The Impact of Exposure to Films of Natural and Built Environments on State Body Appreciation

Viren Swami[1-2], Mark Pickering[3], David Barron[2], & Shreepali Patel[3]

[1]Department of Psychology, Anglia Ruskin University, Cambridge, UK

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

[3]StoryLab, Anglia Ruskin University, Cambridge, UK

[Main text word count = 2,417; Abstract word count: 149]

Address for correspondence: Prof. Viren Swami, Department of Psychology, Anglia Ruskin University, East Road, Cambridge, Cambridgeshire CB1 1 PT, UK. Email: viren.swami@anglia.ac.uk.

Abstract

Previous work has shown that exposure to images of nature results in elevated state body appreciation, but static images may lack ecologically validity. Here, we examined the impact of exposure to short films of simulated, first-person walks in natural or built environments. Thirty-six university students completed a measure of state body appreciation before and after watching films of either a walk in a natural or a built environment created specifically for the present study. Two weeks later, they completed the same task but watched the complementary film. Results indicated that exposure to the film of a natural environment resulted in significantly elevated state body appreciation ($d = 0.66$). There was no significant change in state body appreciation following exposure to the film of the built environment ($d = 0.14$). These findings suggest that exposure to films depicting the natural environment may promote immediate, moderate-sized improvements in state body image.

Keywords: State body appreciation; Natural environment; Built environment; Nature; Film

Introduction

Exposure to natural environments (e.g., wild nature, green spaces, parks) has wide-ranging benefits in terms of physical health and psychological well-being (for reviews, see van den Bosch & Bird, 2018). Emerging research suggests that these benefits may extend to one's body image. For example, cross-sectional work with North American adults has shown that self-reported exposure to natural environments is significantly associated with more positive trait body image (Mitten & D'Amore, 2018; Swami, Barron, Weis, & Furnham, 2016). In addition, experimental studies with British adults has shown that exposure to "isomorphic" (i.e., images of) natural environments results in significantly improved state body image (Swami, Barron, & Furnham, 2018, Studies 1-3). Likewise, exposure to real natural environments was found to result in significantly improved state body image (Swami et al., 2018, Studies 4-5).

Across studies, Swami and colleagues (2018) reported that the effect sizes of exposure to real nature tended to be larger (d = 0.60) than that of exposure to images of nature (ds = 0.26-0.40). One reason for this may be because static images provide only limited representations of in-situ real environments and thus have limited ecological validity (Pearson & Craig, 2014). More specifically, static images do not provide multi-sensory input (e.g., sound, motion), dynamic characteristics (e.g., perceived atmosphere), and continuous multi-views that promote immersion and presence in an environment (Heft & Nasar, 2000; Huang, Parsons, & Tassinary, 2004; Kroh & Gimblett, 1992). Both *immersion* (the extent to which a display system blocks out sensory input from the outside world) and *presence* (the extent to which individuals feel they are "there" in the mediated environment) can be promoted through the use of film (IJsselsteijn, 2004).

Films of natural environments are known to produce more natural viewing behaviour compared to static images (Dorr, Martinetz, Gegenfurtner, & Barth, 2010). Moreover, the available evidence suggests that exposure to films of natural environments elicit positive effects in terms of physiological and psychological well-being (e.g., de Kort, Meijnders, Sponselee, & IJsselsteijn, 2006; Kjellgren & Buhrkall, 2010; Nadkarni, Hasbach, Thys, Crockett, & Schnacker, 2017; Tsutsumi, Nogaki, Shimizu, Stone, & Kobayashi, 2017), but that these effects do not extend to films of built environments (e.g., Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009; McAllister, Bhullar, & Schutte, 2017; van den Berg, Koole, & van der Wulp, 2003). To date, however, the potential benefits of exposure to films depicting natural, as opposed to built, environments on body image have not been examined.

To fill the aforementioned gap in the literature, we examined the impact of exposure to films of natural and built environments on state body image. To do so, we first developed novel films depicting simulated, first-person walks in a natural and built environment for use in the present study. Next, we followed Swami and colleagues (2018, Study 3) in using a prospective design in which participants completed a measure of state body appreciation (a measure of positive body image) immediately before and after viewing either the film of the natural or built environment. Two weeks later, participants completed the same procedure, but viewed the complementary film. Based on Swami et al. (2018), we expected that exposure to the natural environment, but not the built environment, film would result in elevated state body appreciation.

