Simulated Nature and Positive Body Image:

A Comparison of the Impact of Exposure to Images of Blue and Green Spaces

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Abstract

Previous research has shown that exposure to simulated natural environments, such as still images and film, promotes more positive state body image. However, this body of work has not distinguished between different types of natural environment, with the distinction between blue and green spaces being notable. Here, we asked a sample of 168 university students from the United Kingdom to complete a measure of state body appreciation before and after being randomly assigned to one of three groups in which they viewed images of blue spaces, green spaces, or built environments, respectively. A mixed analysis of variance showed that exposure to images of the natural environments, but not the built environments, significantly elevated state body appreciation. In addition, exposure to images of blue spaces had a stronger effect on state body appreciation than exposure to images of green spaces. These results replicate previous work showing that exposure to simulated natural environments promotes more positive state body image, but additionally shows that blue spaces may be more effective than green spaces. Implications of the present findings for the development of imagery-based interventions aimed at promoting healthier body image are discussed.

Keywords: Simulated nature; Natural environment; Positive body image; Body appreciation; Blue spaces

1. Introduction

In a seminal study, Kaplan (1984, p. 271) described the "richness of the psychological benefits" obtained from a wilderness outing programme in Michigan in the United States. Since then, a large body of evidence has supported and extended Kaplan's findings, indicating that exposure to natural environments brings multiple benefits for mental health, such as improved self-esteem, positive affect, and cognitive functioning (for a review, see Frumkin et al., 2017). Accumulating evidence now also supports the contention that exposure to natural environments has a beneficial impact on indices of positive body image. For instance, cross-sectional, experimental, single-arm pre-and-post-test, and experience sampling studies in diverse national contexts have shown that nature exposure is (causally) associated with more positive body image (Swami, 2020a; Swami, Barron et al., 2016, 2018, 2019, 2020; Swami, Mohd. Khatib et al., 2020; Stieger, Aichinger et al., 2021). Based on these findings, it has been suggested that exposure to natural environments may be a cost-effective way of promoting healthier body image (Swami, 2020b).

However, not everyone has access to natural environments. For instance, access to natural environments is uneven in urban areas (Jennings et al., 2019) and is impacted by such factors as mobility, feelings of safety, and – as during the COVID-19 pandemic – lockdown mandates that limit or prevent access to nature (Astell-Burt & Feng, 2021; Stieger, Lewetz et al., 2021). Such circumstances highlight the importance of finding ways of "bringing nature to citizens", that is, of utilising technologies that simulate real natural environments (Browning, Mimnaugh et al., 2020). In fact, many studies have shown that viewing still images, videos, and other simulations of nature have a positive impact on a wide range of indices of mental health (see White et al., 2018). These effects also extend to body image outcomes: experimental studies have shown that, compared to viewing images (Swami, Barron et al., 2018) or films (Swami, 2020c; Swami, Pickering et al., 2018) of built

environments, viewing comparable stimuli depicting natural environments significantly improves state body image.

Research examining the impact of simulated nature on body image has not distinguished between different types of natural environment. One distinction that may be important is between blue spaces (e.g., riverine and seaside views) and green spaces (e.g., forest and parkland views; White et al., 2010). Research increasingly shows that exposure to blue spaces promotes improved psychological health (for a review, see White et al., 2020), including in terms of body image. Thus, one study reported that exposure to real green and blue spaces significantly improved state body appreciation, but effect sizes were larger in the latter (Swami, Mohd. Khatib et al., 2020). Experience sampling research has likewise suggested that exposure to blue spaces is more strongly associated with positive body image compared to green space exposure (Stieger, Aichinger et al., 2021). To our knowledge, however, no study has examined the impact of simulated blue and green spaces on positive body image.

To fill this gap in the literature, we examined the impact of exposure to still images of natural environments (i.e., blue *vs*. green spaces) and, for comparative purposes, of built environments using a mixed design. We hypothesised that exposure to still images of natural, but not built, environments would result in significant improvements to state body appreciation (i.e., a state facet of positive body image). Further, based on the limited research conducted in real-world settings (Stieger, Aichinger et al., 2021; Swami, Mohd. Khatib et al., 2020), we also predicted that exposure to images of blue spaces would elicit larger improvements to state body appreciation than exposure to images of green spaces.

2. Method

2.1. Design

Following Swami, Barron and colleagues (2018, Study 2), we used a matched-samples mixed design. Participants were randomly assigned to one of three conditions in which they viewed still images of blue spaces, green spaces, or built environments, respectively. In each group, participants completed a measure of state body appreciation before and after exposure to the stimuli.

