Awe: part of the solution against global warming?

Exploring the role of awe in sustainable consumer behavior

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Abstract:

This study examines the influence of the emotion of awe on sustainable buying behavior. Building on previous awe research, VR was used to place participants in high and low awe-inspiring environmental settings. A survey was used to record awe's effects. We hypothesised that awe would influence sustainable consumer behavior, perceived barriers to adopting such behavior, and several awe-components (small self, collective values, time perception, body boundaries and connectedness). While most results were found to be insignificant, the environmental condition had a marginally significant effect on collective values. Furthermore, feelings of small self were significantly correlated with sustainable consumer behavior. These findings indicate that there is a relationship between awe and sustainable consumer behavior, which could have a great impact on mankind's struggle with climate change.

I would like to thank my supervisor Dr Thomas van Rompay for his help in this thesis. The specific feedback, great recommendations and constant availability helped out greatly. Furthermore, I would also like to thank everybody that participated in the main study and the pre-test.

Introduction

Climate change due to global warming (GW) has big implications for the natural world. For example, the trend in wildfire potential due to global warming appears to continue rising in the future (Liu et al., 2010). In Britain, future streamflows are expected (Arnell, 2003). The risks of climate change are well known, and the majority of scientists agree that GW is caused by human activity (McFadden, 2016). The urgency of the situation is not lacking, and many trends or movements are aimed at helping battle climate change. However, GW is a collective issue, rather than personal, personal efforts might feel futile, resulting in no undertaking of personal action (KAGAN, 2011).

Awe's potential to steer sustainable consumer behavior could be useful in the battle against climate change. Awe is an emotion that is relatively new to the scientific world, as it has been researched for merely 20 years. While religious and philosophical scholars have been studying awe for a long time, there is much to discover scientifically (Shiota et al., 2007). Certain effects have personal benefits, like an increase in life satisfaction, it can lead to pro-social behavior, and decreased materialism (Rudd et al., 2012).

While the link between awe and sustainable consumer behavior might seem equivocal, the literature suggests an indirect link between the two. An inward environmental attitude, meaning that the self has an environmental attitude, will stimulate green purchasing behavior (Leonidou et al., 2010). If awe can influence inward environmental attitude, it can stimulate green purchasing behavior. Furthermore, awe has certain components and effects that have been directly linked to sustainable consumer behavior.

Awe has five components that could reduce barriers to adopting sustainable consumer behavior, and increase the likelihood of such behavior. The components used in this study are feelings of the small self, collective values, time perception, body boundaries and connectedness. Time, effort and inconvenience are often named as barriers or reasons to postpone eco-friendly adoption (Follows & Jobber, 2000). Perhaps many people already have eco-friendly values, but fail to change their attitude toward eco-friendly behavior because of the perceived personal effort it takes. Because awe

has the potential to diminish personal concerns, also known as the small self, this could too result in reducing the barrier of perceived personal effort to adopt eco-friendly behavior (Piff et al., 2015). Furthermore, awe has the potential to shift the focus to a more collective mindset (Piff et al., 2015; Shiota et al., 2007). Collective values have been found to reduce the perceived inconvenience of recycling, which can in turn lead to eco-friendly behavior (McCarty & Shrum, 1994). Furthermore, awe has the potential to steer consumer decisions, through awe's ability to influence time perception (Rudd et al., 2012). Time perception influences decision making as discussed by Takahashi et al. (2008), who found that the preference for sooner smaller rewards to larger later ones is associated with impaired time perception, as it relates to impatience and impulsivity. The association of time, effort and inconvenience with pursuing eco-friendly behavior were often named as barriers to its adoption (Cornelissen et al. 2008; Follows & Jobber, 2000). For example, altered time perception could influence choosing more time-consuming options such as travel by train instead of airplane (Dällenbach, 2020). Body boundaries could also influence sustainable consumer behavior, as it increases selflessness (Dambrun, 2016). And lastly, feelings of connectedness could also place more importance on the welfare of others, and the environment around us, increasing the likelihood of sustainable consumer behavior.

There is a need for consumers to think more critically about their purchases. Therefore, this research aims to discover how useful the emotion of awe can be in the battle against climate change, by increasing sustainable buying behavior. The main research question of this research is:

This research considers the differences between three groups of participants. One group will view a highly awe-inspiring VR video, one group will view a low awe-inspiring VR video and a last group is a control group that does not watch any video. After this, a survey will capture the participants' awe levels, including its effects, and the participants' sustainable consumer behavior. Before elaborating any further on the details of this research, the key constructs will be defined and explained in the theoretical framework.

Theoretical framework

Awe

Awe is a complex emotion that can evoke intense feelings, positive or negative. Keltner and Haidt stated that awe is positioned "in the upper reaches of pleasure and on the boundary of fear" (2003). According to Keltner en Haidt, awe consists of two features: vastness and need for accommodation. "Vastness refers to anything that is experienced as being much larger than the self, or the self's ordinary level of experience or frame of reference." While this study will only focus on vastness due to physical size, it is important to note that social experiences of fame, authority or prestige can also induce this feeling. Tourists in the Kimberley region in north-western Australia described vastness with words such as "absolute size", "huge", "untouched", "remote", and "wilderness", and related it to natural scenes in which one can see far or observe size (Pearce et al., 2016). Examples of vastness can be a large mountain-scape, the endless ocean or the Grand Canyon.

Need for accommodation is described as the process of adjusting mental structures in an attempt to understand the experience of vastness in which their current traditions and knowledge did not suffice. "The success of one's attempts at accommodation may partially explain why awe can be both terrifying (when one fails to understand) and enlightening (when one succeeds)." (Keltner & Haidt, 2003). Need for accommodation could also be explained as changing the way you view the world (Campos et al., 2013).

In the definition of awe by Keltner and Haidt (2003), it becomes apparent that threatening situations can induce awe as well. Natural settings like thunderstorms and tornadoes can induce awe. Moreover, intimidating, dominant social figures and one's metaphysical position in the universe can induce threat-based awe. However, this study will only focus on positive, non-threatening causes of awe, as threat-based awe has different effects (Gordon et al., 2017).

Effects of awe

Awe has many effects that could have a potential relationship to eco-friendly buying behavior. First of all, dispositional awe has been linked with higher levels of humility (Stellar et al., 2018). This is most

likely through awe's ability to make individuals feel smaller in relation to their surroundings, which will be discussed later (Shiota et al., 2007). Secondly, people report more positive moods when watching awe-inducing natural scenes, compared to mundane natural scenes (Joye & Bolderdijk, 2015). While mood increases might be temporary, people could take positive decisions during periods of more positive moods to increase eco-friendly buying behavior. The Broaden and Build Theory states that positive emotions cause us to be more curious, creative and experimental (Fredrickson, 1998). More concretely, positive emotions can alter our decision-making through more unusual, flexible and open-minded thinking (Isen, 2001). Following that narrative, awe can decrease stress-related symptoms and increase well-being (Anderson et al., 2018). Even life satisfaction can be increased by experiencing awe (Rudd et al., 2012). These positive effects of awe could be more related to eco-friendly buying behavior adoption, with a prolonged effect. Awe is also known to decrease materialism, as people were more inclined to prefer experiential purchases instead of material purchases (Rudd et al., 2012). In another study, participants who thought of an awe experience valued money less than participants that thought of a happy or neutral experience (Jiang et al., 2018). As eco-friendly purchase options are generally more expensive, this effect of awe could potentially increase eco-friendly buying behavior. Lastly, ethical decision-making is also increased in groups that experienced more awe (Piff et al., 2015). How can these effects be explained? Self-transcendence and time perception are at the root of many of these effects, which will now be explained.

Self-transcendence

Awe has been classed as a self-transcendent experience (STE), due to a reduced sense of self and an increase in perceived connectedness (Chirico & Yaden, 2018). Self-transcendent values are values which motivate people to put the welfare of others, close and distant, and nature above selfish concerns (Follows & Jobber, 2000). Focussing more on the environmental consequences of purchasing behavior could promote eco-friendly buying behavior. Furthermore, the barrier to buying eco-friendly, which can be time, effort, inconvenience or expenses, could be reduced by having more self-transcendent values.

