaces in two European nations, Romania and Spain, which were selected because they represent non-English-speaking nations that have not been included in extant research. In addition, although Romania and Spain have very different cultural and historical backgrounds (cf. Capaldi et al., 2017), recent evidence has suggested that Romanian and Spanish respondents are in fact relatively similar in terms of their eco-centric values (i.e., they endorse the intrinsic value of nature, including biodiversity, wilderness, and the integrity of wild animals) (Farjon et al., 2016). In this sense, Romania and Spain represent two European nations with different historical trajectories whose populations nevertheless share similar contemporary beliefs about the value and benefits of natural environments. The specific research sites utilised in Study 1 – Timișoara in Romania and Valencia in Spain – also have similarly limited urban green-space, with an average of about 5-8 m2 of green space per inhabitant (Badiu et al., 2016; del Saz-Salazar & Rausell-Köster, 2008).

Study 1 also built on current knowledge by examining the impact of visiting a hitherto neglected type of natural environment, namely botanic gardens. That is, across Romania and Spain, we examined the impact of visiting the same type of urban green-space environment. Botanic gardens are useful in this regard because they are naturally immersive, multisensory (e.g., visitors are able to smell, see, and in some cases, touch flora), and aesthetically-pleasing (Jones, 2000). These qualities have been shown in previous research with botanic gardens to promote restoration (e.g., Packer, 2014) and result in improvements to psychological well-being (e.g., Carrus et al., 2017; Shaw, 2015). As such, it might be expected that visits to botanic gardens should result in improved state body image, much in the same way that similar effects are realised in other urban green-spaces (Swami, Barron et al., 2018). To date, however, the impact of visits to botanic gardens on body image has not been investigated.

Thus, in Study 1, we replicated the work of Swami, Barron and colleagues (2018, Study 5) to examine the extent to which individuals who visited botanic gardens in Romania and Spain, respectively, experienced changes to state body appreciation. We hypothesised that, compared to state body appreciation scores measured on entry, participants in both research sites would evidence significantly higher scores upon exit. In addition, a secondary aim of the study was to examine whether visit duration would be significantly associated with body image change. Previous research has suggested that the perceived restorativeness of natural environments is higher for longer durations (Webber, Hinds, & Camic, 2015), but evidence in terms of body image is mixed, with one study suggesting no significant association (Swami, Barron et al., 2018, Study 5) and another indicating that greater duration was associated with greater improvements in state body appreciation (Swami, 2020). Here, we expected that greater improvements in body image would be evidenced with longer visit duration across sites.

**2.2. Method**

**2.2.1. Participants.** An *a priori* power analysis based on Swami, Barron and colleagues (2018, Study 5) indicated that a minimum sample of 82 participants per research site was required to detect a medium-sized effect (*f*2) at α = .05, power (1 – β) at .80, and expected correlations of .60 between repeated measurements. Our final sample exceeded this requirement, as we included 140 participants (85 women, 55 men) in Romania and 161 participants (96 women, 65 men) in Spain. The total sample ranged in age from 18 to 84 years (M = 38.70, SD = 16.54) and in self-reported body mass index (BMI) from 15.62 to 40.79 kg/m2 (M = 24.27, SD = 4.24). In terms of education, 25.9% had completed secondary schooling, 28.9% had a post-secondary qualification, 25.9% had an undergraduate degree, 16.6% had a postgraduate degree, and 2.7% had another qualification. In terms of employment status, 25.9% were in full-time education, 51.5% were in full-time employment, 13.6% were retired, and 9.0% were of another status. All participants in Romania were ethnic Romanians and all participants in Spain were Spanish.

**2.2.2. Research sites.** In Romania, the research was conducted at the Timișoara Botanical Park (*Parcul Botanic*), a designed green-space of about 8 hectares. This botanic park consists of walking paths through heavy vegetation representative of Romanian flora, some open green areas, and some built facilities. There are three entrances to the gardens and entry is free. In Spain, our research was conducted at the Botanical Gardens of the University of Valencia (*Jardí Botànic de la Universitat de València*), a designed green-space of about 5 hectares. The garden is home to a wide variety of flora, with walking trails, open green areas, monumental trees, and some built facilities. This botanical garden has one primary entrance and entry costs **€2.50 (about US$2.75) for adults (free or reduced for students, pensioners, and group bookings).**

