EXPLORING THE EMOTIONAL STATE OF 'REAL HAPPINESS'. A STUDY INTO THE EFFECTS OF WATCHING NATURAL HISTORY TELEVISION CONTENT.

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ABSTRACT

BBC Earth commissioned a multi-country online quantitative study to examine the impact of watching natural history content on viewers' emotions. This was conducted in partnership with an international panel company, with data collected and weighted to be nationally representative in each country. Respondents viewed one of five clips: two from Planet Earth II, one from a popular drama, one montage of news coverage, and one control video. The hypothesis was that watching content from Planet Earth II could improve the sensation of positive emotions and reduce the sensation of negative emotions. The study found a range of significant results evidencing not only that watching content from Planet Earth II inspired significant increases in feelings of awe, contentedness, joy, amusement and curiosity, but that it also acted to reduce feelings of tiredness, anger and stress. In the majority of cases, changes in emotions were caused by the type of content viewed, and significantly different from the control group. Our findings therefore support the conclusion that viewing Planet Earth II inspires positive changes in emotions that are distinct to the natural history genre.

INTRODUCTION

It is a deep human intuition that viewing nature and being in nature is good for the mind and body. This notion can be found in the thinking of indigenous peoples on different continents, who routinely guided their adolescents on ritualistic trips out in nature as rites of passage to adulthood. Forest walks in 'healing forests' are a common practice in East Asian cultures such as Japan and South Korea because of the alleged benefits of being in nature. This notion is evident in the writings of the great philosophers from Descartes to Emerson, who made the case that experiences of awe and wonder in nature – for example in the woods or when viewing a rainbow – were the source of healthy mind and body and deep curiosity about life. More recently, scientific literatures have emerged that focus on documenting the benefits of being outdoors, of viewing nature, and of beauty, all in part inspired by E.O. Wilson's celebrated concept, Biophilia, the evolved preference for beauty in nature that humans are endowed with, which guides them in adaptive fashion.

There is a rich and complex literature on what we will call 'the benefits of nature immersion.' These studies are inspired by claims about the benefits of nature, and follow one of four methodological approaches to nature immersion. Some studies focus on the benefits an individual derives from being in nature (for example on walks, gardening, playing near parks, or on backpacking trips). Some studies focus on the benefits of living near green spaces (versus being deprived of such contact with nature). Still other studies, more typically controlled experiments in the lab, have examined what happens when people view nature content in still photographs or short videos, most typically lasting about five minutes. And a fourth kind of study looks at people's responses to artistic portrayals of nature, most notably landscape painting.

One way to summarize this literature is according to an elaborated version of E.O. Wilson's 'Biophilia' hypothesis. This hypothesis holds that for evolutionary reasons people love nature, they have aesthetic preferences for beautiful nature because these preferences produce emotions, thought patterns, and actions that lead people to find resource rich natural environments that provide optimal food, shelter, and comfort. What this means is that nature immersion, even in viewing nature content in images or footage, triggers a constellation of responses in terms of the individual's emotions, thought patterns, and physiology that enables goal directed and adaptive actions (e.g., within an evolutionary context, focusing on finding food, collaborating in building shelter).

Translated to more general terms, this line of theorising suggests that viewing nature should trigger a family of emotional processes that are inherently rewarding, and presumably calming to the nervous system. Those emotions in turn should guide cognitive processes – e.g., greater focus, openness, creativity, curiosity, imagination, empathy -- in ways that enable the individual to take in important information about the environment. Through these processes, viewing nature should yield benefits for stress, wellbeing, and mental and physical health.

When the naturalist John Muir spent weeks in the Sierras in California, he would write of how nature produced profound emotions. Here is one passage: 'We are now in the mountains and they are in us, kindling enthusiasm, making every nerve quiver, filling every pore and cell of us.' Several studies have indeed looked at how viewing awe-inspiring nature imagery in photos and video footage, when compared to nature imagery that is funny, or video content that is more neutral in meaning. It is clear that nature imagery can elicit emotions related to awe and beauty (e.g., awe, wonder, joy), and emotions related to amusement (mirth, humour). For example, to select one relevant paper, participants either viewed a few minutes of Planet Earth, a rather neutral video from a news program, or funny footage from Walk on the Wild Side. Watching a few minutes of Planet Earth led people, compared to control participants, to feel 45.6% more awe and 31.4% more gratitude, but no shifts in feelings of negative emotions such as fear and sadness (Valdesolo & Graham, 2014). The influences on gratitude are pretty striking. This study, and several others like it, tells us that brief exposures to nature content in video footage are a powerful way to feel awe, wonder, gratitude, and reverence, all positive emotions known to lead to increased wellbeing and physical health.