First of all, one study found that collective items or values were negatively related to a measure of recycling inconvenience, while the importance of recycling stayed the same (McCarty & Shrum, 1994). Another study found that collectivism was a good predictor of consumers' intention to pay more for green wine packaging (Barber, 2010). These studies suggest that collective items are relevant for predicting sustainable consumer behavior.

Moreover, the feeling of the "small self" has been suggested to be an effect of awe. Due to the contrast of the sheer physical size or vastness of a natural scene, one feels smaller in comparison. Awe-provoking natural videos as well as memories of experiences of awe have been linked to feelings of the small self (Piff et al., 2015). This reduction of the self can direct the attention away from the self and toward the environment (Shiota et al., 2007). This can lead to pro-social behavior, as one study found that a reduction of self-importance led to more donations to collective resources and more selflessness in relationships (Campbell et al., 2004). Given that eco-friendly behavior, and perhaps eco-friendly buying behavior as well, are often associated with time, effort and inconvenience, a more selfless attitude could cause the adoption of this behavior.

Furthermore, awe has been found to be closely related to feelings of connectedness with surroundings, and seeing the self as part of a greater whole, or universal category (Shiota et al., 2007). Feelings of connectedness could also mean that the environment and others become more important. As discussed earlier, placing the welfare of others and nature above your own concerns are values of self-transcendence. Follows and Jobber (2000) found that self-transcendence was positively related to environmental attitudes about disposable diapers: "a concern for the welfare of others indirectly results in an intention to purchase an environmentally responsible product". Therefore, feelings of connectedness as part of self-transcendence have the potential to increase eco-friendly buying behavior.

Lastly, reduced body boundaries are another good measure of self-transcendence in relation to awe. Feelings of reduced body boundaries or salience, similarly to the small self and connectedness, are linked with higher levels of selflessness (Dambrun, 2016). One study found that certain

respirational and cardiac values altered when experiencing awe, which means that awe can be experienced in our bodies as well (Shiota et al., 2011).

Time perception

Awe has been found to expand feelings of time availability and patience (Rudd et al., 2012). This is due to awe's ability to alter the subjective experience of time. In the introduction, several effects of time perception were briefly mentioned. First of all, time perception influences decision-making. Preferring sooner smaller rewards over larger later ones is related to impaired time perception, but also impatience (Takahashi et al., 2008). Having feelings of more time availability combined with more patience could therefore result in more conscious and long-term decision-making. Feelings of lack of time have been associated with unhealthy diets (Neumark-Sztainer et al., 2003). If feelings of more time availability have the potential for people to make better decisions for their personal life, perhaps it also has the potential to make better decisions for their environment. Especially if we consider that perceived time availability influences some prosocial behaviors, such as helping someone in distress, volunteering and engaging in community service (Rudd et al., 2012).

Furthermore, time availability has been associated with decreased materialism, such as preferring experiential purchases over material ones (Van Boven & Gilovich, 2003). While materialism has no direct link to eco-friendly purchasing behavior, decreased materialism does have the potential to influence the amount of extra money people are willing to spend on eco-friendly products. Time, effort and inconvenience are often named as the other barriers to pursuing eco-friendly behavior (Cornelissen et al. 2008; Follows & Jobber, 2000). Feelings of more time availability have the potential to reduce these barriers, as these barriers can seem smaller and trivial if more time is perceived to be available. As mentioned in the introduction, altered time perception has already been linked to choosing more time-consuming options like travel by train instead of airplane (Dällenbach, 2020). Feelings of time availability possibly reduce the need to minimize travel time. Therefore, feelings of time availability could also incline people to take other eco-friendly choices which are associated with more time investment.

Adoption barriers

As mentioned earlier, the association of time, effort and inconvenience with pursuing eco-friendly behavior were often named as barriers to its adoption (Cornelissen et al. 2008; Follows & Jobber, 2000). Awe and its effects on time perception and self-transcendence could cause these barriers to be perceived as smaller. However, for purchasing eco-friendly products or services, cost and quality are important factors in deciding if the trade-off with the environmental benefits is perceived to be worthwhile (Barber et al., 2012). Consumers are willing to pay more for eco-friendly products (Barber, 2010). So in general, the adoption barriers to eco-friendly purchasing behavior are time, effort, inconvenience, cost and quality.

Aim of study

This research intends to define how experiencing awe impacts eco-friendly purchasing behavior, and reduces the perceived size of the adoption barrier, and if this can be explained through awe's effect on time perception and self-transcendence. Three hypotheses will be tested:

H1. High, rather than low, awe-inspiring environmental settings influence different awe components (time perception, small self, body boundaries, connectedness, collective values)

H2. High, rather than low, awe-inspiring environmental settings reduce the perceived adoption barriers

H3. High, rather than low, awe-inspiring environmental settings increase sustainable consumer behavior.

To test these hypotheses, research using VR stimuli was conducted. The research design consisted of a group with a highly awe-inspiring video, a low awe-inspiring video, and a control group who did not watch a video.

Method

1. Pre-test

This study was conducted using a wireless VR headset (Oculus Go). During the experiment, a 360° video was shown. To determine what videos were highly awe-inspiring and what videos were not, a pre-test was conducted before the actual experiment began. 10 participants ranging from 20 to 55 years of age, including both men and women, were selected. In this pre-test, the participants were shown 8 different 360° videos in VR for one minute each (Earth from space, Forest, Mountain, Ruins, City, Lake, Meadow and Desert). The videos were streamed from Youtube. The videos were without sound, as the sound could impact the results by being too distracting.

The participants rated the 8 videos a number from 0-10 on how awe-inspiring it was (0=not at all awe-inspiring, 10= highly awe-inspiring). The lowest and highest average was selected, which turned out to be Earth from space and City.

Video	Mean of Awe	SD
Earth from space	8	0,67
Forest	7,1	1,37
Mountain	7,6	1,17
Ruins	7,7	0,82
City	5,1	1,10
Lake	5,9	1,45
Meadow	5,9	1,10
Desert	6,8	0,92

Table 1. Results of the pre-test

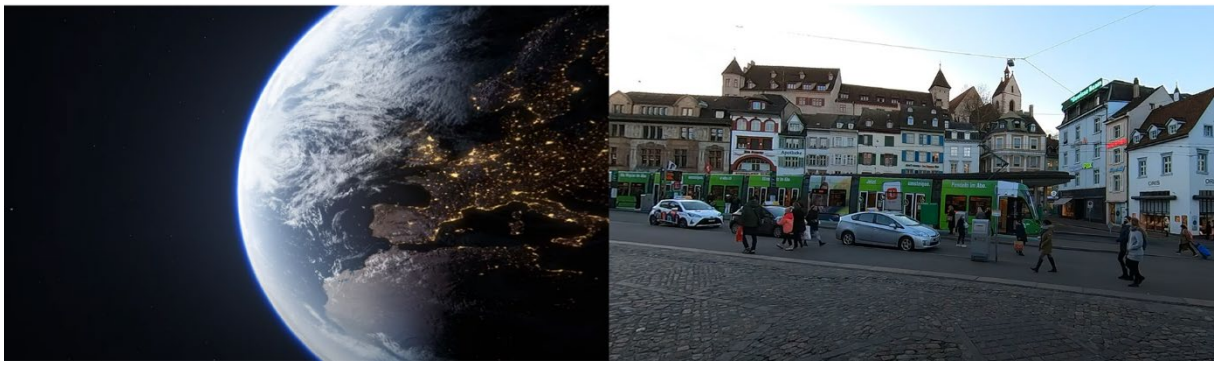

Figure 1. Screenshots of the videos in the main experiment (Earth from space, City)

2. Experiment design

This experiment was conducted using two different stimuli, and a group that did not see any stimuli. Figure 2 presents the research design. The independent variables are presented on the left, and the dependent variables are on the right.