**2.2.3. Materials**

 **2.2.3.1. *State body appreciation*.** To measure state body image, we used the State Body Appreciation Scale (SBAS-2; Homan, 2016). The SBAS-2 is an adaptation of the 10-item Body Appreciation Scale (Tylka & Wood-Barcalow, 2015b), with items reworded to reflect transient mood states. To develop translations of the SBAS-2, we adapted existing and psychometrically-validated versions of the Romanian (Swami, Tudorel, Goian, Barron, & Vintila, 2017) and Spanish BAS-2 (Swami, García, & Barron, 2017), respectively. More specifically, item trunks reflective of state body appreciation (Homan, 2016) were developed through a consensual, back-translation approach. All items were rated on a 5-point scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). SBAS-2 scores at the point-of-entry were subjected to exploratory factor analysis and were found to be one-dimensional in, and equal across, the Romanian and Spanish samples (see Appendix). SBAS-2 scores were, therefore, computed as the mean of all 10 items, so that higher scores reflect more positive state body appreciation. SBAS-2 scores have been shown to have adequate construct, convergent, and incremental validity and adequate internal consistency coefficients (Homan, 2016). In Study 1, internal consistency as assessed using McDonald’s omega (ω) was adequate during entry (Romania ω = .93, 95% Confidence Interval [CI] = .92, .95; Spain ω = .91, 95% CI = .88, .93) and exit (Romania ω = .94, 95% CI = .93, .96; Spain ω = .95, 95% CI = .94, .96).

 **2.2.3.2. *Visit duration*.** When leaving the gardens, participants were asked to estimate the amount of time they had spent in the botanic gardens to the nearest minute.

**2.2.3.3. *Greenspace use.*** Following Swami, Barron and colleagues (2018, Study 5), participants in Spain were asked when they were leaving the research sites to select the activity that best represented the reason for that particular visit. The options provided were: *Spending time with friends or family*, *Sports or exercise*, *Leisure walk*, *Dog-walking*, *Relaxation, mindfulness, or taking a break*, *Multiple activities*, or *Other activity*. Due to a printing error on the questionnaire, data in relation to this item from Romania were not usable.

 **2.2.3.4. *Demographics.*** On the entry questionnaire, participants were asked to report their gender identity, age, ethnicity, educational qualifications, occupational status, height, and weight. Height and weight data were used to compute self-reported BMI as kg/m2.

**2.2.4. Procedures.** Ethics approval was obtained from the relevant departmental ethics committees at the West University of Timișoara and the University of Valencia. Standardised procedures for participant recruitment were used at both research sites and mirrored that described by Swami, Barron and colleagues (2018, Study 5). Over three months (60 days in Romania, 90 days in Spain) between May and July 2019 when weather permitted (i.e., when the weather was clear on spring days), research assistants were stationed at the primary entrances to both botanical gardens between 10am and 4pm. Potential participants were approached as they were entering the gardens between 10am and 1pm and, if they met inclusion criteria (being of adult age, a citizen of the nation, and fluent in Romanian or Spanish, respectively), they were provided with brief information about the project and invited to take part in the study. The project was advertised as ostensibly being on greenspace use, and included a filler scale on use of different types of greenspace, in order to mask the study hypotheses.

 In Romania, a total of 600 invitations were made, of whom 163 individuals agreed to take part. The number of invitations was not recorded in Spain, but 172 individuals agreed to take part in this site. All participants who agreed to take part provided written informed consent and were asked to complete a paper-and-pencil questionnaire containing the SBAS-2 with item order pre-randomised, the filler scale, and a request for demographic information. Nominal codes were generated to link participants’ data across testing sessions (destroyed prior to analyses) and participants were asked, where feasible, to identify themselves to research assistants upon exit. In Romania, 23 participants failed to do as they did not leave the gardens during the period when researchers were stationed at exits. In Spain, 11 participants either declined to complete the exist questionnaire or did not leave the gardens during the period when researchers were present. Therefore, our final sample – as described above – consists of participants who completed both the entry and exit questionnaires. Participants who agreed to complete the exit questionnaire were presented with a paper-and-pencil questionnaire containing the SBAS-2, with the order of item presentation pre-randomised, as well as the items pertaining to green-space use and visit duration. All participants took part on a voluntary basis and were not remunerated for participation. Participants who exited the gardens during the period when researchers were present were provided with written debrief information.

**2.3. Results**

**2.3.1. Preliminary analyses.** In total, 1.2% of SBAS-2 data were missing completely at random (MCAR), as determined by Little’s (1988) MCAR test, χ2(202) = 11.88, *p* = .603. These data were replaced using the multiple imputation technique. Chi-squared tests indicated that the Romanian and Spanish subsamples were not significantly different in the distribution of gender identities, χ2(1) = 0.04, *p* = .848, though there were significant differences in the distributions of educational qualifications, χ2(1) =34.87, *p* < .001 (a higher number of Spanish participants had lower educational qualifications), and employment status, χ2(1) =28.84, *p* < .001 (a higher number of Spanish participants were retired). An independent-samples *t*-test indicated that there was no significant difference in BMI between the Romanian and Spanish subsamples, *t*(299) = 1.05, *p* = .296, *d* = 0.12. However, Spanish participants (*M* = 45.13, *SD* = 15.69) were significantly older than the Romanian participants (*M* = 31.31, *SD* = 14.30). For this reason, we included participant age as a covariate in subsequent analyses.