2.2. Participants

Participants of this study were 168 students (104 women, 64 men) from a university in Cambridgeshire, United Kingdom. Participants ranged in age from 18 to 58 years (M = 24.62, SD = 8.46) and in self-reported body mass index (BMI) from 15.81 to 38.72 kg/m^2 (M = 23.96, SD = 4.31). The majority of the sample indicated that they were White (81.0%), while 10.1% were Asian, 1.8% Black, and 7.1% of another ethnic group. A power analysis based on Swami and colleagues (2018, Study 1) indicated that a minimum sample of 41 participants per group was sufficient to detect a medium-sized effect (f^2) at $\alpha = .05$, power ($1 - \beta$) at .80, and expected correlations of .60 between repeated measurements. Because Swami and colleagues (2018) reported that participant gender did not influence their findings, we did not include gender as a variable in the present study but recruited a mix of women and men.

2.3. Stimuli

The stimulus set consisted of 15 images of blue spaces, 15 images of green spaces, and 15 images of built environments, which were selected on the basis of the results of a pilot study (see Supplementary Materials). All images were presented in high resolution (over 300 dpi).

2.4. Measures

To measure state positive body image, we used the 10-item State Body Appreciation Scale-2 (SBAS-2; Homan, 2016). Items in the SBAS-2 are worded to reflect time-specific states of positive body image (sample item: "Right now, I respect my body"). All items were rated on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Overall scores were computed as the mean of all 10 items, so that higher scores reflect greater state body appreciation. Scores on the SBAS-2 evidence adequate internal consistency and good indices of convergent and incremental validity (Homan, 2016). In the present study, McDonald's ω was adequate across testing sessions and within all subgroups (all $\omega \geq .91$).

2.5. Procedures

Our study received ethics approval from the School Research Ethics Panel at Anglia Ruskin University. All data were collected between December 2020 and April 2021. Due to institutional restrictions that prevented face-to-face testing during this period, all procedures were conducted online. The study was advertised to students via a Research Participation System, and participants first provided digital informed consent before completing a survey hosted on Qualtrics™. To mask the study aims, participants were informed that they would be taking part in a study about the relationships between personality and aesthetic preferences. Participants were also provided with instructions that asked them to ensure they were in a quiet setting with no distractions. Next, they were asked to provide their demographic information (gender identity, age, ethnicity, weight, and height) before completing a survey consisting of the SBAS-2 and filler scales relating to personality (20 items), flourishing (8 items), and desire for aesthetics (36 items), which we used to mask the study hypotheses. Items of the SBAS-2 were presented in a random order within the larger set of filler items. Next, participants were randomly assigned to one of the three experimental conditions (blue space $n = 55$; green space $n = 55$; built environment $n = 58$) and were asked

to rate each of the 15 presented images on a 3-point scale (1 = *dislike very much*, 3 = *like very much*). Instructions to participants asked them to take their time with each image and to imagine they were in each setting. Once all 15 images had been rated, participants were asked to complete the same set of survey items as before, which included the SBAS-2 items presented in a random order. Finally, participants received debriefing information, which described the true purpose of the study. All participants took part on a voluntary basis and received course credit for participation.

3. Results

There were no missing data in the dataset, likely because participants were prompted to respond to incomplete items. There were no significant differences between the three experimental groups in terms of participant age, $F(2, 165) = 2.22$, $p = .112$, $\eta_p^2 = .03$, and BMI, $F(2, 165) = 1.28$, $p = .280$, $\eta_p^2 = .02$. There were also no between-group differences in the distribution of gender identities, $\chi^2(2) = 1.06$, $p = .590$, and ethnic groups, $\chi^2(6) = 12.58$, $p = .052$. Finally, there was no significant between-group difference in pre-exposure state body appreciation scores, $F(2, 165) = 1.03$, $p = .360$, $\eta_p^2 = .01$. These results indicate that the three experimental groups were suitably matched in terms of key demographics and, importantly, in terms of pre-exposure state body image.

To test the study hypotheses, we conducted a 3 x 2 (experimental condition: blue space *vs*. green space *vs*. built environment; testing period: pre-exposure *vs*. post-exposure) mixed analysis of variance (ANOVA). State body appreciation scores were entered as the dependent variables. The results indicated a significant interaction, $F(2, 165) = 11.11$, $p < .001$, $\eta_p^2 = .12$ (see Figure 1). There were also significant main effects of testing period, $F(1, 165) = 22.13$, $p < .001$, $\eta_p^2 = .12$, and of experimental condition, $F(2, 165) = 7. 98$, $p < .001$, $\eta_p^2 = .09$.