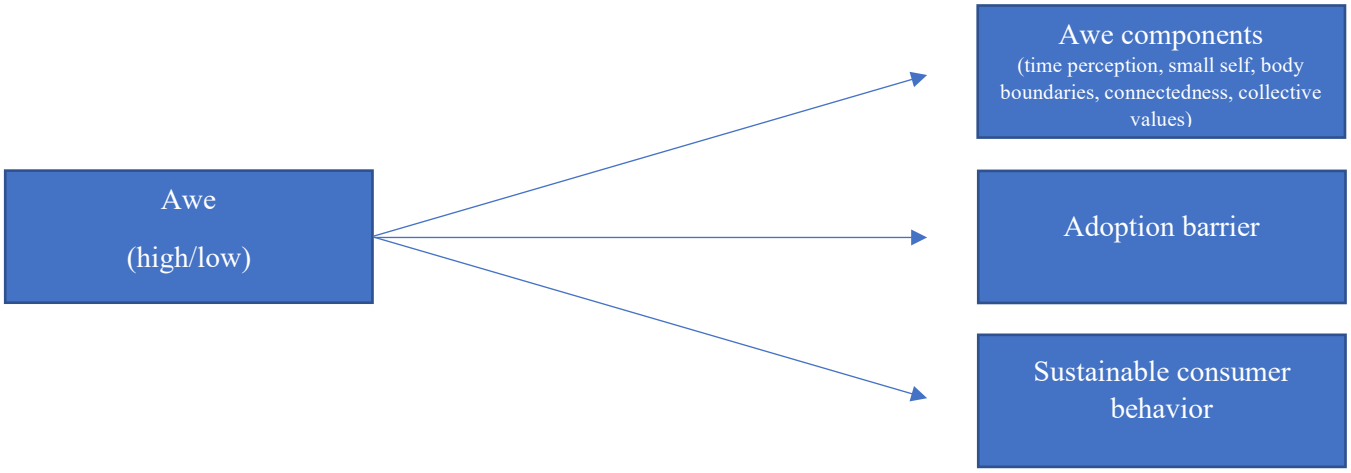

Figure 2. Research design

3. Data collection

The experiment took place from May 26th to May 30th 2022. In total, there were 94 participants, ranging from 20 to 67 years of age, including both men and women. Participants were either visited at their homes after having agreed to participate or were kindly asked to participate on the campus of the University of Twente. The group that did not get VR stimuli presented to them, were asked to fill in the questionnaire online.

4. Participants and procedure

In total, 93 participants took part in the experiment. They ranged from 19 to 60 years old, and included men and women. The data collection took 4 days in total. The procedure started with the participant either verbally or digitally giving consent to participate. Then, two third of the participants were randomly assigned to a VR environmental setting, while one third of the participants did not view anything in VR and skipped that part of the experiment and only filled in the questionnaire. For the two environmental condition groups, the participant was given instructions about the experiment, while the headset was prepared. Then, the VR headset was given to the participant, who watched

either the Earth from space environmental setting or the City environmental setting for 60 seconds without the controller. After completion, the participant was instructed to take the VR headset off and asked to fill in the questionnaire. The participant could choose between filling in the questionnaire on a laptop provided by the experimenter, or on their smartphone by scanning a QR code, directing them to the questionnaire.

5. Measures

This study used a questionnaire to measure the responses. The variables were awe, time perception, small self, body boundaries, connectedness, collective values, sustainable buying behavior and adoption barriers.

5.1 Awe

Awe was measured using 5 factors from the Awe-experience scale from Yaden et al. (2018): altered time perception; self-diminishment; connectedness; perceived vastness; need for accommodation. The physiological factor was left out, as it seemed irrelevant for this study. Statements like "I sensed things momentarily slow down" were measured on a 7-point Likert scale, for 25 items. These statements were asked regarding the VR video the participant watched. Only these 25 statements were regarding the VR video, and all the following questions are regarding general feelings and behavior. This scale was only used to measure the level of awe the participant experienced while watching the VR video, meaning that the control group did not answer this question. The Cronbach's Alpha's for each factor was: 0,864 (time Perception), 0,868 (small self), 0,848 (Connectedness), 0,901 (Vastness), 0,861 (Need for Accommodation).

5.2 Time perception

As a second, more general measure for time perception, another scale was added. This was a modified perceived-time-availability index by Rudd et al. (2012). 4 items, like "I have lots of time in which I can get things done" were measured on a 7-point Likert scale. The Cronbach's Alpha for this scale was 0,474. Deleting item 3 "time moves slowly in my life" would increase Cronbach's Alpha slightly, but still under the acceptable threshold. Therefore, the items will be analysed individually. The item "I

always have too little time to do things" was chosen for this analysis, as this appeared to be the strongest item in factor analysis.

5.3 Small self

Small self was measured using two scales, both introduced by Bai et al. (2017). These can be viewed in Figures 3 and 4. Because figure 3 involves a sun, participants might answer with their size in relation to their surroundings, while figure 4 allows the participant to describe their size without any relation to the environment. These scales were recoded to mean that a higher score means a smaller self.

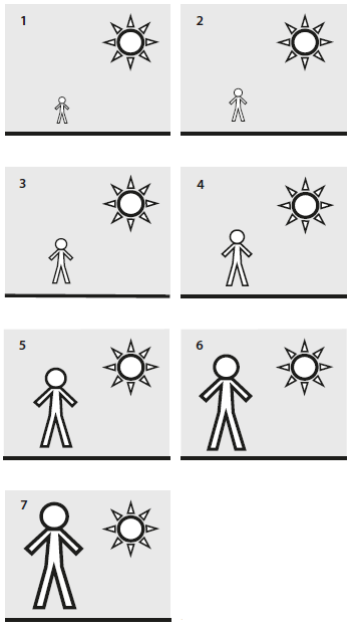

Figure 3. Small self scale by Bai et al. (2017).

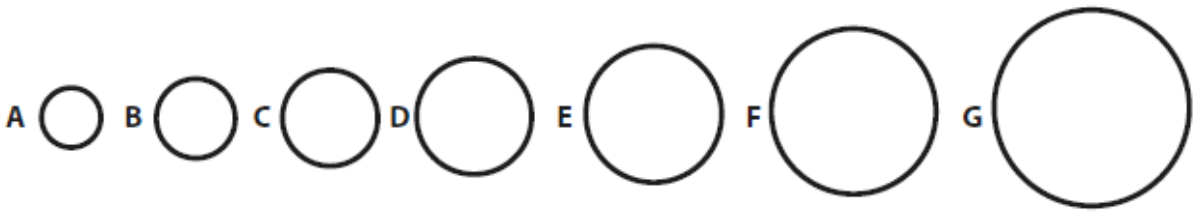

Figure 4. Small self scale by Bai et al. (2017).

5.4 Connectedness

To measure connectedness, the Inclusion of Community in Self scale (ICS) was chosen, by Mashek et al. (2007). This single-item scale can be viewed in figure 5.

Figure 5. Inclusion of Community in Self scale, Mashek et al. (2007)

5.5 Body boundaries

Body boundaries were measured using the single-item Body Boundary Scale by Dambrun (2016). This scale shows seven states of human body boundaries, from which the participants had to choose which one represented themselves the most. This single-item scale can be viewed in figure 6.