**2.3.2. Main analyses.** To test the primary hypothesis, we computed a 2 (Nation: Romania *vs*. Spain) × 2 (Time-point: entry *vs*. exit) mixed analysis of covariance (ANCOVA). Nation was treated as a between-groups variable and Time-point was treated as a repeated variable, with SBAS-2 scores entered as the dependent variable and participant age as a covariate. Descriptive statistics are reported in Table 1. The results indicated that there was a significant Nation × Time-point interaction, *F*(1, 298) = 7.86, *p* = .005, ηp2 = .03. Follow-up testing showed that there was no significant difference in state body appreciation scores between the Romanian and Spanish samples at entry, *t*(299) = 0.18, *p* = .858, *d* = 0.02. However, state body appreciation at exit was significantly higher in the Spanish compared to the Romanian sample, *t*(299) = 2.24, *p* = 0.26, *d* = 0.26. Importantly, state body appreciation scores on exit were significantly higher than entry scores in both the Romanian, *t*(139) = 6.16, *p* < .001, dependence-corrected *d* = 0.52, and Spanish samples, *t*(160) = 8.72, *p* < .001, dependence-corrected *d* = 0.68.

 There was also a significant main effect of Time-point, *F*(1, 298) = 10.79, *p* < .001, ηp2 = .04, with state body appreciation scores being significantly higher at exit compared to entry. In contrast, the main effect of Nation was not significant, *F*(1, 298) = 3.65, *p* = 0.57, ηp2 = .01. Covariate age did not reach significance in any of its interactions (all *F*s < .32, all *p*s > .574, all ηp2 < .01). Although our sample was not optimally powered to examine the effects of gender, we repeated the main analyses but included participant gender as an additional between-subjects factor. In this analysis, none of the interactions with gender reached significance (all *F*s < 0.62, all *p*s > .802, all ηp2 < .01). To summarise, the main analyses indicated that there was an elevation in state body appreciation scores at exit, but that these effects were comparatively larger in the Spanish subsample.

**2.3.3. Further analyses.** For further analyses, we computed the difference between state body appreciation scores on entry and exit to provide an index of body image change. We then computed bivariate correlations between this score and visit duration for the two subsamples separately (Romania *M* = 117.17 min, *SD* = 48.21, range = 30-300 min; Spain *M* = 88.99 min, *SD* = 36.57, range = 12-190 min). Results indicated no significant correlation between state body image change and visit duration in the Romanian subsample, *r* = .02, *p* = .816. Conversely, longer visit duration was significantly, albeit weakly, associated with greater body image change in the Spanish subsample, *r* = .33, *p* < .001. In the Spanish subsample only, we also examined between-group differences in state body image change as a function of activity conducted in the botanic gardens (Spending time with friends or family = 43.5%; Relaxation, mindfulness, or taking a break = 22.4%; Other activity = 18.6%; Leisure walk = 11.8%; Sports or exercises = 1.9%; Multiple activities = 1.9%). The results of a univariate ANOVA indicated no significant differences in body image change as a function of activity, *F*(5, 161) = 1.66, *p* = .146, ηp2 = .05.

**2.4. Discussion**

 The results of Study 1 showed that visits to botanic gardens in Romania and Spain, respectively, resulted in significant elevations to state body appreciation, though there was some nuance in these findings. Specifically, the elevation in state body image at exit was comparatively larger in the Spanish subsample compared to the Romanian subsample. It is possible that the impact of nature exposure on body image is sensitive to environmental quality, which may have differed across research sites. For example, it is possible that between-group differences reflect variations across the botanic gardens in biodiversity. Consistent with this explanation, previous research has shown that greater species richness and abundance is associated with greater restorative effects (e.g., Cracknell, White, Pahl, Nichols, & Depledge, 2015). Another possibility is that the two sites differed in pristineness (e.g., cleanliness, degradation), aesthetic qualities, or functional access, all of which may have had an impact on outcomes (see Maguire, Miller, Weston, & Young, 2011; Wyles et al., 2016). Certainly, our observations of the two botanic gardens and the broader political climate – where funding for the upkeep of green-spaces in Romania is less-than-adequate compared to other European nations (Morar, Radoslav, Spiridon, & Păcurar, 2014) – would seem to support this explanation.

 A secondary objective of Study 1 was to examine the impact of visit duration on body image outcomes. Here, our findings were mixed, with visit duration being significantly associated with state body image change in Spain, but not Romania. While studies have generally shown that greater restorative benefits are experienced when people spend more time in nature (Johansson, Hartig, & Staats, 2011; Webber et al., 2015), studies that have examined visit duration on body image outcomes have returned equivocal results. Thus, one study found that visit duration to a designed greenspace was not significantly associated with changes to state body appreciation (Swami et al., 2018, Study 5), whereas another found that greater time spent on an allotment garden was significantly associated with greater improvements in state body appreciation (Swami, 2020). It is possible that environmental qualities may again be relevant here: longer visit duration may only incrementally improve body image outcomes when environmental qualities are optimal.

