

Watching a nature video improves negative affect and stress but does not change positive affect

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Jan. 2021

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Abstract

Lockdown measures implemented due to COVID-19 pandemic decreased people's visiting frequency of and access to outdoor natural spaces, which have restorative and mental health benefits like increasing well-being, vitality and decreasing stress. As such, by conducting a repeated-measures online study with 112 participants, we investigated whether watching a nature video of less than four minutes would change the mood and stress levels. Statistical analysis showed significant decreases in negative affect and stress scores with effect sizes of $-.69$ and $-.78$ respectively. No significant change in positive mood was observed and the change in measures did not correlate with participants' nature connectedness. These indicate that watching a nature video can benefit by blocking negative emotions regardless of how connected to nature people are. While the endurance of these effects need further exploring, the findings suggest a potential for similar interventions short in duration, especially when outdoor nature is less accessible.

This project was carried out collaboratively by:

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Introduction

After the onset of COVID-19 pandemic in December 2019, countries implemented lockdown measures, which decreased people's contact with nature. Given the benefits of nature to mental health, this paper investigates whether watching a short simulation of nature can affect mood and stress levels.

The benefits of nature were brought to attention by Ulrich (1984), who reported that patients whose rooms viewed nature had shorter hospital durations. Since then, research on the effects of nature has expanded rapidly (van den Berg, 2017), mostly concentrating on natural outdoor settings. Individuals in various countries like the UK, the USA, and China all reported lower distress and higher well-being when interacting with nature (White et al., 2013; Larson et al., 2016; Ma et al., 2019). Additionally, self-reported participation in nature-based activities is associated with experiencing calmness, vitality, forgetting worries and clarifying thoughts (Korpela et al., 2014). Given the universality of such findings, interventions and policies aimed to bring people to nature (i.e. health-walks programs) and bring nature to people (i.e. having urban parks) (van den Berg, 2017).

There are multi-dimensional aspects to benefits of nature. Mensah et al. (2016) highlights that green spaces increase the air quality and biodiversity while serving as a platform for leisure activities, physical exercise and social cohesion. However, it is noteworthy that exercise and social cohesion only mediate 25% of nature and well-being association (van den Berg et al., 2019), suggesting psychological explanations. The first explanation is the stress-reduction theory by Ulrich et al. (1991), which argues that natural environments evoke positive emotions and block negative ones. This affective pathway might be related to evolution since humans depend on nature for survival (Hanold et al., 2016). On the other hand, attention restoration theory by Kaplan (1995) focuses on the cognitive pathway by stating that nature captures attention pleasantly and effortlessly, alleviating cognitive fatigue and resulting in restoration. These two factors underlie the mental benefits of nature, suggesting that the view of nature can also be beneficial. To substantiate this notion, a recent study showed that participants whose homes had views of diverse plants had lower levels of cortisol (Hanold et al., 2016).

Taking this a step further, research demonstrated that nature simulations also yield similar benefits. Beute and de Kort (2018) found that participants had improvements in hedonic mood and worrying after watching 3 minutes of nature photos slideshows twice a day for a week, supporting stress reduction theory. Moreover, Grassini et al. (2019) used event-related potentials to observe that nature images required lower attentional demands from the participants, who also rated nature photos as more relaxing compared to urban ones, in-line with attention restoration theory. These emphasize that technology can be used to bring nature to people, a noteworthy point for when outdoor nature is not easily accessible.

Another important factor in nature literature is connectedness to nature (NC), which measures experiential and emotional sense of belonging to the natural world (Richardson et al., 2017). It is believed that people more connected to nature benefit more from it psychologically. For instance, university students rated indoor study spaces with nature posters more preferable and this preference was positively correlated

with students' NC scores (van den Bogerd et al., 2018). Similarly, McMahan et al. (2018) also demonstrated that stronger NC moderated the effect of nature simulation on positive emotions, emphasizing on the importance of individual differences on benefiting from nature.