In the light of what has gone before, the objective of this study, therefore, is to describe the emotional profile of those who watched natural history footage from Planet Earth II against a control clip, with the aim of discovering the extent to which any emotional changes observed are caused by watching natural history content. The hypothesis is that Planet Earth II will generate positive emotional changes that can be directly attributed to watching this content (as opposed to watching any other type of content).

Knowing that engagement with nature generally and Planet Earth content specifically has been shown to generate positive improvements in feelings of wellbeing, the secondary objective of this study is to describe the nature of 'real happiness' – happiness that is comprised of emotions that are known to contribute to positive impacts on individuals' health and wellbeing, which this study argues are caused distinctly by the natural history genre.

METHODS

The approach used was to field large, nationally representative quantitative surveys in six markets globally, to test the universality of any findings. This survey comprised measurement of demographic and lifestyle factors, the stimulus clips and associated emotional measures, and all data was subsequently post-weighted to be representative of the online population in each country.[1]

Participants and design

The online study was programmed by a panel partner: Lightspeed GMI. Respondents in each market were recruited in the numbers given in Table 1 to set quotas for age, gender and location (region) matching the overall population in that country. Data was subsequently post-weighted to allow for small discrepancies in the achievement of each quota set.

Table 1. Sample sizes by market

Market	*n.*
United States of America	3,486
United Kingdom	1,006
India	1,000
Australia	1,012
South Africa	501
Singapore	505

Stimuli

The stimuli were five clips of between 53 seconds and 190 seconds. Two of these showed natural history television content from Planet Earth II.

[1] Due to the online-only methodology, only the online members of populations in less developed countries like India and to an extent South Africa were able to participate. Internet penetration in all other markets is sufficient for the online population to be considered representative of the whole population in that country.

One was a self-contained narrative story showing a sloth in search of a mate, and one was a montage of different scenes from the series in the form of a trailer. The third clip was a montage of excerpts from reports on news stories from 2016; all of these were drawn from major US television news networks for consistency. The fourth clip was a scene from a recent major international drama. The fifth, control, clip was an excerpt from an instructional DIY video.

With the exception of the instructional video, all of these clips were chosen for their potential to elicit an emotional response, with the expectation that their variety might generate different emotional responses from one another. All except the news montage used emotive orchestral background music throughout, and the news montage was deliberately comprised of stories which viewers were likely to be emotionally invested in (e.g. the impacts of the bombing campaign in Syria; images of the destruction caused by a hurricane). The DIY video was by contrast a 'control' clip, chosen as it was for its assumed lower likelihood to generate strong emotions in viewers, and on the evidence of previous similar studies that have found these types of videos to be effective controls by eliciting little to no emotional change (Piff, et al., 2015).

Measures

Measures used in this study were chosen in order to understand both conscious and subconscious responses to the stimulus content amongst participants.

Emotional measures

The emotional measures used in the survey were designed to measure respondents' conscious, self-reported feelings. Respondents were asked to consider 14 sets of emotion groups. They were asked to report the extent to which they were feeling each emotion group (in which all of the emotions were related to one another, e.g. 'content, relaxed, peaceful') 'right now'. Each group of emotions was measured on a ten-point scale from 1 ('not at all') to 10 ('completely'). This approach is taken from work undertaken at the Greater Good Science Center at the University of Berkeley and is hereafter referred to as the 'positive emotion differentiation scale'.

Perceived Stress Scale

The Perceived Stress Scale (PSS) (Cohen, Kamarck and Mermelstein, 1983), a well-validated measure of self-reported stress, was used to measure participants' general stress levels. This asks respondents to report on the frequency in the last month of feelings described in short sentences, e.g. 'Found that you could not cope with all the things that you had to do', using a five-point scale from 'very often' to 'never'. This scale produces a numerical score from 0-40; the higher the number, the higher stress levels felt by that individual.

CrowdEmotion micro facial mapping technology

CrowdEmotion measures a viewer's subconscious facial response to video. This method was used to complement the conscious self-reported measures of the emotion sets.