**3. Study 2**

**3.1. Background and Hypotheses**

The results of Study 1 suggest that visits to green-spaces results in significant elevations to state body appreciation. To extend these findings, we examined the impact of nature exposure on body image in a third nation, namely Malaysia. Malaysia is a useful context in which to extend current knowledge because, in comparison to European nations, it is recognised as being nature-rich, both in terms of the diversity of flora and fauna, as well as green-space coverage per capita (e.g., Kaniah & Ho, 2017; Richards, Passy, & Oh, 2018). Beyond this, Malaysian lived experiences among all ethnic groups are steeped in respect for green-space, a historical dependence on agriculture, and *kampung* (village) life in general (Adnan & Othman, 2012). Many Malaysians retain familial links to *kampung* life, which is typically rural and surrounded by green-space. To date, however, the impact of exposure to nature on the body image of Malaysian has not been explored, although one previous study did find that rural Malaysians had significantly higher positive body image than urban Malaysians (Swami, Kannan, & Furnham, 2012).

Aside from green-spaces, Malaysia also has relatively higher coverage of blue-spaces (i.e., aquatic environments including rivers, lakes, and the seaside) compared to many other nations. As with green-space connections, many Malaysians also retain historical and familial links to seaside life, either for employment (e.g., in the fisheries) or for recreation. Thus, in Study 2, we extended available knowledge by examining the impact of exposure to both green- and blue-spaces on state body image in Malaysian adults. Previous research has suggested that coastal environments are experienced as particularly restorative (White et al., 2013, 2017), which might mean the impact of exposure to blue-spaces on body image will be comparatively larger than that of impact to green-spaces. However, blue-spaces may also be problematic, particularly in terms of women’s body image. This is because coastal areas, and beaches in particular, are perceived by women as surveilled spaces where their bodies are foregrounded (Field, Pavlidis, & Pini, 2019), which in turn may attenuate any positive effects of nature exposure.

In short, Study 2 examined the impact of visits to green- and blue-spaces on state body appreciation in a Malaysian sample. Here, we hypothesised that visits to both types of environments would result in significantly improved state body appreciation. However, to examine possible gendered effects, we ensured sufficiently large samples of women and men to be able to include gender as a variable in our analyses. Based on previous research (Field et al., 2019), we hypothesised that any impact of exposure to blue-spaces would be attenuated in women compared to men. In addition to these primary objectives, we examined whether changes to state body appreciation would be significantly associated with time spent in both natural environments. Based on the equivocal results of Study 1, this aspect of Study 2 was more exploratory, although we preliminarily hypothesised that greater duration of exposure to both green- and blue-spaces would be significantly associated with greater improvements in state body appreciation.

**3.2. Method**

**3.2.1. Participants.** Participants of Study 2 were 702 Malaysian citizens, of whom 351 (206 women, 145 men) were recruited in a green-space and 351 (201 women, 150 men) were recruited from a blue-space. These sample sizes exceeded the minimum sample requirements, based on the power calculation reported above, to examine the effects of environment type and gender. The total sample ranged in age from 18 to 67 years (*M* = 28.49, *SD* = 9.63) and in self-reported BMI from 14.01 to 45.72 kg/m2 (*M* = 23.28, *SD* = 4.96). In terms of ethnicity, the majority of the sample were ethnic Malays (82.8%), while the remainder were Chinese (11.7%), Indian (3.0%), or of another ethnic group (2.6%). The majority of the sample were single (63.8%), while 34.2% were married and 2.0% were divorced. In terms of educational qualifications, 30.7% had completed secondary education, 34.2% had an undergraduate degree, 10.4% had a postgraduate degree, and the rest had another educational qualification (24.8%).

**3.2.2. Research sites.** The green-space utilised in Study 2 was the Forest Research Institute Malaysia (FRIM) forest reserve site in Kepong in the state of Selangor. The 545-hectare site includes a wide range of natural environments, including tropical forests, wetlands, botanical and ethnobotanical gardens, plantations, grasslands, and secondary forests. For the purposes of Study 2, participants were recruited as they embarked on one of four forest hiking trails open to the public. All forest walks were led by FRIM nature guides and began at the same starting point. Entry to FRIM costs RM5.00 (about US$1.20) per vehicle and forest treks cost RM150.00 (about US$35.00) per group of 20 individuals. The blue-space utilised in Study 2 was Pantai (Beach) Cahaya Negeri, a seaside destination in Port Dickson in the state of Negeri Sembilan. The site consists of a 4-acre coastline, of which 1.8 hectares consists of a sandy bank and long beaches with clear seawater. There are a number of facilities available at the site. There is no cost to enter the site.