Lockdown measures and mobility restrictions urging people to stay at home to prevent further spread of COVID-19 have negative impacts on mental health that can be 'buffered' with nature contact (Pouso et al., 2021). However, people in most countries visit parks and outdoor spaces less often (COVID-19 Community Mobility Reports, 2021). Given the current world situation and the evidence that nature simulation can be beneficial, the current study investigates the effects of watching a nature video on mood and stress levels. The study is novel in the sense that it uses a shorter stimulus than previous ones. We hypothesized that (1) positive affect, negative affect and stress levels would change as a result of watching the video, and (2) this change would be correlated with individual NC scores.

Methods

Ethical Statement

The study was designed according to the BPS guidelines. The participants had the right to withdraw their data at any time, including retroactively after completing the experiment until the 8th of December, 2021. The study was ethically approved by the School of Psychology at the University of Glasgow.

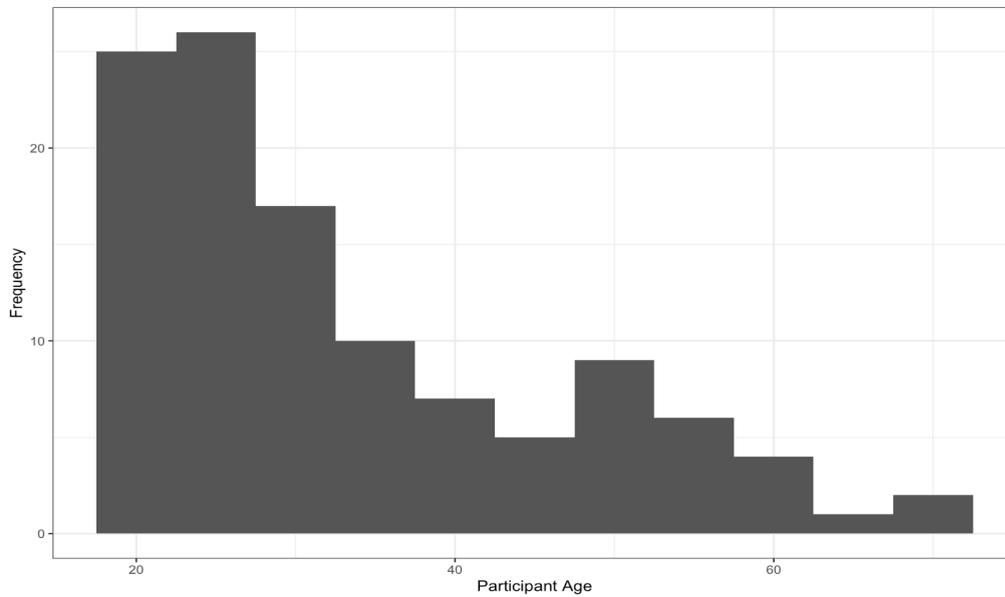
Participants

Participants were recruited through personal connections and social media advertisements. Requirements were being over the age of 18, not being diagnosed with epilepsy or colour-deficiency and being proficient in English. Since previous studies demonstrated that benefit of nature is consistent for all ages (White et al., 2018), no upper age limit was implemented.

181 people attempted the experiment. Participants who left more than one question unanswered, self-reported not being proficient in English, or did not pass the mid-survey attention test were excluded. This resulted in 112 participants (70 females, 4 non-binary) with an age range of 19-69 ($M = 33.52$, $SD = 13.05$). Figure 1 illustrates the age distribution.

Figure 1

The distribution of participants' ages



Note. Each bar represents a 5-year bin.

Participants affiliated mainly with Europe and the UK (see Table A1). The slight majority were non-students and unemployed. Most of them spend six to seven days a week at home, lived with others and used phones to complete the experiment (see Table A2).