To examine the significant interaction, we conducted tests of simple effects. The results of paired-samples *t*-tests indicated significant increases in state body appreciation scores from pre- to post-exposure in the blue space group (pre-exposure $M = 3.35$, $SD = 0.92$; post-exposure $M = 3.98$, $SD = 0.85$), $t(54) = 4.76$, $p < .001$, dependence-corrected $d = 0.64$, and in the green group (pre-exposure $M = 3.37$, $SD = 0.87$; post-exposure $M = 3.66$, $SD = 0.89$), $t(54) = 2.60$, $p = .012$, dependence-corrected $d = 0.36$. In the built environment group, there was no significant change in state body appreciation from pre- to post-exposure (pre-exposure $M = 3.16$, $SD = 0.78$; post-exposure $M = 3.10$, $SD = 0.76$), $t(57) = 1.01$, $p = .312$, dependence-corrected $d = 0.13$. A comparison of post-exposure scores indicated that the blue space group had significantly higher scores than the green space group, $t(108) = 2.04$, $p = .044$, $d = 0.40$.

4. Discussion

The results of the present study indicated that exposure to images of both blue and green spaces resulted in significant improvements to state body appreciation, whereas exposure to images of built environments resulted in no such improvement. In addition, our results showed that exposure to images of blue spaces resulted in larger improvements to state body appreciation (i.e., a moderate effect size) compared to exposure to images of green spaces (i.e., a small effect size). Overall, these findings are consistent with the suggestion that exposure to natural environments is associated with more positive body image (Swami, 2020a, 2020c; Swami et al., 2019; Swami, Barron et al., 2016, 2018; 2020; Swami, Mohd. Khatib et al., 2020; Stieger, Aichinger et al., 2021).

The link between nature exposure – whether simulated or real – and positive body image can be explained by drawing on Attention Restoration Theory (Kaplan & Kaplan, 1989), which suggests that natural environments have the capacity to restore psychological resources. Specifically, it has been suggested that the “being away” (i.e., being separate and

apart from one's usual thoughts and concerns) in nature helps to restrict negative appearance-related thoughts and supports speedier recovery from threats to body image, thus turning negative body image states into positive ones (Swami, Barron et al., 2018). Natural environments are also "softly fascinating" (i.e., where one's attention is held without effort) and promote "extent" (i.e., immersion and engagement), which helps to shift attention toward greater appreciation for the body's functionality (Swami, Barron et al., 2019). Exposure to natural environments also likely promote improvements to self-compassion and connectedness to nature, both of which promote positive body image in turn (Swami, Barron et al., 2020).

Our finding that exposure to images of blue spaces was more effective at elevating state body appreciation than green spaces is consistent with recent studies that have demonstrated a similar effect in real natural environments (Stieger, Aichinger et al., 2021; Swami, Mohd. Khatib et al., 2020), as well as work showing that images of natural and built environments with views of water elicit greater positive affect than images without water (White et al., 2010). One possible explanation for this finding is that views of water are perceived as more restorative than views without water: compared to green spaces, blue spaces are rated as having significantly better restorative qualities, more aesthetically pleasing, and more likely to confer a sense of "being away" (White et al., 2010, 2013, 2020). More generally, views of water are more positively rated than are views of green spaces, perhaps because water evokes a greater sense of biodiversity, colour, and sounds that are restorative (for a review, see Völker & Kistemann, 2011).

Another possibility is that images of blue spaces offer better representations of natural environments than green spaces (cf. Nutsford et al., 2016). If this is the case, then it may be that blue spaces – to a greater extent than green spaces – are more likely to promote restorative outcomes in participants, which in turn promote more positive state body image.

Of course, the national context in which the present study was conducted may also be important in explaining the stronger impact of blue spaces compared to green spaces. For instance, blue spaces may be of especial significance to island nations such as the United Kingdom (for discussions in relation to Aotearoa/New Zealand, see Kearns et al., 2014; Richardson et al., 2010). For residents of island nations, blue spaces may be perceived as being especially representative of natural environments or may be particularly valued for restorative qualities.

If our results can be replicated, they may offer important implications for body image scholars and practitioners. For instance, beyond developing therapeutic interventions to promote healthier body image through immersion in natural environments (e.g., interventions that involve physical activity in nature), it may also be useful to develop intervention techniques based on visual imagery. Importantly, de Wet and colleagues (2020) have recently demonstrated that guided imagery meditations, which draw focus to natural environments, were effective at promoting body appreciation. Our results suggest that developing guided imagery meditations that specifically draw attention to blue spaces may be especially effective at achieving body image gains. Beyond simple imagery, it will be useful to future research to assess the effectiveness of combining visual and auditory stimuli. Indeed, recent work has shown that the addition of the sound of flowing water or birdsong to still images of nature was effective at improving the restorative potential of the images (Zhao et al., 2018). Likewise, it would also be useful for future research to assess the effectiveness of other forms of simulated nature (White et al., 2018), especially extended reality immersive technologies (e.g., virtual, augmented, and mixed reality), at promoting healthier body image.