Method

Development of Stimulus Materials

We followed a previous study (Amati, Sita, Parmehr, & McCarthy, 2018) in developing two films depicting simulated walks in a natural and built environment, respectively. We first discussed and agreed potential shooting locations for the films of the natural and built environments. A number of test shoots were conducted before we settled on Grantchester Meadows (wild meadowland intersected by the River Cam) for the natural environment film and Cambridge city centre (low-rise commercial buildings) for the built environment film. Next, the second author – a cinematographer and sound specialist – produced digital films of first-person walks in each environment in February 2018, early in the morning and under fair weather conditions. A high-quality digital camera (Cannon DSLR Mark III with a 35mm lens) was attached to a DJI Ronin Handheld 3 axis stabilisation rig to create films with fluid movements in HD 1080p resolution at 25 fps. Films were shot in a single take, so that each simulated walk was 3 minutes long. Gaze direction, walk trajectories, and camera movement were standardised as far as possible across both films. It was not possible to entirely eliminate the intrusion of other people and vehicles in the built environment film, but we elected not to exclude the relevant frames so as to produce a smooth and cogent transition. Following filming, ambient sounds were added to both films to reflect sounds typically found in each environment (see Supplementary Materials). The final films were produced with identical colour grading and are available at the following URLs: https://vimeo.com/257870213 (natural environment) and https://vimeo.com/257870376 (built environment).

In a pilot study, 33 university students (51.5% women; age M = 20.24, SD = 2.87; 75.8% White) were invited to a laboratory setting where they were individually shown each film in a randomised order on a 20” screen. These participants were asked to rate each film using the short form of the Perceived Restorativeness Scale (PRS; Korpela & Hartig, 1996; short form: Berto, 2005), which includes five items that assesses restorative qualities rated on an 11-point scale (0 = *not at all*, 10 = *completely*). Overall PRS scores for each film were computed as the mean of all five items and demonstrated adequate internal consistency coefficients (ordinal α natural environment = .80, built environment = .78). A paired-samples t-test revealed that the film of the natural environment (M = 6.55, SD = 0.74) was rated as being significantly more restorative than the film of the urban environment (*M* = 4.60, *SD* = 0.55), $t(32) = 13.77$, $p < .001$, dependence-corrected $d = 2.14$.

Participants

An *a priori* power analysis based on Swami and colleagues (2018, Study 3) indicated that a minimum sample of 22 participants was sufficient to detect a small-sized effect (f^2) at $\alpha = .05$ and power ($1 - \beta$) at .95. To account for possible drop-out and to ensure adequate power, we recruited a much larger sample than was necessary. Because Swami and colleagues (2018) consistently reported that participant sex did not influence their findings, we did not include sex as a variable in the present study but recruited a mix of women and men. In practise, 39 undergraduates were recruited from a university in Cambridge, United Kingdom, but three did not complete both testing sessions, leaving a final sample of 19 women and 17 men. Participants ranged in age from 18 to 29 years (*M* = 20.47, *SD* = 2.22) and in self-reported body mass index (BMI) from 17.47 to 31.63 kg/m^2 (*M* = 22.81, *SD* = 3.45). The majority of participants self-reported as being of White ethnicity (77.8%).

Measures

State body appreciation. We used the 10-item State Body Appreciation Scale-2 (SBAS-2; Homan, 2016), a measure of transient mood states reflective of body appreciation. All items were rated on a 5-point scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), with higher scores reflecting more positive state body appreciation. Homan reported that SBAS-2 scores have a one-dimensional factor structure, satisfactory convergent and incremental validity, and adequate internal consistency. In the present study, ordinal α for this scale was ≥ .94 across testing conditions.

Demographics. Participants provided their demographic details, consisting of sex, age, ethnicity, height, and weight (the latter two items were used to compute self-reported BMI).