Procedure

The study had a repeated-measures design, was conducted online through the *Experimentum* platform (DeBruine et al., 2020) and took about 10 minutes. Participants were presented with an information and consent sheet offering information about the study and their rights as participants. They were then asked to fill a demographics questionnaire, Nature Connectedness Index (NCI) questionnaire that also included an attention test, stress visual analogue scale (Stress-VAS) and Positive and Negative Affect Schedule (PANAS). Afterwards, they were presented with a nature video, followed by post-questionnaires of Stress-VAS and PANAS. At the end of the experiment, participants were debriefed and asked to give comments and their email addresses for further information. This last-stage was optional and was analysed independently from the data to ensure anonymity.

Measures

NCI is a reliable and valid 6-item questionnaire of nature-related statements with a Likert scale ranging from 1 (*completely disagree*) to 7 (*completely agree*) (Richardson et al., 2019). The final score is between 0-100 and calculated according to Response Scale Rating, where each response to each item has a different pre-determined weighted point.

Stress-VAS ranges from 0 to 100 with 1 point increments, numbers unknown to the participants. It offers a quick and simple assessment of perceived stress and is discriminatory of differences. (Lesage et al., 2012).

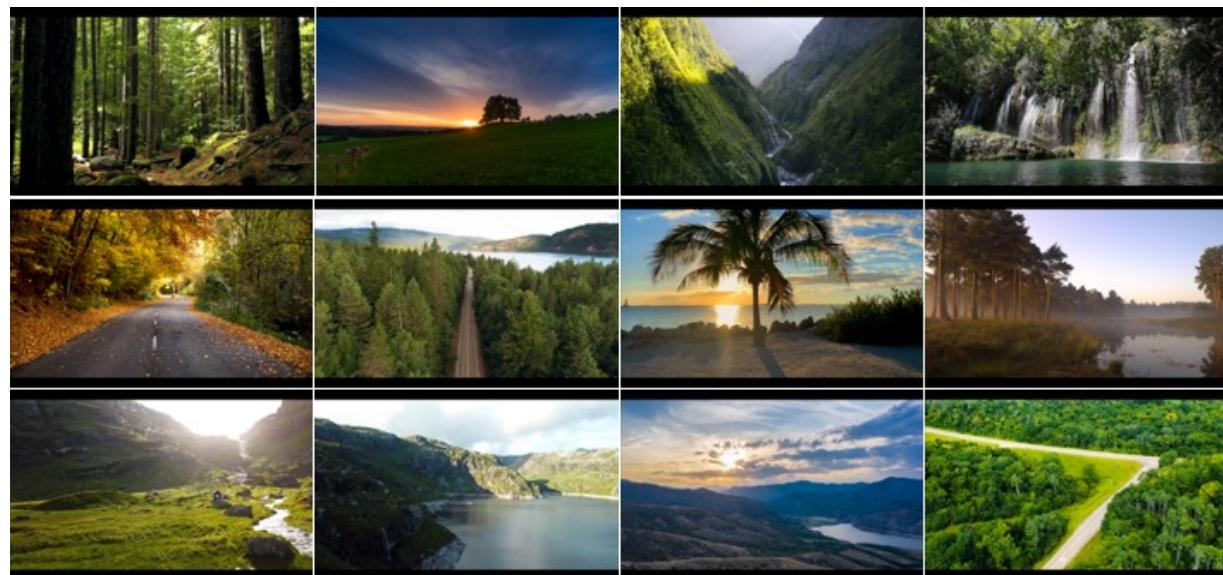
PANAS is a widely-used, highly reliable and valid 20-item mood schedule that includes 10 positive and 10 negative affect words, measured through a Likert scale from 1 (*Very slightly or not at all*) to 5 (*Extremely*) (Crawford & Henry, 2004). Affect scores (between 0-50) are calculated by the sum of these.