**3.2.3. Materials**

 **3.2.3.1. *State body appreciation*.** As in Study 1, we used the SBAS-2 (Homan, 2016) to measure state body appreciation. Bahasa Malaysia (Malay) translations of SBAS-2 item trunks were developed using the back-translation approach, based upon an existing and psychometrically-validated Malay version of the BAS-2 (Swami, Mohd. Khatib et al., 2019). All items were rated on a 5-point scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). SBAS-2 scores at the point-of-entry in both green- and blue-spaces were combined and subjected to exploratory factor analysis. Results indicated that scores were one-dimensional and equal across genders (see Appendix). SBAS-2 scores were, therefore, computed as the mean of all 10 items, so that higher scores reflect more positive state body appreciation. In the present study, internal consistency was adequate during entry (green-space ω = .92, 95% CI = .91, .93; blue-space ω = .92, 95% CI = .91, .94) and exit (green-space ω = .90, 95% CI = .88, .92; blue-space ω = .93, 95% CI = .91, .95).

 **3.2.3.2. *Visit duration*.** On the exit questionnaire, participants were asked to estimate the amount of time they had spent in the botanic gardens to the nearest minute.

 **3.2.3.3. *Demographics.*** On the entry questionnaire, participants were asked to report their gender identity, age, ethnicity, educational qualifications, marital status, height, and weight. Height and weight data were used to compute self-reported BMI as kg/m2.

**3.2.4. Procedures.** Ethics approval was obtained from the Institutional Review Board at Perdana University and permission to recruit from each site was obtained from relevant administrative bodies. The same procedures as in Study 1 were used to recruit participants in green- and blue-spaces. Green-space recruitment took place over 11 days in July and August 2019. Three research assistants recruited potential participants from the start of the jungle trails on days when the weather was clear and re-recruited participants at trail exits. A total of 400 invitations were made in the green-space site, of whom 392 agreed to take part. At exit, 41 participants either declined to complete the post-walk questionnaire or could not be re-recruited. For the blue-space site, recruitment took place over 5 days in August 2019. The same three research assistants recruited participants entering at the main entrance between 8am and 1pm. A total of 550 invitations were made, of whom 372 agreed to take part. A total of 21 participants either declined to complete the exit questionnaire, did not leave the site via an exit where a research assistant was stationed, or did not leave the site when researcher assistants were stationed there (up to 7pm).

In both cases, inclusion criteria included being of adult age, a citizen of Malaysia, and fluent in Bahasa Malaysia. If potential participants met inclusion criteria, they were provided with brief information about the study and invited to participate. Participants who agreed to take part provided written informed consent before completing a paper-and-pencil questionnaire containing the Malay SBAS-2 with item order pre-randomised, the same filler scale as in Study 1, and a request for demographic information. Nominal codes were generated to link participants’ data across testing sessions (destroyed prior to analyses). Participants who agreed to complete the exit questionnaire were presented with a paper-and-pencil questionnaire containing the SBAS-2, with the order of item presentation pre-randomised, and an item on visit duration. All participants took part on a voluntary basis and were not remunerated for participation. Participants who exited the sites during the period when researchers were present were provided with written debrief information.

**3.3. Results**

**3.3.1. Preliminary analyses.** Ten participants were missing weight data and 16 participants were missing height data, so these were replaced using multiple imputations. In total, 1.1% of SBAS-2 data were MCAR, χ2(202) = 99.58, *p* = .069, and were replaced using multiple imputations. The samples recruited from the two sites did not differ significantly in the distribution of gender identities, χ2(1) = 0.15, *p* = .702, ethnic groups, χ2(3) = 261, *p* = .457, educational qualification, χ2(6) = 8.89, *p* = .712, and marital status, χ2(6) = 9.91, *p* = .129. Independent-samples *t*-tests indicated that the two subsamples were also not significantly different in terms of age, *t*(700) = 1.83, *p* = .067, *d* = 0.14, and BMI, *t*(700) = 1.62, *p* = .107, *d* = 0.12.

**3.3.2. Main analyses.** To test the primary hypothesis in Study 2, we computed a 2 (Research site: blue-space *vs*. green-space) × 2 (Gender: women *vs*. men) × 2 (Time-point: entry *vs*. exit) mixed ANOVA. Research site and Gender were treated as a between-groups variables and Time-point was treated as a repeated variable, with SBAS-2 scores entered as the dependent variable. Descriptive statistics are reported in Table 2. Results indicated that the three-way interaction was not significant, *F*(1, 698) = 0.04, *p* = .837, ηp2 < .01, nor was the Gender × Time-point interaction, *F*(1, 698) = 0.01, *p* = .989, ηp2 < .01. However, the Research site × Time-point interaction was significant, *F*(1, 698) = 10.34, *p* = .001, ηp2 = .02. Tests of simple effects indicated that there was no significant difference in state body appreciation between participants at the two sites at entry, *t*(700) = 1.50, *p* = .135, *d* = 0.11. At exit, however, participants in the blue-space had significantly higher scores than participants in the green-space, *t*(700) = 5.22, *p* < .001, *d* = 0.40. State body appreciation scores on exit were significantly higher than entry scores in both the blue-space, *t*(350) = 13.69, *p* < .001, dependence-corrected *d* = 0.99, and green-space groups, *t*(350) = 12.24, *p* < .001, dependence-corrected *d* = 0.66.