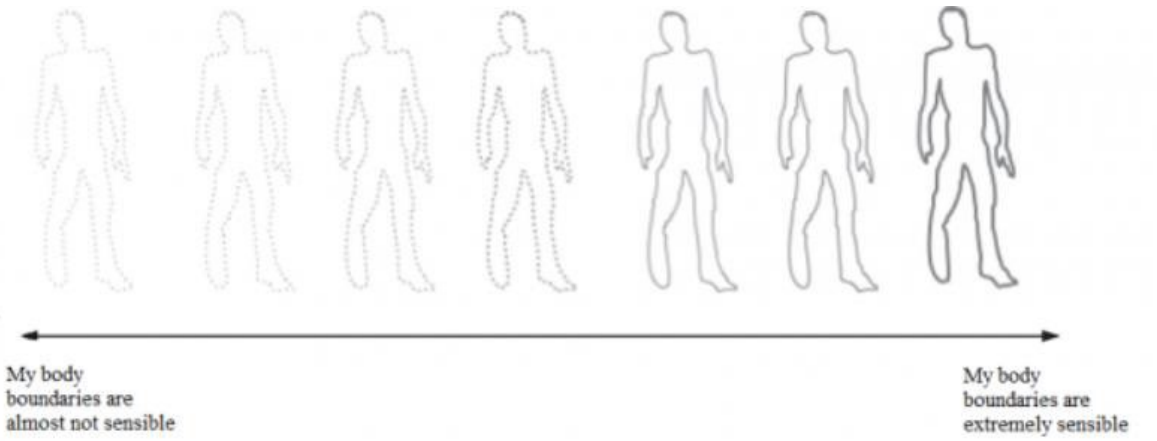

Figure 6 Body Boundary Scale by Dambrun (2016)

5.6 Collective values

Collective values were measured using 4 self-transcendence items from Follows & Jobber (2000). These items were about universalism (equality) and benevolence (helpful, forgiving, loving). These items were rated on a 7-point Likert scale from 1 (Highly unimportant) to 7 (Highly important). The Cronbach's Alpha was 0.599. Deleting equality increases Cronbach's Alpha to 0.634, which was

therefore done. This reliability was deemed acceptable for this study, especially because all items are different values on which opinions can differ.

5.7 Sustainable consumer behavior

Sustainable consumer behavior was measured using four scales. The first is a one-item scale asking "How much more are you willing to pay for sustainable goods as an alternative to unsustainable goods?", measuring their monetary willingness to buy sustainably in percentages. The second scale consisted of 7 items, measuring how much effort, inconvenience, product quality and personal preference influences the participants' sustainable buying behavior, measured on a 7-point Likert scale from 1 (Strongly disagree) to 7 (Strongly agree).

The third and fourth scales were both one-item questions regarding a digital supermarket Pieter Pot and a post made by the Ocean Cleanup Company. With both questions, the participants' likelihood of performing such sustainable activities was measured on a 7-point Likert scale, from 1 (Highly unlikely) to 7 (Highly likely). These included pictures, the third scale can be viewed in figure 7, and the fourth scale can be viewed in figure 8.

When analysing the reliability, the first scale of measuring monetary willingness to buy was deleted, as it brought the Cronbach's Alpha down very low. With this one-item scale deleted, Cronbach's Alpha was 0,769.

Figure 7 Pieter Pot image

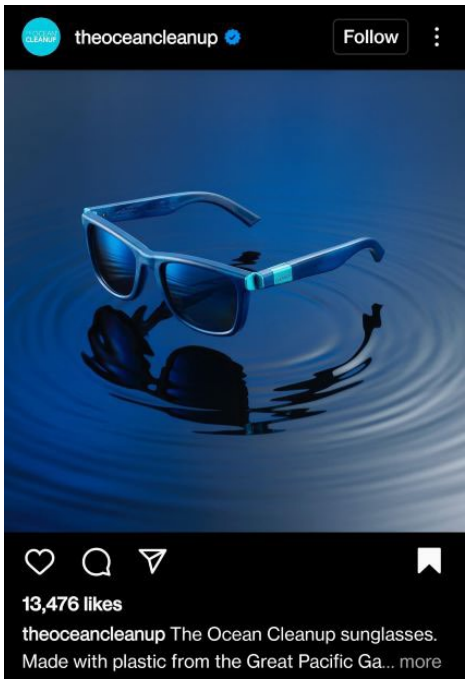

Figure 8 The Ocean Cleanup Company image

5.8 Adoption barrier

The adoption barrier was measured using a 5-item scale, measuring each of the aforementioned barriers (time, effort, inconvenience, money, quality). These were measured on a 7-point Likert scale from 1 (Strongly disagree) to 7 (Strongly agree). The Cronbach's Alpha of this scale was 0,723.

Results

Data were analysed based on the hypotheses with an ANOVA analysis. Post-hoc tests were conducted to further analyse the differences between the three environmental settings.

6.1 Awe

The main effect of environmental setting on awe reached marginal significance (F (1, 56) = 3.712, p = 0.06). As can be seen in the figure below, the environmental setting of Earth from space induced more awe (M = 4.32, SD = 0.87) than the City environmental setting (M = 3.89, SD = 0.82). Of all factors of the Yaden awe-scale, only vastness was significantly effected by the main effect of environmental setting (F (1, 59) = 11.06, p = 0.00). The main effect of environmental setting did not reach significance for the other factors, being time perception (F (1, 57) = 1.34, p = 0.25), small self (F (1, 58) = 0.36, p = 0.55), connectedness (F (1, 59) = 0.01, p = 0.98) and need for accommodation (F (1, 59) = 1.26, p = 0.27).

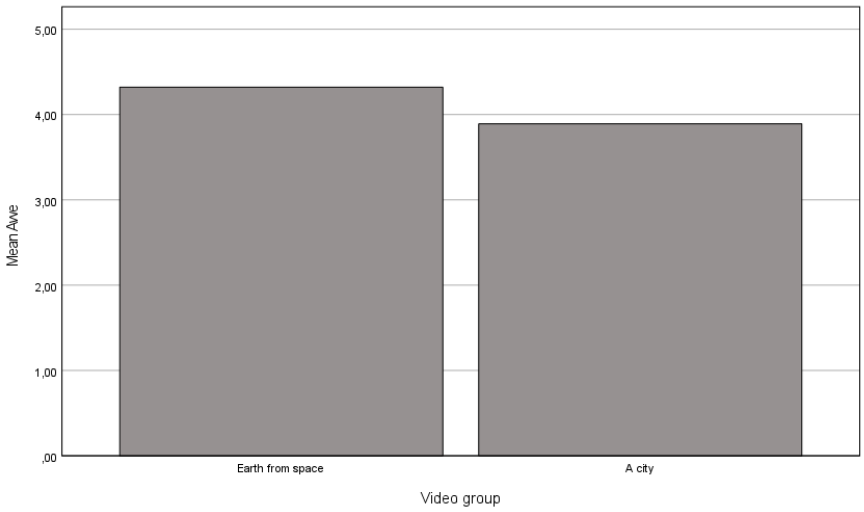

Figure 9 Bar chart awe per environmental setting

6.2 Small self

The main effect of environmental setting on small self did not reach significance (F (2, 91) = 1.98, p = 0.14). In further post-hoc testing, the biggest mean difference was found between the Earth from space

environmental setting (M = 5.08, SD = 1.61) and the City environmental setting (M = 4.34, SD = 1.43), with this difference being marginally significant.

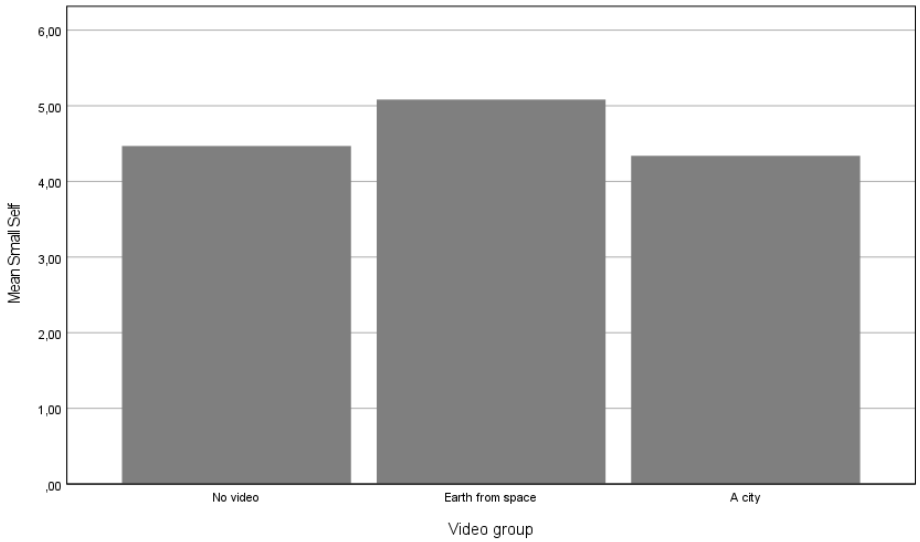

Figure 9 Bar chart small self per environmental setting

6.3 Time perception

The main effect of environmental setting on time perception did not reach significance (F (2, 91) = 1.36, p = 0.26).