Stimulus

The stimulus was a 3:42 minute nature video (shorturl.at/dloxF) that was created for this experiment. It is composed of 11 short clips obtained from the website <https://www.pexels.com/search/videos/nature/>. Since previous research found natural or serene peri-urban environments with less prospect of culture to be more restorative (Gao et al., 2019; Carrus et al., 2013), videos were chosen accordingly, as Figure 2 illustrates. The stimulus also had an auditory component, bird chirping sounds, for a more complete experience.

Figure 2

Example scenes from the nature video



Statistical Analysis

One NCI score and two stress, negative affect, and positive affect scores (pre and post) were calculated for each participant. We performed Wilcoxon Signed Rank tests and Spearman correlations to test our hypotheses. For there were multiple measures and comparisons, we used Bonferroni correction ($.05/3$), which gave the alpha value of .017.

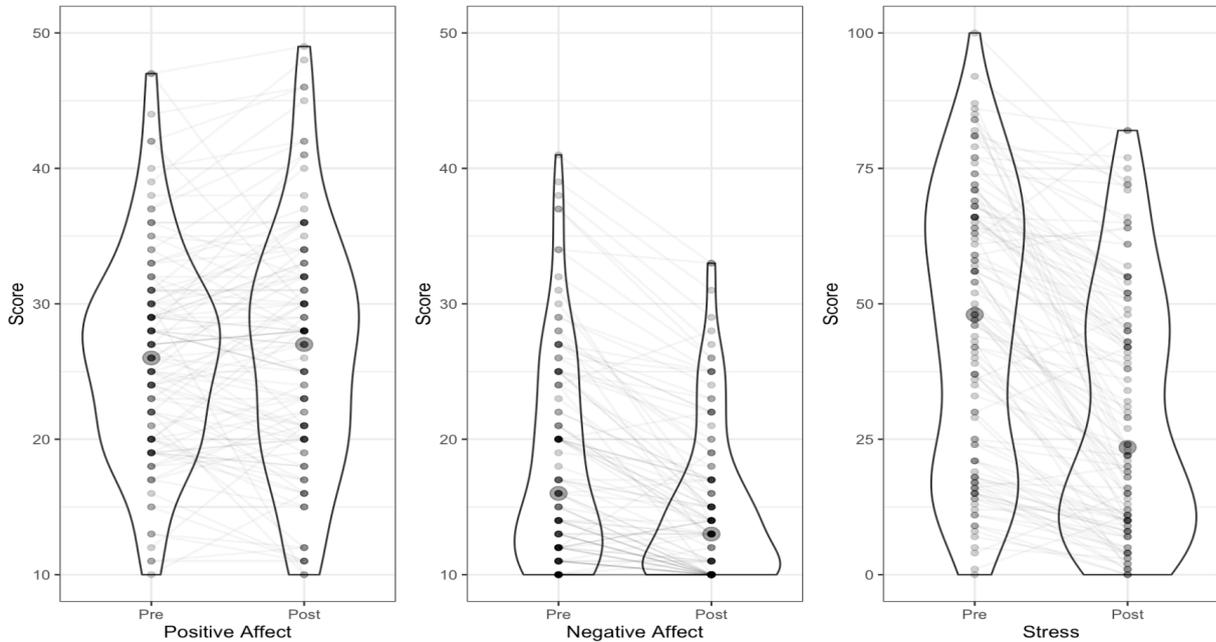
All analysis were conducted using R (V.4.0.2) through RStudio (V.1.3.1093) with the packages *tidyverse* (Wickham et al., 2019), *patchwork* (Pedersen, 2020), *corr* (Kuhn et al., 2020) and *rcompanion* (Mangiafico, 2020).

Results

Our first hypothesis was that stress, positive affect and negative affect scores would change after watching the nature video. The assumption of the data being symmetrically distributed around the median was found to hold by visual inspection.

Figure 3

The distribution of scores pre-and-post video



Note. Bigger dots represent the median scores. Each small dot represents a participant, with lines illustrating how individual scores have changed.