The results of the ANOVA also indicated a significant main effect of Time-point, *F*(1, 698) = 326.12, *p* < .001, ηp2 = .32, and of Research site, *F*(1, 698) = 14.04, *p* < .001, ηp2 = .02, but not of Gender, *F*(1, 698) = 0.43, *p* = .513, ηp2 < .01. To summarise, the main analyses indicated that there was an elevation in state body appreciation scores at exit across genders, but that these effects were comparatively larger in the blue-space group. For further analyses, we computed the difference between state body appreciation scores on entry and exit to provide an index of body image change. We then computed bivariate correlations between this score and visit duration for the two subsamples separately (green-space *M* = 154.94 min, *SD* = 83.37, range = 27-420 min; blue-space *M* = 192.89 min, *SD* = 169.94, range = 30-720 min). Results indicated that visit duration was significant associated with greater body image change in the green-space group, *r* = .15, *p* = .005, and blue-space group, *r* = .35, *p* < .001. Fisher’s *z* test indicated that the magnitude of the correlation was significantly different across the subsamples, *z* = 2.83, *p* = .002.

**3.4. Discussion**

The results of Study 2 indicate that exposure to natural environments resulted in elevated state positive body image in a sample of Malaysian adults. More specifically, we found that spending time in both green- and blue-spaces resulted in significantly higher state body appreciation, although the effects appeared to be slightly larger in the latter. This finding may be interpreted as being consistent with research indicating that coastal and aquatic environments are experienced as more restorative than green-spaces (White et al., 2013, 2017). This may be because coastal environments are perceived as highly aesthetically fascinating (Wynyeen, Kyle, & Sutton, 2010), which promotes a greater sense of being away (i.e., psychological distance from everyday stressors) than green-spaces (White et al., 2013; Wyles et al., 2016). These features of coastal areas may also be important in promoting more positive body image, although it is also possible that there are indirect mechanisms at play, such as greater relaxation experienced in coastal areas that may promote greater mindfulness or self-compassion (White et al., 2013).

Interestingly, and in contrast to our hypotheses, we found that there were no gender differences in the impact of nature exposure on body image, including in the blue-space; that is, both men and women experienced improved state body image, despite the suggestion that visits to coastal areas may induce body surveillance in women (Field et al., 2019). Indeed, spending time at the beach is often described in body image research with Western participants as inducing a focus on the body (e.g., Cash, Fleming, Alindogan, Steadman, & Whitehead, 2002), but our results suggest that beach-going may also promote more positive body experiences. Of course, it is likely that the national and cultural context matters in this regard. For example, in the relatively traditional climate of Malaysia, it is possible that use of conservative beachwear helps to mitigate against body surveillance and/or promote a less body-focused mindset while at the seaside compared to more liberal nations. Finally, the results of Study 2 also indicated that greater visit duration was significantly associated with larger improvements in state body image, although the associations was significantly stronger in the blue-space group.

**4. General Discussion**

 In broad outline, the results of the present studies corroborate research with English-speaking samples showing that nature exposure is effective at improving state body appreciation (Swami, Barron et al., 2018). In fact, the present results indicated that nature exposure – to green-space (*d*s = 0.52, 0.68, and 0.66), but especially to blue-space (*d* = 0.99) – was either larger (Swami, Barron et al., 2018, Study 5) or comparable (Swami, Barron et al., 2018, Study 4) in effect sizes relative to earlier work. These results provide preliminary evidence that the positive impact of nature exposure on body image may be robust across different national, linguistic, and cultural groups. Beyond including samples from hitherto neglected national contexts, however, we also showed that exposure to different types of natural environment (botanic gardens in Romania and Spain; green- and blue-spaces in Malaysia) was effective at elevating state body appreciation in both women and men. Taken together, the available research suggests that exposure to natural environments is effective at promoting improvements in state body image.

 A secondary aim of the present studies was to examine the relationships between visit duration and body image change. Our results were mixed, with significant relationships found in Spain and Malaysia, but not Romania. Even in the former cases, however, the strength of the relationships was relatively weak. Although it may seem intuitive that greater visit duration should be associated with greater improvements in state body image, such a dose-response framework (Barton & Pretty, 2010; Cox et al., 2017) likely neglects the complexities of lived experiences in natural environments (Bell, Leyshon, Foley, & Kearns, 2019). To take an example pertinent to the present work, coastal encounters – and the range of activities that can be conducted in coastal areas – likely engender a variety of feelings and practices that shape body experiences differently (Bell, Phoenix, Lovell, & Wheeler, 2015). In addition, the aesthetics of a natural environment – the sound and motion of waves, as but one example – may resonate differently for different people, which helps to explain the lack of strong associations with visit duration and improvements to body image. Of course, it remains likely that repeated visits to natural environments produce embodied improvements over time, gradually helping to promote longer-term improvements to trait body image (Foley, 2017).