6.4 Connectedness

The main effect of environmental setting on connectedness did not reach significance (F (2, 91) = 0.00, p = 0.99).

6.5 Body boundaries

The main effect of environmental setting on connectedness did not reach significance (F (2, 91) = 0.04, p = 0.96).

6.6 Collective values

In line with the hypotheses, the main effect of environmental setting on collective values was found to be marginally significant (F (2, 91) = 2.68, p = 0.07). The biggest mean difference was to be found between the City environmental setting and the no video condition, with the city environmental setting

being significantly lower (M = 5.71, SD = 0.85) than the no video condition (M = 6.16, SD = 0.65), as can be seen in the figure below. Further post-hoc testing revealed a significant positive correlation between collective values and small self (r(93) = 0.36, p = 0.00). Furthermore,

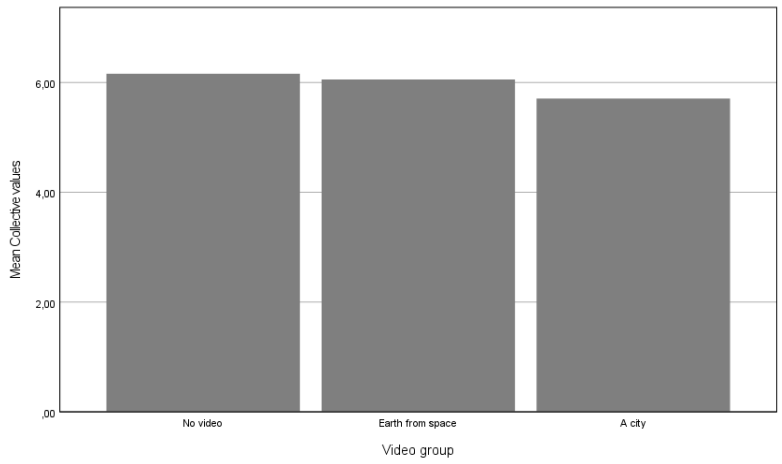

Figure 10 Bar chart collective values per environmental setting

6.7 Sustainable consumer behavior

The main effect of environmental setting on sustainable consumer behavior did not reach significance (F (2, 91) = 1.52, p = 0.22). Further post-hoc testing showed a positive significant correlation between sustainable consumer behavior and small self (r(92) = .25, p = 0.02). Furthermore, a significant positive correlation was found between adoption barriers and sustainable consumer behavior (r(91) = -0.50, p = 0.00).

6.8 Adoption barriers

The main effect of environmental setting on adoption barriers did not reach significance (F (2, 91) = 1.73, p = 0.18). In further post-hoc testing, the biggest mean difference was found between the Earth from space environmental setting (M = 4.33, SD = 1.05) and the City environmental setting (M = 4.78, SD = 0.88), with this difference being marginally significant.

Discussion

The research question for this study was: What effect does awe have on sustainable consumer behavior and its adoption barriers, through its components of feelings of the small self, collective values, time perception, body boundaries and connectedness? The present study investigated the relationship between awe experiences and sustainable consumer behavior.

Awe was found to have a marginally significant effect on collective values, in line with that part of hypothesis two, stating that awe components will be affected by awe-inducing environmental conditions. Previous research already found a direct link between collective values and sustainable buying behavior (McCarty & Shrum, 1994, Barber, 2010). Therefore, collective values seem to be a variable that links awe indirectly to sustainable consumer behavior. Next to this finding supporting part of hypothesis two, all other hypotheses could not be supported with significant findings. While other main effects were not found to be significant in this study, most variables, like small Self, did have expected differences, especially between the low and high awe environmental settings. Especially since the mean difference between the two VR environmental settings was found to be marginally significant, the effects of awe on feelings of the small Self can be taken into account. Moreover, it was also found that the City group experienced more adoption barriers than the Earth from space group, suggesting that awe reduces adoption barriers.

Furthermore, some interesting results were found in the post-hoc analysis, in which significant correlations were found between awe components, sustainable consumer behavior and adoption barriers. Feelings of the small self positively correlated with sustainable consumer behavior significantly. Especially since feelings of the small self significantly differed per environmental condition, the small self indirectly links awe to sustainable consumer behavior. Especially given that collective values are also related to both awe and sustainable consumer behavior, this proves that the awe components definitely are related to the way consumers behave towards sustainable options, solidifying the link between awe and sustainable consumer behavior. Previous research has already shown that these awe-components (time perception, small self, body boundaries, connectedness,

collective values) are direct results of awe. In this study we were able to link some of these components to sustainable consumer behavior, and how adoption barriers are perceived.

While previous research focussed on awe's components (small self, collective values, time perception, body boundaries, connectedness) or how these factors influence sustainable consumer behavior, research on the direct link between awe and sustainable consumer behavior is poor. This study was not able to find a direct link between awe and sustainable consumer behavior, however, we did see significant individual correlations and relations between awe, its components, and sustainable consumer behavior. The significant findings on collective values and small self, both influenced by awe and correlating significantly with sustainable consumer behavior, indicate that awe and sustainable consumer behavior are relevant to one another.

Limitations

Most main effects were not found to be significant, which could be a direct result of the limitations of this study. Due to limited time and resources for this study, the perfect research environment could not be created. Participants took part in the study in different environments, at different times, with alternating numbers of people around them. Therefore, other factors might have held back the effects of awe. Furthermore, a bigger sample size could prove beneficial for this research. Differences between conditions or people are large, with many outliers. Therefore, a larger sample size could be able to retract more reliable statistics, with higher significance. Lastly, the questionnaire was filled out on a laptop or phone. This could take the participant out of the experience. If the participant can fill in the form in VR while in the environmental setting, or work with real-life awe-inducing environmental settings instead, this could result in a larger effect.

Implications and future research

This study has several implications for existing research on awe and sustainable consumer behavior. First of all, this study proved that digitally induced awe, using VR, can also influence awe-components that can affect sustainable buying behavior, along with its adoption barriers. While researching awe using VR has been done numerous times, this study confirmed that digitally induced awe does not

hold back its downstream effects. Furthermore, this study was able to find some significant effects between awe and sustainable consumer behavior, solidifying the theory that people's behavior regarding sustainable consumption can be positively influenced by using awe. This could be used in marketing sustainable products, or by campaigns for a more sustainable future. Also, being aware of awe's effects on states of self-transcendence, time perception, and sustainable consumer behavior could motivate people to experience awe more frequently and intensely. Future research should focus on finding more direct links between the emotion of awe and sustainable consumer behavior, and how modern life, with all its technologies and distractions, impacts the frequency and intensity of our awe experiences. Also, on a more general level, these findings ask for future research to dive deeper into the realm of awe and its effect on sustainable behavior, including other green activities (e.g. recycling behavior, cleaning up outside, donating to green charities).

Conclusion

Concluding, this study shows that awe may be able to influence sustainable consumer behavior, through awe components such as small self and collective values. Apart from demonstrating the importance of awe on sustainable consumer behavior, it solidified previous research on states of self-transcendence, time perception, and adoption barriers. On a more general level, this study motivates us to think more broadly on how certain awe-inspiring environmental settings and emotions of awe can influence our behavior, such as sustainable consumer behavior, and how it could be used to make the earth a better place.