Procedure

Ethics approval for the pilot and mainstage studies were obtained from the departmental research ethics committee at [blinded for review] (application number: EHS17-009). Participation for the mainstage study was solicited through flyers placed in areas of congregate activities on campus and through a call for participation during undergraduate lectures. An attempt was made to mask the study hypotheses by advertising the project as a study on the effects of personality on aesthetic preferences. Participants who agreed to take part in the study were invited to a laboratory setting, where they provided written informed consent and completed a paper-and-pencil questionnaire consisting of the SBAS-2 along with filler scales consistent with the study's advertised objectives. Following completion of the pre-test questionnaire, participants were seated at a distance of about 60cm in front of a flat-screen, high-definition 20" screen in a testing cubicle. Lights in the cubicle were turned off to ensure that participants were focused on the screen and participants wore headphones (JVC HA-RX300) to ensure a consistent audible sound. The first author explained to participants that they would be shown a film and were asked to imagine being the cameraperson, thereby experiencing what the cameraperson had seen and heard. The order of presentation of films (natural versus built environment) was counterbalanced for each participant (natural environment first, n = 18) and, following the film, participants were asked to rate how much they liked the environment depicted in the film (1 = *dislike very much*, 3 = *like very much*). Following this, the cubicle lights were turned on and participants were asked to complete the same scales as during pre-test. Two weeks after the first testing sessions, participants were invited to return to the laboratory to complete the same procedure but viewed the complementary film. Nominal codes were used to link participant data across testing sessions and were destroyed prior to analyses to ensure anonymity. All participants took part on a voluntary basis, were not remunerated, and received written debriefing information at the end of the study. Following completion of the second testing session, all participants were verbally asked to guess the study hypothesis, but none were able to do so.

Results

Missing data accounted for < 0.2% of the total dataset, were missing completely at random, and were inputted using the multiple imputation technique. The data were analysed using a 2 × 2 repeated measures analysis of variance (ANOVA), with film type (nature versus built environment) and test period (before versus after viewing the images) as within-subjects variables. The results indicated that the film type × test period interaction was significant, $F(1, 35) = 14.68$, $p = .001$, $\eta_p^2 = .30$ (see Figure 1), which we follow-up with paired-samples *t*-tests. When participants viewed the built environment film, there was no significant difference in state body appreciation between pre-viewing ($M = 3.11$, $SD = 0.55$) and post-viewing ($M = 3.05$, $SD = 0.45$), $t(35) = 0.95$, $p = .350$, dependence-corrected $d = 0.14$. On the other hand, when participants viewed the nature film, there was a significant elevation in scores from pre-viewing ($M = 3.08$, $SD = 0.65$) to post-viewing ($M = 3.42$, $SD = 0.46$), $t(35) = 3.73$, $p = .001$, dependence-corrected $d = 0.66$. The ANOVA also indicated that there was a significant main effect of testing period, $F(1, 35) = 4.86$, $p = .034$, $\eta_p^2 = .12$, but not of film type, $F(1, 35) = 2.02$, $p = .164$, $\eta_p^2 = .06$.

Discussion

Our results showed that exposure to a short film of a walk in a natural environment, but not a built environment, resulted in significantly improved state body appreciation. This is noteworthy because the effect size of the elevation in state body appreciation was comparable to that of a walk in a real natural environment reported in a previous study (Swami et al., 2018, Study 4). One preliminary conclusion here is that exposure to films of natural environments may adequately represent real nature, at least in terms of their effects on state body image. To the extent that films also include multi-sensory, dynamic characteristics of an environment, they may be more effective at promoting improvements in state body image compared to static images, which lack these characteristics (cf. Dorr et al., 2010; IJsselsteijn, 2004).

Of course, this is not to claim that exposure to films of the natural environment is identical in all forms to exposure to real nature. For example, although there are some similarities in eye-fixation patterns when walking in real environments and when watching a first-person film of the same walk (e.g., a central bias in the visual field), individuals walking in the real world spend more time focusing on the walking path (e.g., in order to navigate an uneven path) as compared with individuals watching a screen in laboratory setting (Foulsham, Walker, & Kingstone, 2011). One way to examine whether such differences have an impact on state body image would be to compare the effects of walking in a real environment with watching a film of the same walk. Similarly, future work could also compare the effects on body image of watching a filmed walk on a screen and exposure to stills obtained from the film, although doing so would require a much wider variation in environments than was the case here.