Before viewing the stimulus video, respondents were asked whether they were happy for the survey to use their webcam to record a video of the user whilst watching the clip. If they agreed, the video received was analysed by CrowdEmotion's automated facial mapping technology, which analyses micro facial expressions to quantify the extent to which a viewer is feeling one of six emotions – happiness, surprise, puzzlement, fear, anger, rejection - whilst watching, and how these change over the course of the clip.

Procedure

The study began with a series of demographic and lifestyle questions, followed by the first emotion measurement using the positive emotion differentiation scale, to establish a base level of emotions prior to video exposure. Respondents were then randomly assigned one of the five stimulus clips. It was not possible to skip the video section so it is assumed that participants watched the entire clip they were assigned. Immediately following this they were asked the positive emotion differentiation scale again to capture change as a result of watching. This was followed by the Perceived Stress Scale, and additional lifestyle and demographic questions.

RESULTS

Data from the six markets was merged and post-weighted to reflect the relative sizes of each country's population relative to the others. This

global data forms the basis for the analysis that follows.

Effects on emotion

Two statistical tests were conducted on the data. Paired t-tests were conducted on all mean scores before and after stimulus for all emotion groups to ascertain levels of emotional change. A multiple regression was conducted to compare the effect of watching natural history content on the 14 emotion groups with the impact on the same emotion groups of having watched the Control clip, to determine causality.

Paired t-test

Analyses show that there were statistically significant differences between the base levels of emotion and the levels experienced after watching the natural history stimulus videos in all but two emotion sets globally, shown in table 2 below.

The extremely low p-values (all <0.001) on emotion groups that did exhibit significant change offer a compelling picture of the effect of watching this clip on viewers.

Multiple regression

Multiple regression was used in order to ascertain which changes in emotion could be attributed to having watched natural history content specifically.

The analysis shows that stimulus type significantly predicted changes in emotion for all but two emotion groups tested. Descriptive statistics can be found in table 3 below.

In all but four cases, the results of multiple regression matched statistically significant p-values found in paired t-tests on each emotion group. For the 'sad, depressed, down' and 'lonely, isolated, solitary' emotions, although paired t-tests showed significant reductions, stimulus type did not significantly predict these changes. For 'proud, a sense of accomplishment, successful' and 'grateful, appreciative, thankful', although multiple regression found that stimulus type significantly predicted difference in means between the two stimuli (natural history and control), this prediction was not of significant change in these emotion states when watching natural history; rather the prediction was of these emotions remaining static compared to the control group, who experienced significant decreases in both emotions.

CrowdEmotion facial emotion coding

CrowdEmotion data revealed high levels of the 'happy' emotion evident in the faces of those watching natural history content. At the core of this emotion reading are the machine's recognition of two facial movements: lip corners pulled up/out, and cheeks raise / eyes squint.

When compared against the level of happy emotion in evidence at the start of the clip (benchmark), the peak of the increase in happiness was highest in the happy emotion for both natural history stimulus clips. This compares to the peak for the other three types of clip shown, which in all

Table 2.
T-test showing emotion comparisons between natural history viewing groups prior to and post video exposure

Emotion	Prior to video exposure		Post video exposure		95% CI for mean			
	Mean	SD	Mean	SD	difference	t	df	p
	n = 3,004		n = 3,004					
Proud, a sense of accomplishment, successful	5.84	2.72	5.87	2.80	-0.1699, 0.1099	0.4212	6006	ns
Nervous, anxious, fearful	3.68	2.99	2.92	2.91	0.6104, 0.9096	9.9836	6006	<0.001
Awe, amazed, wonder	4.94	2.93	6.36	2.73	-1.5636, -1.2764	19.4342	6006	<0.001
Stressed, overburdened	4.33	3.07	3.30	3.03	0.8754, 1.1846	13.0877	6006	<0.001
Content, relaxed, peaceful	6.71	2.39	7.03	2.31	-0.4392, -0.2008	5.2766	6006	<0.001
Sad, depressed, down	3.48	3.03	2.90	2.96	0.4282, 0.7318	7.5048	6006	<0.001
Joyful, excited, enthusiastic	5.89	2.67	6.21	2.68	-0.4556, -0.1844	4.6362	6006	<0.001
Lonely, isolated, solitary	3.89	3.13	3.31	3.07	0.4228, 0.7372	7.2507	6006	<0.001
Grateful, appreciative, thankful	6.95	2.41	6.91	2.51	-0.0847, 0.1647	0.63	6006	ns
Angry, irritable, mad	2.97	2.86	2.39	2.77	0.4373, 0.7227	7.9842	6006	<0.001
Tired, fatigued, low energy	4.89	3.00	3.98	3.09	0.7556, 1.0644	11.5809	6006	<0.001
Amused, having fun, laughing	5.59	2.77	5.89	2.76	-0.4402, -0.1598	4.2049	6006	<0.001
Curious, interested, wanting to explore	6.41	2.58	6.72	2.60	-0.4413, -0.1787	4.6387	6006	<0.001
Small, tiny, insignificant	3.71	3.03	3.38	3.07	0.1754, 0.4846	4.1931	6006	<0.001

Note SD = Standard deviation, CI = confidence interval, df = degrees of freedom, ns = not significant

cases was the 'fear' emotion.