We could all live on a greener earth if we let a little bit more wonder into our life.

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Enclosures

Appendix 1: survey main study

Block 1

Dear participant,

Thank you for participating!

This survey is part of my research for my Bachelor Thesis in Communication Science at the University of Twente.

By now, you have had the VR-glasses on and viewed a video on them. In this survey, you will be asked about this experience, and your sustainable consumer behavior. The survey will take 10 minutes, and the data will be completely anonymised.

I would like to remind you that the research is still fully voluntary. You have already given your consent, but if you feel uncomfortable, you are free to discontinue at all times.

If you have any questions, leave them in the box below, ask me in person or mail me at m.j.deboer@student.utwente.nl.

Thanks again for your help!

Awe experience scale

Take yourself back to the VR-experience. Below, there are several statements. Please fill in to what extent these statements correspond with the VR-experience.

	Strongly disagree	Moderately disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Moderately agree	Strongly agree

	Strongly disagree	Moderately disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Moderately agree	Strongly agree
I sensed things momentarily slow down.	○	○	○	○	○	○	○
I noticed time slowing.	○	○	○	○	○	○	○
I felt my sense of time change.	○	○	○	○	○	○	○
I experienced the passage of time differently.	○	○	○	○	○	○	○
I had the sense that a moment lasted longer than usual.	○	○	○	○	○	○	○
I felt that my sense of self was diminished.	○	○	○	○	○	○	○
I felt my sense of self shrink.	○	○	○	○	○	○	○
I experienced a reduced sense of self.	○	○	○	○	○	○	○
I felt my sense of self become somehow smaller.	○	○	○	○	○	○	○
I felt small compared to everything else.	○	○	○	○	○	○	○
I had the sense of being connected to everything.	○	○	○	○	○	○	○
I felt a sense of communion with all living things.	○	○	○	○	○	○	○
I experienced a sense of oneness with all things.	○	○	○	○	○	○	○

	Strongly disagree	Moderately disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Moderately agree	Strongly agree
I felt closely connected to humanity.	○	○	○	○	○	○	○
I had a sense of complete connectedness.	○	○	○	○	○	○	○
I felt that I was in the presence of something grand.	○	○	○	○	○	○	○
I experienced something greater than myself.	○	○	○	○	○	○	○
I felt in the presence of greatness.	○	○	○	○	○	○	○
I perceived something that was much larger than me.	○	○	○	○	○	○	○
I perceived vastness.	○	○	○	○	○	○	○
I felt challenged to mentally process what I was experiencing .	○	○	○	○	○	○	○
I found it hard to comprehend the experience in full.	○	○	○	○	○	○	○
I felt challenged to understand the experience.	○	○	○	○	○	○	○
I struggled to take in all that I was experiencing at once .	○	○	○	○	○	○	○

	Strongly disagree	Moderately disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Moderately agree	Strongly agree
I tried to understand the magnitude of what I was experiencing.	○	○	○	○	○	○	○

Time availability

Below, there are several statements regarding how you perceive time. Fill in to what extent you agree with the statement.

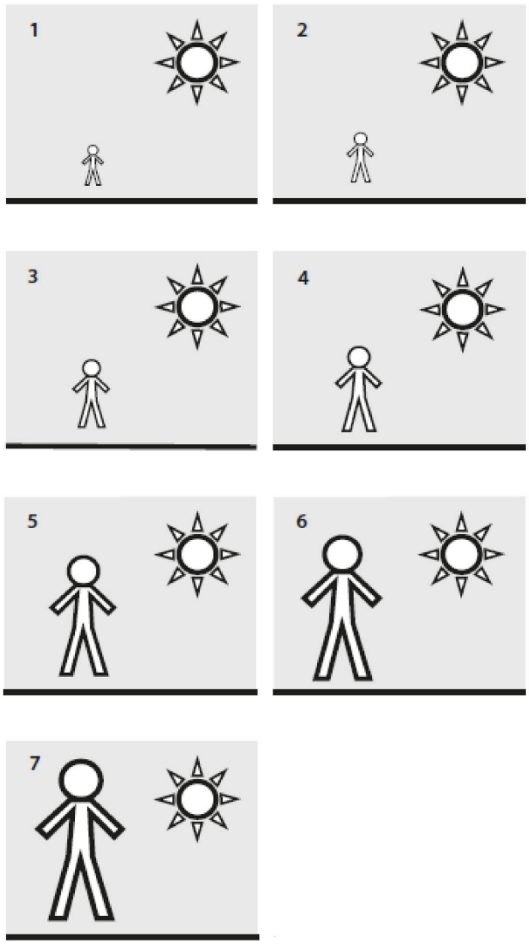
	Strongly disagree	Moderately disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Moderately agree	Strongly agree
I have lots of time in which I can get things done.	○	○	○	○	○	○	○
Time is slipping away.	○	○	○	○	○	○	○
Time moves slowly in my life.	○	○	○	○	○	○	○
I always have too little time to do things.	○	○	○	○	○	○	○

Self-transcendence

This question is about how big or small you feel.

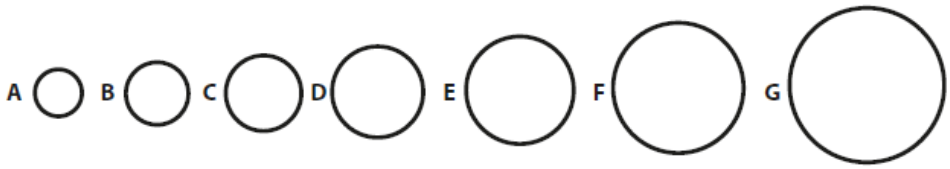
View the image below. Please indicate which one of the following drawings best

describes yourself.



- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6
- ○ 7

Think about one of the circles below as representing yourself.
Please choose the circle that best describes how big or small you feel about yourself.



- A
- B
- C
- D
- E
- F
- G

Feelings of connectedness with others, and seeing yourself as part of a greater whole, can differ.

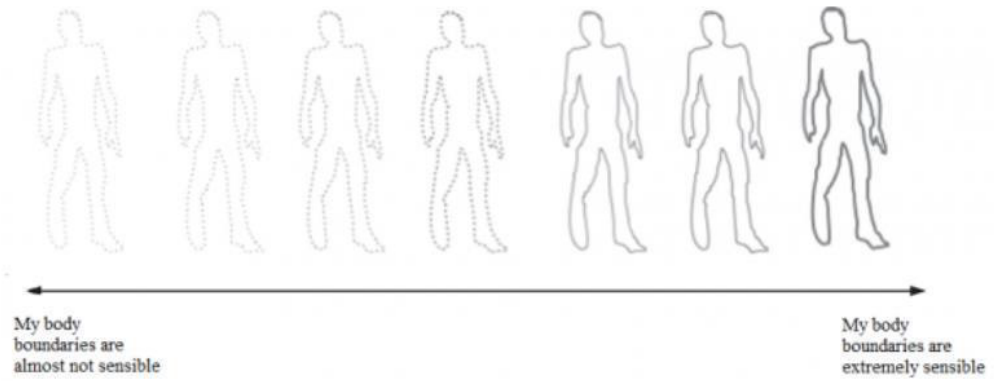
Choose the picture that best describes your relationship with the community at large. (S=Self; C= Community at large)

(Order: 1 to 6 from left to right.)

- 1
- 2
- 3
- 4
- 5
- 6

This question is regarding your body boundaries. How strongly you can feel your body boundaries - where your body stops, and where the environment around you starts - can differ.

Choose the picture that best describes your sense of body boundaries.



(Order: 1 to 7 from left to right.)

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6
- ○ 7

Please answer to what extent these values are important to you.