In future work, it would also be useful to examine the impact of exposure to films without auditory stimuli (e.g., Annerstedt et al., 2013) or with alternative sounds (e.g., tonal or musical sound design), so as to more precisely identify the features that contribute to elevations in state body image. Future research could also manipulate situational variables that may affect outcomes when viewing films, such as screen size and the degree of interactivity with the environment (de Kort et al., 2006). In terms of the latter, immersive virtual environments may be one medium worthy of investigation in terms of its effects on body image (Calogiuri et al., 2017). Finally, our study relied on a sample of university students and it will be important for future research to replicate our findings with other segments of the wider community.

Importantly, the present study was not able to address the question of *why* exposure to films of the natural environments promotes improvements in body image. Swami and colleagues (2016, 2018) have proposed a number of explanations, including the possibility that natural environments promote a "cognitive quiet" that fosters self-kindness, nurturance, and a compassionate view of one's body. Clearly, there remains much work to be done to more fully understand how exposure to natural environments promotes immediate improvements in state body image, as well as the longer-term effects on trait body image. In the meantime, the findings of the present study may offer practitioners a simple intervention technique for promoting healthier body image, particularly for individuals who may not have easy access to real natural environments (e.g., due to a lack of such environments in the immediate vicinity or who have low mobility), and also highlights the potential applications of art-science collaborations (see Patel, Jackson, Wallis-Redworth, & Rose, 2017; Patel & Toulson, 2014).

References

Amati, M., Sita, J., Parmehr, E., & McCarthy, C. (2018). How eye-catching are natural features when walking through a park? Eye-tracking responses to videos of walks. *Urban Forestry and Urban Greening*, in press. doi:10.1016/j.ufug.2017.12.013

Annerstedt, M., Jönsson, P., Wallergård, M., Johansson, G., Björn, K., Grahn, P., … & Währborg, P. (2013). Inducing physiological stress recovery with sounds of nature in a virtual reality forest – Results from a pilot study. *Physiology and Behavior*, *118*, 240-250. doi:10.1016/j.physbeh.2013.05.023

Berto, R. (2005). Exposure to restorative environments helps restore attentional capacity. *Journal of Environmental Psychology*, *25*, 249-259. doi:10.1016/j.jenvp.2005.07.001

Calogiuri, G., Litleskare, S., Fagerhaim, K. A., Rydgren, T. L., Brambilla, E., & Thurston, M. (2017). Experiencing nature through immersive and virtual environments: Environmental perceptions, physical engagement, and affective responses during a simulated nature walk. *Frontiers in Psychology*, *8*, 2321. doi:10.3389/fpsyg.2017.02321

de Kort, Y. A. W., Meijnders, A. L., Sponselee, A. A. G., & IJsselsteijn, W. A. (2006). What's wrong with virtual trees? Restoring from stress in a mediated environment. *Journal of Environmental Psychology*, *26*, 309-320. doi:10.1016/j.envp.2006.09.001

Dorr, M., Martinetz, T., Gegenfurtner, K. R., & Barth, E. (2010). Variability of eye movements when viewing dynamic natural scenes. *Journal of Vision*, *10*, 28. doi:10.1167/10.10.28.

Foulsham, T., Walker, E., & Kingstone, A. (2011)., The where, what, and when of gaze allocation in the lab and the natural environment. *Vision Research*, *51*, 1920-1931. doi:10.1016/j.visres.2011.07.002

Heft, H., & Nasar, J. L. (2000). Evaluating environmental scenes using dynamic versus static displays. *Environment and Behavior*, *32*, 301-322. doi:10.1177/0013916500323001

Homan, K. J. (2016). Factor structure and psychometric properties of a state version of the Body Appreciation Scale-2. *Body Image*, *19*, 204-207. doi:10.1016/j.bodyim.2016.10.004

Huang, S.-C. L., Parsons, R., & Tassinary, L. G. (2004). An exploratory approach for using videos to represent dynamic environments. *Landscape Research*, *29*, 205-218. doi:10.1080/01426390410001690356 (Corrigendum: 2005, vol. 30, 431, doi:10.1080/01426390500193114)