In the case of the self-contained narrative of the Sloth natural history clip, levels of happiness shown on the faces of respondents strongly correlated to identifiable events in the clip.

CrowdEmotion data validates findings elsewhere in the study showing that increases in positive emotions such as awe, contentedness and joy are more likely to be caused by watching natural history footage.

Analysis by demographic group

UK television ratings data showed that Planet Earth II as a series was watched by more people aged 16-34 than 2016's X Factor talent show: the audience share amongst 16-34s for Planet Earth II averaged 41%, compared to 28% for the X Factor. This suggests that Planet Earth II was a more compelling proposition for this group than a programme more explicitly aimed at them, which has been consistently popular both in television ratings generally and amongst their age group specifically for a number of years.[2] Knowing that the Planet Earth II had had unusual appeal for younger people when on-air in the UK made it of interest to discover whether the extent of emotional change caused by watching the series could help explain why.

Findings elsewhere in the survey data amongst this group of younger individuals showed evidence of greater levels of stress and worry than amongst older people, particularly regarding environmental issues. For example, 71% of 16-34s described themselves as 'extremely worried about the state of the world's environment and what it will mean for my future', compared to an average of 64% amongst older age groups. In addition, 22% of 16-24s had the lowest levels of agreement with the statement 'I regularly get outside and enjoy spending time with nature', suggesting around a fifth of this age group could be considered to be deprived of contact with the natural world. The Perceived Stress Scale also suggests higher levels of stress for this group (an average of 20, compared to scores of between 19 and 15 that decline consistently with age).

Looking at paired t-tests across all emotion groups for five separate age groups (16-24, 25-34, 35-44, 45-54 and 55+), as an age group young people did not quite achieve the highest number of significant emotional changes (11, compared to the 45-54 age group's 12). However, the amount of change in mean scores after watching natural history content was in all but one case larger amongst younger people than the older group, demonstrating a heightened impact on this group. These changes are shown in Table 4, below.

Finding that this younger age group was more likely to experience significant positive shifts in emotion allows us to conclude that natural history content not only taps into a particular environmental interest amongst younger people, but that in addition, or maybe because of this, the positive effects of natural history content recorded in the population in general are amplified in this

Table 3.

Multiple regression showing change in mean scores for natural history viewing group related to control video viewing group

Emotion	NH viewing group	Control viewing group	β	t	p
n.	3004	1501			
Proud, a sense of accomplishment, successful	0.02	-0.48	0.11	7.65	<0.001
Nervous, anxious, fearful	-0.77	-0.64	-0.03	-1.73	ns
Awe, amazed, wonder	1.42	-0.12	0.27	18.54	<0.001
Stressed, overburdened	-1.03	-0.78	-0.05	-3.33	<0.001
Content, relaxed, peaceful	0.32	-0.36	0.15	10.25	<0.001
Sad, depressed, down	-0.58	-0.49	-0.02	-1.23	ns
Joyful, excited, enthusiastic	0.31	-0.63	0.21	14.35	<0.001
Lonely, isolated, solitary	-0.58	-0.57	0.00	-0.17	ns
Grateful, appreciative, thankful	-0.04	-0.80	0.18	12.47	<0.001
Angry, irritable, mad	-0.58	-0.24	-0.08	-5.09	<0.001
Tired, fatigued, low energy	-0.91	-0.68	-0.05	-3.15	0.002
Amused, having fun, laughing	0.30	-0.68	0.20	14.01	<0.001
Curious, interested, wanting to explore	0.31	-0.63	0.19	13.29	<0.001
Small, tiny, insignificant	-0.34	-0.58	0.05	3.43	0.001

n = 3,004

ns = not significant

[2] Source: BARB

group. We could say that they 'need' this type of content more than older people.