	Highly unimportant	Moderately unimportant	Slightly unimportant	Neutral	Slightly important	Moderately important	Highly important
Universalism - Equality (brotherhood, equal opportunity for all)	○	○	○	○	○	○	○
Benevolence - Helpful (working for the welfare of others)	○	○	○	○	○	○	○
Benevolence - Forgiving (willing to pardon others)	○	○	○	○	○	○	○

Benevolence

	Highly unimportant	Moderately unimportant	Slightly unimportant	Neutral	Slightly important	Moderately important	Highly important
Benevolence - Loving (affectionate, tender)	○	○	○	○	○	○	○

Sustainable consumer behavior

How much more are you willing to pay for sustainable goods as an alternative to unsustainable goods? (eg. goods that are biological, CO2-neutral, palm-oil free, biodegredable material, etc.)

	0	10	20	30	40	50	60	70	80	90	100
Percentage you would pay more											

Please fill in to what extent you agree with the statements.

	Strongly disagree	Moderately disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Moderately agree	Strongly agree
I am willing to drive an extra 10 minutes (and 10 minutes back) to a biological farm instead of buying at the supermarket.	○	○	○	○	○	○	○
I would not buy reusable dishcloths because they are less convenient.	○	○	○	○	○	○	○
I research which goods are sustainable, so I can make responsible purchasing decisions.	○	○	○	○	○	○	○

	Strongly disagree	Moderately disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Moderately agree	Strongly agree
I am willing to sacrifice product quality to buy sustainable.	○	○	○	○	○	○	○
Personal preference or taste is more important to me than buying sustainably.	○	○	○	○	○	○	○
I prefer refillable options over throwaway goods, even if it comes with a bit of inconvenience.	○	○	○	○	○	○	○
I am likely to encourage others to buy more sustainably.	○	○	○	○	○	○	○

Pieter Pot is an online supermarket that ships all its products in glass preserving jars. The products are delivered to your house, and empty jars can be given to the deliverer. They reduce waste and co2 doing this.

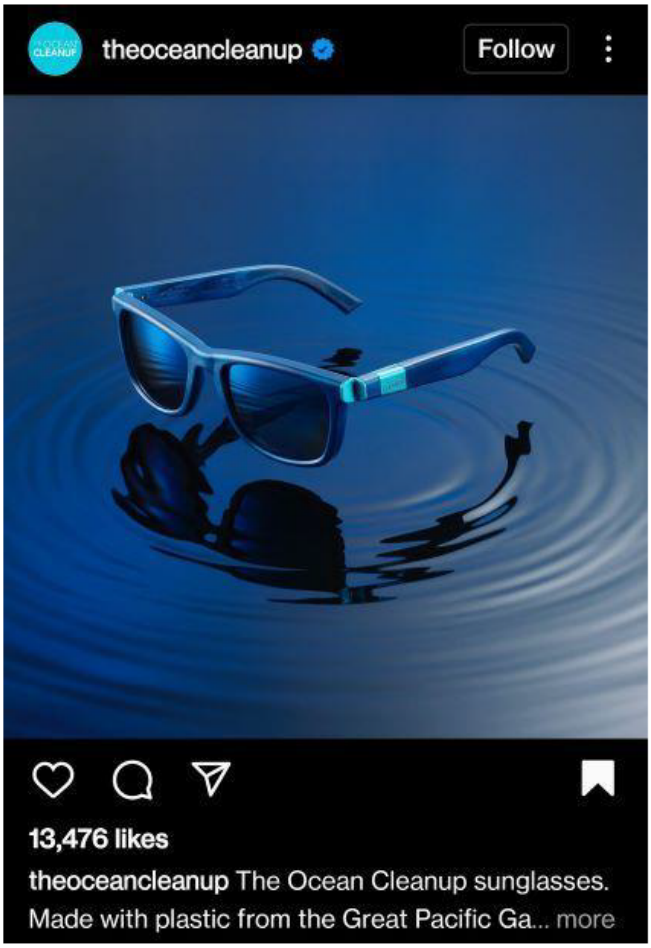
Assuming the products are equally expensive as their supermarket alternatives, how

likely are you to buy from new sustainable buying options like Pieter Pot?

- ○ Highly unlikely
- ○ Moderately unlikely
- ○ Somewhat unlikely
- ○ Neutral
- ○ Somewhat likely
- ○ Moderately likely
- ○ Highly likely

The ocean cleanup company produced sunglasses made of plastic from theGreat Pacific Garbage Patch.

How likely are you to share or repost messages from sustainable companies or charities like this on your social media?



- Highly unlikely
- Moderately unlikely
- Somewhat unlikely
- Neutral
- Somewhat likely
- Moderately likely
- Highly likely

Perceived adoption barrier

There are certain barriers that stop consumers from buying sustainably. Please fill in to what extent do you agree with the statements below.

	Strongly disagree	Moderately disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Moderately agree	Strongly agree
The amount of time it costs stops me from purchasing sustainably.	○	○	○	○	○	○	○
The amount of effort it costs stops me from buying sustainably.	○	○	○	○	○	○	○
The inconvenience stops me from buying sustainably.	○	○	○	○	○	○	○
The money it costs stops me from buying sustainably.	○	○	○	○	○	○	○
The difference in quality of sustainable products stops me from buying sustainably.	○	○	○	○	○	○	○

Stimuli

What video did you view in VR?

- ○ Earth from space
- ○ A city

Appendix 2: results

Results awe

Tests of Between-Subjects Effects

Dependent Variable: Awe_Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2,671[a]	1	2,671	3,712	,059
Intercept	977,013	1	977,013	1357,864	,000
Q15	2,671	1	2,671	3,712	,059
Error	40,293	56	,720		
Total	1017,616	58			
Corrected Total	42,964	57			

a. R Squared = ,062 (Adjusted R Squared = ,045)

Descriptive Statistics

Dependent Variable: Awe_Average

Video group	Mean	Std. Deviation	N
Earth from space	4,3214	,87449	28
A city	3,8920	,82306	30
Total	4,0993	,86819	58

Results awe-factor time perception

Tests of Between-Subjects Effects

Dependent Variable: Awe_time_perception

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2,308[a]	1	2,308	1,344	,251
Intercept	883,908	1	883,908	514,631	,000
Q15	2,308	1	2,308	1,344	,251
Error	97,901	57	1,718		
Total	982,840	59			
Corrected Total	100,209	58			

a. R Squared = ,023 (Adjusted R Squared = ,006)

Descriptive Statistics

Dependent Variable: Awe_time_perception

Video group	Mean	Std. Deviation	N
Earth from space	4,0690	1,08137	29
A city	3,6733	1,49895	30
Total	3,8678	1,31443	59

Results awe-factor small self

Tests of Between-Subjects Effects

Dependent Variable: Awe_small_self

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	,585[a]	1	,585	,357	,552
Intercept	1141,030	1	1141,030	696,634	,000
Q15	,585	1	,585	,357	,552
Error	94,999	58	1,638		
Total	1236,160	60			
Corrected Total	95,584	59			

a. R Squared = ,006 (Adjusted R Squared = -,011)

Descriptive Statistics

Dependent Variable: Awe_small_self

Video group	Mean	Std. Deviation	N
Earth from space	4,4621	1,21197	29
A city	4,2645	1,34004	31
Total	4,3600	1,27282	60

Results awe-factor connectedness

Tests of Between-Subjects Effects

Dependent Variable: Awe_connectedness

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	,001[a]	1	,001	,001	,976
Intercept	829,730	1	829,730	538,901	,000
Q15	,001	1	,001	,001	,976
Error	90,841	59	1,540		
Total	920,760	61			
Corrected Total	90,842	60			

a. R Squared = ,000 (Adjusted R Squared = -,017)

Descriptive Statistics

Dependent Variable: Awe_connectedness

Video group	Mean	Std. Deviation	N
Earth from space	3,6933	1,22247	30
A city	3,6839	1,25833	31
Total	3,6885	1,23046	61