 Likewise, we caution against an interpretation of our results as suggesting that all natural environments are effective at promoting more body image. Indeed, the results of both Studies 1 and 2 suggest that some natural environments may be more effective in this regard. Future research that includes a wider range of natural environment types within the same geographic space may help scholars to better understand the types of environment that are best-suited to promoting positive body image. Even here, however, it may be important to consider the impact of additional factors that vary both within and across natural environments, such as the presence and degree of pristineness. One possible methodology for assessing the impact of such factors on body image outcomes is the use of images or films of natural and built environments that vary in the presence and degree of pristineness (e.g., the presence and type of litter; Wyles et al., 2016). In addition, it may be important to consider the impact of other factors, such as the time of day in which a visit is made and the presence of other visitors. Alternatively, qualitative research may be useful for understanding how natural environments influence embodied experiences and practices in specific contexts (e.g., Foley, 2017).

 It is also possible that the type of activity conducted in a natural environment has an impact on both body image outcomes, as well as the effects of visit duration on outcomes (cf. Bell et al., 2019). In Study 1, however, we found no significant differences in body image outcomes as a function of activity type in the Spanish sample, which is consistent with previous work (Swami, Barron et al., 2018, Study 5). Nevertheless, it is possible that our measure of greenspace activity was insufficiently nuanced to capture intended effects. For example, some research has suggested that the positive effects of nature exposure are experienced when participants engaged in activities that were more appreciative of nature (e.g., walking in nature) as opposed to consumptive activities (e.g., hunting or boating; White et al., 2013; Wolsko & Lindberg, 2013). Other research has suggested that the benefits of nature are influenced by visit characteristics, with improved outcomes for those who visit on their own compared to those who visit with others (e.g., with friends or children; White et al., 2013). Gathering additional data on visit characteristics would, therefore, be useful in future research.

 A number of additional issues may have affected our findings and their generalisability. First, our samples were self-selecting: although attempts were made to reduce self-selection biases by recruiting throughout the day and over a period of time, it is possible those who agreed to take part in the studies differed substantively from those who declined participation. Self-selection and recruitment biases likely also reduce the generalisability of our findings, as we cannot be certain that our samples were representative of those who visit the specific environments utilised in the present studies or, indeed, of the wider populations in Malaysia, Romania, and Spain, respectively. Conversely, it will be important to evaluate the extent to which similar effects as in the present studies can be replicated in other world regions and in diverse cultural groups. This is important because socio-political legacies, narratives, and norms can affect both access to natural environments, as well as the impact of different environments on psychological well-being (for discussions, see Bell et al., 2019).

Additionally, the lack of control groups in both studies is an important limitation (i.e., these were one-group pretest-posttest studies), as it means that it cannot be conclusively claimed that engagement with natural environments necessarily caused the improvements in state body image. Nevertheless, it should be noted that previous studies have used experimental designs that included control groups and have returned similar results (e.g., see Swami, Barron et al., 2018). Likewise, it may be useful to examine additional constructs – unmeasured in the present study – that may mediate the impact of nature exposure on body image. One potentially important variable is state connectedness to nature (Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009), which refers to a situational emotional response reflecting an individual’s emotional and cognitive bond to the natural world. Thus, recent work has suggested that greater state connectedness to nature may mediate the effects of nature exposure on beneficial psychological outcomes (Wyles et al., 2019). In a similar vein, it may be useful to include other measures of state well-being, such as mood and happiness. For example, it is possible that elevations in state body image reflect an improvement in state affect and mood. Thus, testing for the mediational impact of connectedness to nature, mood, or other indices of psychological well-being would be a useful step in future research.

 These issues notwithstanding, we suggest that our findings are important for a number of reasons. First, our finding that visits to natural environments improved state body appreciation, coupled with the finding that these effects were consistent across two nations and different environments, suggest that nature exposure may offer a viable means of promoting positive body image across diverse groups. Promoting positive body image, in turn, is likely to have a range of upstream benefits, including improved psychological well-being (e.g., greater optimism, resilience, and self-esteem), positive self-care health behaviours, and adaptive eating behaviours that are associated with lower BMIs (Tylka, 2018; Tylka, Calogero, & Daníelsdóttir, 2019). That is, in promoting more positive body image, nature exposure may give individuals the psychological tools to undertake healthy behaviours that mean their bodies are taken care of and functional optimally. Of course, our results are limited to improvements in state body appreciation, but it seems likely that repeated exposure to natural environments provides recurrent opportunities for restorative experiences that accumulate over time into more positive trait positive body image (Swami, Barron et al., 2019). Future studies could investigate this notion using longitudinal designs and, if supported, it would provide additional evidence for the benefits of nature exposure and body appreciation.