Table 1

Descriptive and inferential statistics

| | <i>Mdn (IQR)</i> | | <i>Z</i> | <i>p</i> | <i>r</i> | <i>Mdn</i> | <i>95%CI</i> |
|-----------------|------------------|-------------|----------|----------|----------|------------|--------------|
| | <i>Pre</i> | <i>Post</i> | | | | | |
| Positive affect | 26 (10) | 27 (12) | -.871 | .384 | | .5 | (-.5, .1.5) |
| Negative affect | 16 (12) | 13 (7) | -7.24 | < .001 | -.687 | -4 | (-4.5, -3) |
| Stress | 48 (46) | 23.5 (36.5) | -8.26 | < .001 | -.78 | -15 | (-18, -12) |

As Figure 3 illustrates, positive affect increased slightly from pre- to post-intervention, although not enough to suggest a significance. On the other hand, negative affect and stress both decreased after watching the video. Wilcoxon Signed-Rank tests (see Table 1) revealed a non-significant result for positive affect, but significant results for negative affect and stress, both with large effect sizes. Therefore, the first hypothesis is partially accepted, since the intervention improved negative affect and stress but did not alter positive affect as predicted, suggesting that nature video restores negative mood and stress, but does not elevate positive mood.

Our second hypothesis was that the change in stress, positive and negative affect scores would be correlated with nature connectedness scores. As seen from Table 2, NCI scores ($Mdn = 55$, $IQR = 43.5$) did not significantly correlate with any of the variables. The hypothesis is rejected, suggesting that the benefits of the nature video were not dependent on participants' nature connectedness. On further analysis, we found that age was not correlated with the difference in the scores either, whereas the change in stress was related to changes in positive and negative affect.

Table 2

Spearman Correlations (r) of variables

| | 1 | 2 | 3 | 4 | 5 |
|----------------------------------|---------|--------|------|-----|---|
| 1. Difference in Positive Affect | — | | | | |
| 2. Difference in Negative Affect | -.15 | — | | | |
| 3. Difference in Stress | -.44*** | .50*** | — | | |
| 4. NCI Score | .19 | -.002 | -.04 | — | |
| 5. Participant Age | -.05 | .14 | .18 | .10 | — |

Note. *** $p < .001$

Discussion

The present study investigated whether watching a short nature video changed mood or stress levels. We hypothesized that stress, positive affect and negative affect would change after watching the video and this change would be correlated with individuals' nature connectedness levels. By conducting an online study where participants answered a set of questionnaires before and after watching the video, we found that while positive mood did not change, negative mood and stress levels decreased significantly. Moreover, the change in none of them was correlated with NC levels, nor age. Although it cannot be argued that the intervention increased well-being since well-being is more than the absence of negative emotions and distress (White et al, 2018), nature video was still beneficial.

Some findings of the study correspond with the existing literature. For example, Beute and de Kort (2018) reported lower worrying levels after a week of viewing nature photographs, which is similar to decreased negative affect and stress levels in our study, underlining that nature blocks negative emotions like stress-restoration theory (Ulrich, 1991) suggested. However, we did not find a significant change in positive affect. In contrast, Schutte et al. (2017), using virtual reality, found an improvement in positive affect but no change in negative affect – which is the opposite of our results. While the research on simulation of nature indicates various benefits, specific aspects are not consistent, which requires further investigation since this may due to the stimuli or screen used.

Our results are in-line with Passmore and Holder (2017), who demonstrated that nature connectedness did not moderate nature's beneficial impact. However, they investigated outdoor nature and research on nature stimulation suggest the opposite (Schutte et al., 2017; McMahan et al., 2018; van den Bogerd et al., 2018). These studies found that nature connectedness mediated positive affect improvement, and since that did not change significantly in our study, this might explain the variation. Our results also mean that more people can benefit from the relaxing effects of the nature video since the benefits did not depend on participants' nature connectedness, which is a strength.