Results awe-factor vastness

Tests of Between-Subjects Effects

Dependent Variable: Awe_vastness

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	19,501[a]	1	19,501	11,057	,002
Intercept	1231,910	1	1231,910	698,497	,000
Q15	19,501	1	19,501	11,057	,002
Error	104,056	59	1,764		
Total	1350,720	61			
Corrected Total	123,557	60			

a. R Squared = ,158 (Adjusted R Squared = ,144)

Descriptive Statistics

Dependent Variable: Awe_vastness

Video group	Mean	Std. Deviation	N
Earth from space	5,0600	1,33096	30
A city	3,9290	1,32519	31
Total	4,4852	1,43502	61

Results awe-factor need for accommodation

Tests of Between-Subjects Effects

Dependent Variable: Awe_need_for_accommodation

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2,418[a]	1	2,418	1,255	,267
Intercept	1049,039	1	1049,039	544,490	,000
Q15	2,418	1	2,418	1,255	,267
Error	113,672	59	1,927		
Total	1163,760	61			
Corrected Total	116,090	60			

a. R Squared = ,021 (Adjusted R Squared = ,004)

Descriptive Statistics

Dependent Variable: Awe_need_for_accommodation

Video group	Mean	Std. Deviation	N
Earth from space	4,3467	1,32970	30
A city	3,9484	1,44219	31
Total	4,1443	1,39099	61

Results small self

Tests of Between-Subjects Effects

Dependent Variable: Small_Self_Average_Recoded

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	9,638[a]	2	4,819	1,982	,144
Intercept	2012,426	1	2012,426	827,878	,000
Q15	9,638	2	4,819	1,982	,144
Error	221,205	91	2,431		
Total	2239,250	94			
Corrected Total	230,843	93			

a. R Squared = ,042 (Adjusted R Squared = ,021)

Descriptive Statistics

Dependent Variable: Small_Self _Recoded

Video group	Mean	Std. Deviation	N
No video	4,4697	1,61989	33
Earth from space	5,0833	1,61930	30
A city	4,3387	1,42821	31
Total	4,6223	1,57549	94

Results Time perception

Tests of Between-Subjects Effects

Dependent Variable: Q3_I always have too little time to do things.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	6,742[a]	2	3,371	1,356	,263
Intercept	2326,068	1	2326,068	935,929	,000
Q15	6,742	2	3,371	1,356	,263
Error	226,163	91	2,485		
Total	2553,000	94			
Corrected Total	232,904	93			

a. R Squared = ,029 (Adjusted R Squared = ,008)

Descriptive Statistics

Dependent Variable: Q3_I always have too little time to do things.

Video group	Mean	Std. Deviation	N
No video	4,61	1,560	33
Earth from space	5,20	1,627	30
A city	5,13	1,544	31
Total	4,97	1,583	94

Results connectedness

Tests of Between-Subjects Effects

Dependent Variable: Connectedness

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	,006[a]	2	,003	,002	,998
Intercept	1135,596	1	1135,596	798,288	,000
Q15	,006	2	,003	,002	,998
Error	129,451	91	1,423		
Total	1267,000	94			
Corrected Total	129,457	93			

a. R Squared = ,000 (Adjusted R Squared = -,022)

Descriptive Statistics

Dependent Variable: Connectedness

Video group	Mean	Std. Deviation	N
No video	3,48	1,202	33
Earth from space	3,47	1,196	30
A city	3,48	1,180	31
Total	3,48	1,180	94

Results body boundaries

Tests of Between-Subjects Effects

Dependent Variable: Body Boundaries

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	,160[a]	2	,080	,042	,959
Intercept	2305,743	1	2305,743	1208,170	,000
Q15	,160	2	,080	,042	,959
Error	173,670	91	1,908		
Total	2484,000	94			
Corrected Total	173,830	93			

a. R Squared = ,001 (Adjusted R Squared = -,021)

Descriptive Statistics

Dependent Variable: Body Boundaries

Video group	Mean	Std. Deviation	N
No video	4,97	1,287	33
Earth from space	4,90	1,447	30
A city	5,00	1,414	31
Total	4,96	1,367	94

Results collective values

Tests of Between-Subjects Effects

Dependent Variable: Collective_Values_Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3,525[a]	2	1,762	2,684	,074
Intercept	3351,310	1	3351,310	5102,730	,000
Q15	3,525	2	1,762	2,684	,074
Error	59,766	91	,657		
Total	3423,333	94			
Corrected Total	63,291	93			

a. R Squared = ,056 (Adjusted R Squared = ,035)

Descriptive Statistics

Dependent Variable: Collective_Values_Average

Video group	Mean	Std. Deviation	N
No video	6,1616	,65150	33
Earth from space	6,0556	,91845	30
A city	5,7097	,85089	31
Total	5,9787	,82495	94

Results sustainable consumer behavior

Tests of Between-Subjects Effects

Dependent Variable: Sustainable_Consumer_Behavior_Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3,045[a]	2	1,523	1,529	,222
Intercept	1622,793	1	1622,793	1629,265	,000
Q15	3,045	2	1,523	1,529	,222
Error	89,642	90	,996		
Total	1712,633	93			
Corrected Total	92,688	92			

a. R Squared = ,033 (Adjusted R Squared = ,011)

Descriptive Statistics

Dependent Variable:

Sustainable_Consumer_Behavior_Average

Video group	Mean	Std. Deviation	N
No video	3,9827	1,18114	33
Earth from space	4,4236	,91988	29
A city	4,1429	,84274	31
Total	4,1736	1,00373	93

Results adoption barriers

Tests of Between-Subjects Effects

Dependent Variable: Barriers_Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3,406[a]	2	1,703	1,726	,184
Intercept	1888,258	1	1888,258	1914,082	,000
Q15	3,406	2	1,703	1,726	,184
Error	88,786	90	,987		
Total	1987,160	93			
Corrected Total	92,192	92			

a. R Squared = ,037 (Adjusted R Squared = ,016)

Descriptive Statistics

Dependent Variable: Barriers_Average

Video group	Mean	Std. Deviation	N
No video	4,4182	1,04207	33
Earth from space	4,3379	1,04759	29
A city	4,7806	,88145	31
Total	4,5140	1,00104	93

Appendix 3: Search matrix

Log

Date	Database	Search string	Total hits	Remarks
Write the date of your search	*Write the database name*	Copy-paste the resulting search string (e.g. '*smartphone OR digital technolog**)', including any limiters or additional settings you used (e.g. *'searched only from X to Y date'*)	*Write how many total hits your search delivered, and*	*Write down important notes for you to remember about this search (e.g. if or how many relevant articles you spotted by quickly reviewing the first pages of the search results)*
29-03-2022	*Scopus*	(Nature OR Environment OR Landscape) AND (Wellbeing OR Health) AND (stress OR anxiety) AND (Prevent* OR Avoid*)	*7,432*	*Way too broad results, from drugs to medicine to education. Environment and landscape seems to be used in different context*
		Nature AND (Wellbeing OR Health) AND (stress OR anxiety) AND (Prevent* OR Avoid*)	1,806	Nature is also often used in different context "the nature of nicotine addiction"
		Nature AND (outside OR outdoors) AND (Wellbeing OR Health) AND (stress OR anxiety) AND (Prevent* OR Avoid*)	35	Also "outside" can be used in different ways, which dilutes the results. While there are some decent finds in this search, it probably excluded many valuable results.
TOPIC CHANGE				
5-04-2022	Scopus	Awe AND Decision making	57	Good results, at least two sources will be used.
		("time perception" AND climate)	33	Decent, at least one useful source
		("time perception" AND health)	879	Many results, but good ones, especially when sorting on relevance
		("time perception" AND choice)	789	Many, but the first result is

				immediately useful
22-04-2022	Scopus	("global warming" AND public AND knowledge)	374	
29-04-2022	Scopus	((consumer AND decisions) AND ((climate AND change) OR (global AND warming)))	704	
9-5-2022	Scopus	(vastness AND nature)	107	
11-5-2022	Scopus	(barriers AND eco-friendly AND behavior)	92	Snowballed to find useful information