 Second, and more practically, in order to maximise these potential benefits of nature exposure and positive body image, it is important that citizens have easy access to natural environments. That is, there is an urgent need to support the prioritisation of access to natural environments in order to maintain and promote their benefits for future visitors, as well as ensuring adequate funding for the maintenance and creation of easily-accessible natural environments, particularly in urban areas. This is an important issue that concerns nations and communities across the world and, while our research was limited to three national contexts, we suggest that our findings are likely applicable to many geographic regions. Ensuring access to natural environments across and within nations, and supporting efforts to leverage natural environments for psychological well-being – including, but not limited to, positive body image – remains vital.

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Table 1. *Descriptive Statistics Describing State Body Appreciation at Entry and Exit in the Romanian and Spanish Subsamples from Study 1.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Research Site | Entry  |  | Exit |  |
|  | *M* | *SD* | *M* | *SD* |
| Romania | 3.88 | 0.80 | 4.09 | 0.78 |
| Spain | 3.87 | 0.70 | 4.27 | 0.62 |
| Total | 3.87 | 0.75 | 4.19 | 0.71 |

Table 2. *Descriptive Statistics Describing State Body Appreciation at Entry and Exit in the Blue- and Green-Space Subsamples from Study 2.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Research Site | Entry  |  | Exit |  |
|  |  | *M* | *SD* | *M* | *SD* |
| Blue-space | Total | 3.86 | 0.61 | 4.40 | 0.53 |
|  | Women | 3.89 | 0.63 | 4.42 | 0.52 |
|  | Men | 3.83 | 0.58 | 4.37 | 0.54 |
| Green-space | Total | 3.79 | 0.64 | 4.17 | 0.66 |
|  | Women | 3.79 | 0.62 | 4.17 | 0.63 |
|  | Men | 3.80 | 0.68 | 4.17 | 0.66 |

**Appendix**

To examine the factor structure of the Malaysian, Romanian, and Spanish State Body Appreciation Scale-2 (SBAS-2), we subjected entry-point data to principal-axis factor analysis in IBM Statistics v.24. Sample size requirements, based on item communalities (≥ .55 in Malaysia, ≥ .54 in Romania, and ≥ .52 in Spain), item distributions, average item correlations, and item-total correlations (see Swami & Barron, 2019), were adequate. To determine whether our data were factorable, we computed the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (which should ideally be ≥ .80) and Bartlett’s test of sphericity (which should be significant). Separate factor analyses were then run for the Malaysian, Romanian, and Spanish samples, respectively, using a quartimax rotation due to the expectation of a single factor.

For the Romanian subsample (*n* = 140), Bartlett’s test of sphericity, χ2(45) = 943.83, *p* < .001, and the KMO measure of sampling adequacy, KMO = .91, indicated that the SBAS-2 items had adequate common variance for factor analysis. The results of the factor analysis indicated only one factor with λ = 6.29. All 10 items loaded onto this factor (factor loadings = .70 to .89). For the Spanish subsample (*n* = 161), Bartlett’s test of sphericity, χ2(45) = 812.88, *p* < .001, and the KMO measure of sampling adequacy, KMO = .91, suggested that the SBAS-2 items were factorable. The factor analysis again indicated the existence of only a single factor with λ = 5.52 and all SBAS-2 items loaded onto this factor (factor loadings = .57 to .86). To assess the degree of factor similarity across the subsamples, we estimated Tucker’ congruence coefficient and obtained a value of .96, which suggests that the factor structures can be considered equal across groups (Lorenzo-Seva & ten Berge, 2006).

For the Malaysian sample, entry-point data were combined across green- and blue-spaces (*n* = 702), but were run separately for women (*n* = 407) and men (*n* = 295). For women, Bartlett’s test of sphericity, χ2(45) = 2422.68, *p* < .001, and the KMO measure of sampling adequacy, KMO = .92, indicated that the SBAS-2 items had adequate common variance for factor analysis. The results of the factor analysis indicated only one factor with λ = 5.90. All 10 items loaded onto this factor (factor loadings = .68 to .84). In men, Bartlett’s test of sphericity was significant, χ2(45) = 1865.57, *p* < .001, and the KMO indicated sampling adequacy was achieved, KMO = .92. The results of the factor analysis indicated only one factor with λ = 6.18. All 10 items loaded onto this factor (factor loadings = .71 to .85). Tucker’s congruent coefficient was .97, indicating that the factor structures can be considered equal across genders (Lorenzo-Seva & ten Berge, 2006).