DISCUSSION

The hypothesis posed, that watching natural history content could change emotions in a similar way to the effects inspired by exposure to or interaction with the natural world, is largely supported by the data collected in this study. In our ability to attribute significant shifts in emotions directly to having watched natural history content, we are able to confidently predict the outcome of watching this type of content in the future.

Moreover, as many of the emotional shifts revealed by the data have been proved to be caused by the natural history footage itself (and not being a product of watching any type of video footage), it is possible to say with confidence that this is the scientific description of the 'real happiness' that watching natural history content generates.

It builds on a large body of work in the field of environmental psychology, and more specifically on previous work by Piff, et al. (2015) that records positive emotional results for participants watching the original series of Planet Earth, but does so on a larger scale by using nationally-representative samples of respondents across a range of countries internationally. It adds further weight to extant evidence of engagement with nature triggering a range of emotional responses that have been proved to be beneficial to humans (reducing stress, increasing feelings of wellbeing).

When combined with the existing body of literature on this subject, this study adds weight to findings that nature in general has positive benefits for the individual. Specifically, it extends our understanding of the form that interaction with nature should take in order to produce these benefits. It provides evidence to support previous studies by the Greater Good Science Center, and Joye and Bolderdijk (2015) amongst others, that 'virtual nature' can also generate positive effects. Moreover, it refines the causal relationship between 'virtual nature' and changes in emotion, with multiple regression demonstrating changes that can specifically be attributed to natural history content.

Additionally, by broadening the scope of the study to nationally-representative levels, this study supports the consistency of these findings found in studies on a much smaller scale that have gone before.

This research has its limitations. The duration of the clips shown to participants was necessarily short, to fit in with the online methodology used. Measurement of the duration of these improved emotion metrics following exposure was also precluded by the methodology, therefore it is not possible to speculate as to whether there is a link between length of exposure and how sustained these effects are, although the differing extents of some of the changes engendered by watching the natural history clip would indicate that there may be variations in the duration of some of its effects regardless of clip length. Future studies would benefit from focussing on these two areas.

Other than undertaking studies designed to address these two limitations, this project could usefully be developed to evaluate whether increased exposure

Table 4.
Change in mean emotion scores before-to-after watching amongst natural history viewing groups, by age

Emotion	16-24	25-34	35-44	45-54	55+
n.	562	728	594	583	537
Proud, a sense of accomplishment, successful	0.1	0.07	-0.08	0.03	-0.05
Nervous, anxious, fearful	-1.09*	-0.92*	-0.44*	-0.7*	-0.61*
Awe, amazed, wonder	1.55*	1.01*	1.05*	1.83*	1.78*
Stressed, overburdened	-1.26*	-1.06*	-0.77*	-1.24*	-0.78*
Content, relaxed, peaceful	0.51*	0.37*	0.2	0.34*	0.11
Sad, depressed, down	-0.83*	-0.59*	-0.38*	-0.61*	-0.42*
Joyful, excited, enthusiastic	0.49*	0.24	0.14	0.34*	0.37*
Lonely, isolated, solitary	-0.79*	-0.66*	-0.36	-0.62*	-0.41*
Grateful, appreciative, thankful	-0.02	0.1	-0.09	-0.12	-0.13
Angry, irritable, mad	-0.65*	-0.71*	-0.51*	-0.58*	-0.4*
Tired, fatigued, low energy	-1.01*	-0.95*	-0.78*	-0.9*	-0.92*
Amused, having fun, laughing	0.63*	0.16	0.07	0.33*	0.32*
Curious, interested, wanting to explore	0.2	0.17	0.15	0.61*	0.48*
Small, tiny, insignificant	-0.54*	-0.31*	-0.29	-0.36*	-0.14

Significance testing at 95% confidence
*=significant

to natural history television content has positive benefits on participants' subsequent engagement with 'real nature', i.e. in improved propensity to go outdoors, exercise or otherwise show increased interest in the natural world. This would be particularly useful as we feel that the extent of this causality is an under-researched area in the literature.

In addition, study of this area of nature interaction would benefit from more in-depth analysis of a number of different types of video nature stimulus. For example, Joye and Bolderdijk's 2015 study amongst others have found differences in the nature of change as a result of viewing different types of nature stimulus (in their case 'awesome, mundane or neutral' images of nature). Therefore a useful extension of this project would also be to understand different patterns in emotional change dependent on subject type within nature programming. This would have positive benefits for understanding the type of natural history content that might most benefit a range of emotional situations (e.g. the ideal video to combat feelings of stress).