Another strength of our study is that the stimulus is shorter in duration and watching the video once is enough for a significant mood change with large effect sizes, supporting the idea that experiences are more important than the duration (Korpela et al., 2014). This is less costly than using virtual environments or watching longer videos. Moreover, our video had mental benefits regardless of the participant age. It has also been shown that nature simulations benefit depressed, anxious and ostracised people (Beute & de Kort, 2018; Yang et al., 2020) and help to cope with COVID-19 lockdown measures (Pouso et al., 2021). Thus, such intervention can target multiple populations and ages, although future research is necessary to determine how long-lasting the effects are and which properties of stimuli mediate this.

Participants' comments on the experiment and the video (see Appendix B) also give insights. One limitation was that we did not measure restorativeness quantitatively, nevertheless some comments indicate the video had restorative effects, suggested by the words "relaxing" and "refreshing", which future research can also measure. Most comments focused on the emotional effects, such as "decompressing", "erased negative feelings", supporting the statistical results. Participants generally reported liking the video, although some prefer eye-level-shots to drone-shots and realistic background sounds to birds chirping to get a better feeling of being in nature. Future research can consider these inputs while designing stimuli.

Conclusion

We examined whether a short nature video changed mood and stress levels. The video alleviated negative mood and stress regardless of participants' nature connectedness levels but did not elevate positive mood. Based on the comments and literature, while outdoor nature can be more effective (Richardson et al., 2017), nature simulation is an option worth exploring for when outdoors are less accessible, as in the example of COVID-19 pandemic. Therefore, similar interventions can be investigated further to improve mood and stress.

Appendix A

Demographics Questionnaire Responses

Table A1*Country affiliations of participants (N = 112)*

| Country | Frequency | Percentage (%) |
|------------------------------|-----------|----------------|
| Australia | 2 | 1.8 |
| Bulgaria | 2 | 1.8 |
| Canada | 1 | .89 |
| Czech Republic | 1 | .89 |
| Germany | 4 | 3.6 |
| Estonia | 1 | .89 |
| The United Kingdom | 40 | 35.7 |
| Greece | 3 | 2.7 |
| Hungary | 16 | 14.3 |
| Ireland | 1 | .89 |
| Japan | 1 | .89 |
| Portugal | 1 | .89 |
| Russia | 2 | 1.8 |
| Sweden | 3 | 2.7 |
| Turkey | 32 | 28.6 |
| The United States of America | 1 | .89 |
| N/A | 1 | .89 |

Table A2*Demographics summary*

| Answers to Questions | Frequency | Percentage (%) |
|---|-----------|----------------|
| Gender | | |
| Female | 70 | 62.5 |
| Male | 38 | 33.9 |
| Non-binary | 4 | 3.6 |
| Time spend indoors (days per week) | | |
| 0-2 | 20 | 17.9 |
| 3-5 | 25 | 22.3 |
| 6-7 | 67 | 59.8 |
| Living situation | | |
| By myself | 20 | 17.9 |
| With others | 92 | 82.1 |
| Occupation | | |
| Employed full-time | 31 | 27.7 |
| Employed part-time | 23 | 20.5 |
| Unemployed | 58 | 51.8 |
| Being a student | | |
| Yes | 51 | 45.5 |
| No | 61 | 54.5 |
| English proficiency | | |
| Yes | 112 | 100 |
| The type of screen used for the experiment | | |
| Desktop computer | 11 | 9.8 |
| Laptop | 39 | 34.8 |
| Phone | 59 | 52.7 |
| Tablet | 3 | 2.7 |

Appendix B

Participant Comments

The list of the participants' comments, prompted by the question: "Please write any comments you may have about the study, particularly the video." Comments such as "—" or "NA" have been removed and grammar errors or typos have not been corrected.