A number of limitations of the present study preclude drawing stronger conclusions. First, we cannot rule out the possibility that our findings reflect the restorative potential of images, rather than the effects of natural environments *per se*. That is, because our images of

blue and green spaces were rated as more restorative than the comparable images of built environments, it may be that the present results are driven by perceived restorativeness more directly (see Browning et al., 2021). Although we have followed both established practice (see Berto, 2005, for a discussion) and theory (natural environments are theorised to be more restorative than built environments; Kaplan & Kaplan, 1989), one way to disentangle this issue would be to develop an image set depicting highly restorative built environments, which would be a useful task for the future. Relatedly, we did not systematically consider different types of blue space in the present study (e.g., riverine *vs*. seaside views), and it may be useful in future work to determine whether some blue spaces elicit more positive body image outcomes than others. In developing image sets for future use, it may also be valuable to develop sets that are available under Creative Commons license, so as to facilitate sharing across research groups.

An additional limitation was our reliance on a sample of university students, which may limit the generalisability of our findings. Relatedly, because the study was conducted online (due to COVID-19-related restrictions that were in place during the period of study), we cannot determine how the images were viewed (i.e., on what device and for how long). We also cannot be certain that participants were not distracted while completing the experiment. It should also be acknowledged that "exposure" in the present study was essentially passive. An alternative approach would be to systematically examine the ways in which blue and green spaces are used in everyday life (see White et al., 2020), and to begin the task of assessing how active use of natural environments promotes healthier body image. Indeed, it would be useful to compare the impact of exposure to simulated nature and their real-world counterparts (for a discussion, see Browning, Shipley et al., 2020).

These limitations aside, the present study has demonstrated that exposure to images of natural environments promotes body appreciation, and that images of blue spaces may be

particularly effective. Most immediately, we encourage body image scholars to consider the implications of our findings for both practice and research. For instance, one important conclusion is that scholars should avoid using images of natural environments as a "control" in experimental studies (e.g., Williamson & Karazsia, 2018). In the longer term, and acknowledging the need for our results to be replicated using different techniques and methodologies, it may be possible to develop sustainable intervention programmes that "bring nature to citizens" so as to promote healthier body image across diverse populations, including those with limited access to real nature.

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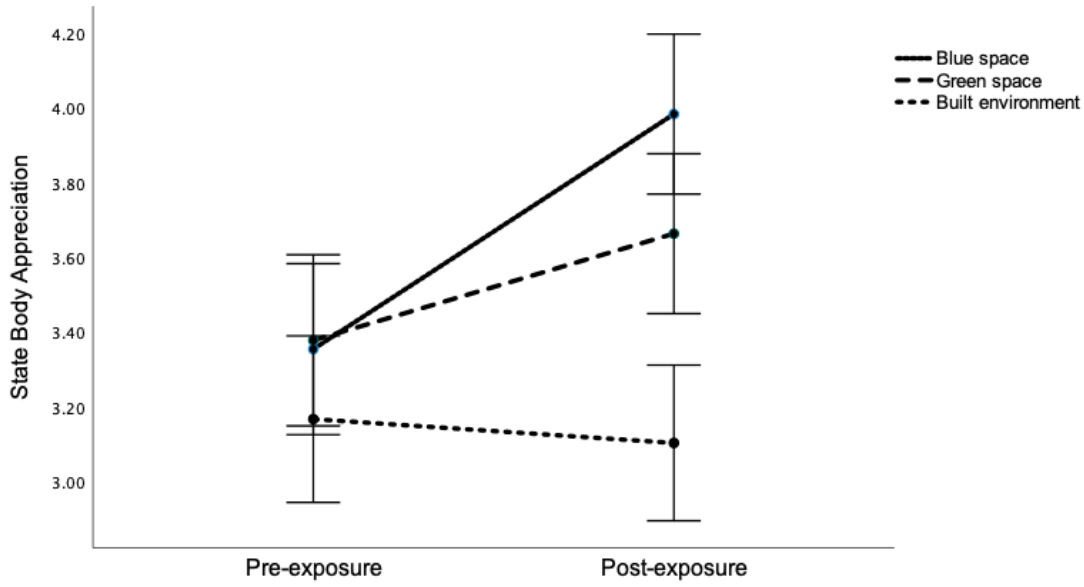

Figure 1. Graphical representation of the significant interaction between environment type (blue space, green space, and built environment) and testing period (pre- and post-exposure).