Kjellgren, A., & Buhrkall, H. (2010). A comparison of the restorative effect of a natural environment with that of a simulated natural environment. *Journal of Environmental Psychology*, *30*, 464-472. doi:10.1016/j.envp.2010.01.001

Korpela, M. K., & Hartig, T. (1996). Restorative qualities of favorite places. *Journal of Environmental Psychology*, *12*, 249-258. doi:10.1006/jevp.1996.0018

Kroh, D. P., & Gimblett, R. H. (1992). Comparing live experience with pictures in articulating landscape preference. *Landscape Research*, *17*, 58-69. doi:10.1080/01426399208706362

Mayer, S. F., Frantz, C. M., Bruehlman-Senecal, E., & Dolliver, K. (2009). Why is nature beneficial? The role of connectedness to nature. *Environment and Behavior*, *41*, 607-643. doi:10.1177/0013916508319745

McAllister, E., Bhullar, N., & Schutte, N. S. (2017). Into the woods or a stroll in the park: How virtual contact with nature impacts positive and negative affect. *International Journal of Environmental Research and Public Health*, *14*, 786. Doi:10.3390/ijerph14070786

Mitten, S., & D'Amore, C. (2018). The nature of body image: The relationship between women's body image and physical activity in natural environments. In D. A. Vakoch &

S. Mickey (Eds.), *Women and nature? Beyond dualism in gender, body, and environment* (pp. 96-116). London: Routledge.

Nadkarni, N. M., Hasbach, P. H., Thys, T., Crockett, E. G., & Schnacker, L. (2017). Impact of nature imagery on people in severely nature-deprived environments. *Frontiers in Ecology and the Environment*, *15*, 395-403. doi:10.1002/fee.1518

Patel, S., & Toulson, E. R. (2014). Educating and enhancing compassion, emotion, and reflective professional choice practice through contemporary digital filmmaking. In R. Neves-Silva, G. A. Tsihrintzis, V. Uskov, R. J., Howlett, & L. C. Jain (Eds.), *Smart digital futures 2014* (pp. 582-591). Clifton, VA: IOS Press.

Patel, S., Jackson, S., Wallis-Redworth, M., & Rose, L. (2017). Art and science: Promoting empathy through film. *British Journal of Midwifery*, *25*, 734-740. doi:10.12968/bjom.2017.25.11.734

Pearson, D. G., & Craig, T. (2014). The great outdoors? Exploring the mental health benefits of natural environments. *Frontiers in Psychology*, *5*, 1178. doi:10.3389/fpsyg.2014.01178

Swami, V., Barron, D., & Furnham, A. (2018). Exposure to natural environments, and photographs of natural environments, promotes more positive body image. *Body Image*, *24*, 82-94. doi:10.1016/j.bodyim.2017.12.006

Swami, V., Barron, D., Weis, L., & Furnham, A. (2016). Bodies in nature: Associations between exposure to nature, connectedness to nature, and body image in U.S. adults. *Body Image*, *18*, 153-161. doi:10.1016/j.bodyim.2016.07.002

Tsutsumi, M., Nogaki, H., Shimizu, Y., Stone, T. E., & Kobayashi, T. (2017). Individual reactions to viewing preferred video representations of the natural environment: A comparison of mental and physical reactions. *Japan Journal of Nursing Science*, *14*, 3-12. doi:10.1111/jjns.12131 van den Berg, A., Koole, S. L., & van der Wulpe, N. Y. (2003). Environmental preferences and restoration: (How) are they related? *Journal of Environmental Psychology*, *23*, 135-146. doi:10.1016/S0272-4944(02)00111-1

van den Bosch, M., & Bird, W. (Eds.). (2018). *Oxford textbook of nature and public health: The role of nature in improving the health of a population*. Oxford: Oxford University Press.