1. It was a lovely calming video, but I would add the sound of water when images with water sources were present to complete the full experience.
2. It would have been more relaxing if the visuals had sounds that related them, like the sound of rivers or wind in the trees etc, rather than continuous bird sounds.
3. It was very relaxing. Thanks.
4. Hava a nice day
5. the video was relaxing but almost hard to pay attention to at the moment - even though it didn't require much actual attention
6. The video definitely has a positive effect on the psychological state of mind
7. I was very nervous, but now i feel relaxed. Amazing!
8. You are not in the nature if you are above it. The begining of the video really caight my attention with the forest and the chirping birds and then I saw waterfalls and mountains from impossible angle s with the same bird chirping which ruined the feeling completely.
9. Some of the woodland scenes in the video reminded me of walks I went on, during lockdown, in the spring.
10. Good idea
11. Really enjoyed this. Something different to take up my time
12. I think there was a minor typo on the first page (in instead of is or something like that), and one of the questions just said "please select agree" or something like that, just thought I'd point it out :)
13. Very nice study, keep going!
14. The looping sound was annoying after the first minute or so. I had to lower the volume to keep watching.
15. Video put me in the same mode I would be in whn I am on the tread mill in the gym as the video content was quite similar.
16. Calming
17. the video was stunning. I watched it twice
18. I'd prefer wind sound when I see the mountains. Constant bird sound is not relevant with the video.
19. Very relaxing to watch. \nHelped to destress a little and listening to the birds in the background was relaxing

20. I liked the video. High pitch of birds chirping was a little bit disturbing though.
21. It was a pleasure to be a part of the study. The video was amazing and nowadays I often watch this kind of videos to have a little peace but it does not provide as much peace as the nature does. I reckon that I feel the necessity of the smell of the nature.
22. It was a nice video. I sometimes search for relaxing hd nature videos on youtube..
23. If it was concentrating one place it'd be different. Too much places
24. about the video: it was boring, sometimes depressing, and the birds sounded like gunshots sometime which upset me. what was good: when the birds sounded nice to my ears and in harmony with the nature, also liked the green colour, didn't like not seeing any moving life (animal or human). i could just imagine a drone which is not part of the green environment
25. Nice video. To be in nature is nicer:)
26. Thank you. I wish success of your studies.
27. You need to change the sound as the environment changes
28. I felt there for a moment. When I closed my eyes, I felt the sun touching my skin, especially at sunset. thanks for this feeling
29. Interesting
30. Breathtaking video, I felt much better after watching it, it erased most of my negative feelings and fears.
31. First off, brilliant video and its above and beyond what I'd be able to produce. I did note that the start-stop panning of the POV drone-follows road clip near the end did reduce my subjective immersion. May or may not be useful feedback for your writeup.
32. I'm used to being in nature and the video didn't have quite the same effect as being around plants. There's a different energy in nature. It was inspiring though and it made me want to visit some of those places in the video
33. I found the study one of the most interesting ones that I have participated. The video was refreshing and made me thinking that in a moment of distress would be an excellent idea to watch something similar even for a few moments as I found out that it actually makes a difference to my emotional state. Thank you.
34. Study is very short
35. chilled.
36. I liked the images but it the audio. It felt like the audio didn't sit well with the images. Enjoyed your experiment though!
37. I have to say the video did have a more calming/pleasant effect than I was expecting (despite the fatigue associated with looking at a screen for the last eight hours)
38. Lovely pics but the birdsong didn't quite match
39. preferred slow pace to speeded up videos, preferred still water to running water, preferred ground-level videos to flying :-)

40. I was interested in the birdsong. Was that Australian bird song?

41. lovely video! wish it was high definition but the sound was so relaxing

42. I think that this is a great idea. Although my overall mood at the moment is very low, the first clip did take me to an environment that reminded me of where I sometimes walk. Interestingly, I felt immediately emotional and my eyes filled with tears. After one or two clips I found myself smiling and thinking about many happy times in these places. Towards the end my mind drifted. So, although the short clips did not change my overarching reaction. I certainly did feel a sense of familiarity about those places that were familiar.

43. beautiful video, make me feel relaxing!

44. Beautiful video, I found it to be very soothing! Loved it!

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