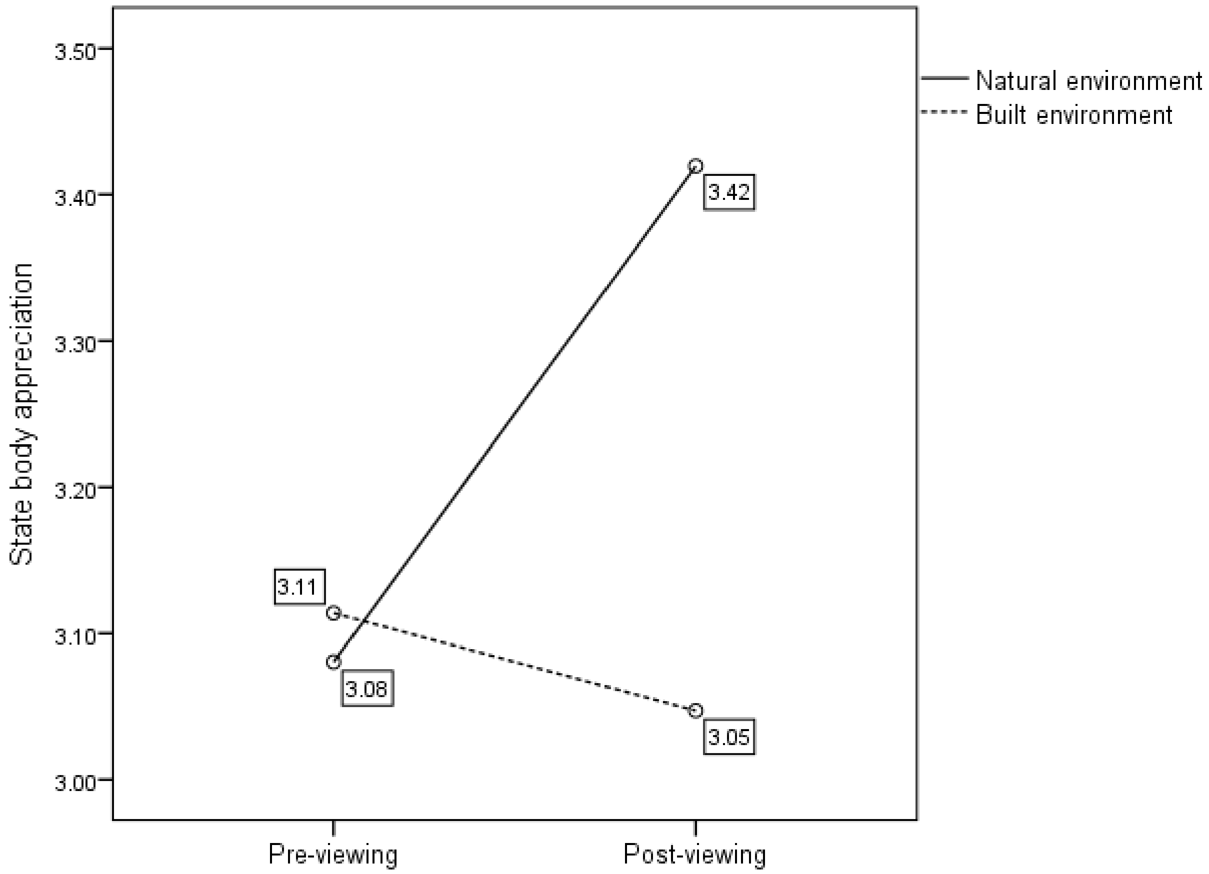

Figure 1. *Representation of the Significant Interaction between Film Type and Testing Period*

Supplementary Materials

Following filming, ambient and environmental sound was added so as to reflect each environment, with care taken not to add any sounds (e.g., music, manufactured sound design) that would not be present in the environments or that could unintentionally influence the state of mind of the viewer. Sounds such as bird song, insects, ambience (natural environment) and passing cars and bicycles (built environment) were added as they were present in the footage. The volume levels on both films were kept within the same decibel range, with minor fluctuations in sound peaks kept between -31db-24db on both films. Although the overall volume levels were kept similar, sound frequencies within the two pieces of audio differed as the environments filmed were different. In the built environment film, lower frequencies from machinery within buildings and vehicle tyres were dominant (30hz-400khz), whereas in the natural environment film there was a more diverse range of fauna, particularly birds, that dominated sound dynamic (3khz-6khz). Therefore, the two films are sonically different as illustrated in the audio spectrum below.