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Neuroscience and CSR: Using EEG for Assessing the Effectiveness of Branded Videos Related to Environmental Issues

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Abstract: The majority of studies evaluating the effectiveness of branded CSR campaigns are concentrated and base their conclusions on data collection through self-reporting questionnaires. Although such studies provide insights for evaluating the effectiveness of CSR communication methods, analysing the message that is communicated, the communication channel used and the explicit brain responses of those for whom the message is intended, they lack the ability to fully encapsulate the problem of communicating environmental messages by not taking into consideration what the recipients' implicit brain reactions are presenting. Therefore, this study aims to investigate the effectiveness of CSR video communications relating to environmental issues through the lens of the recipients' implicit self, by employing neuroscience-based assessments. For the examination of implicit brain perception, an electroencephalogram (EEG) was used, and the collected data was analysed through three indicators identified as the most influential indicators on human behaviour. These three indicators are emotional valence, the level of brain engagement and cognitive load. The study is conducted on individuals from the millennial generation in Thessaloniki, Greece, whose implicit brain responses to seven branded commercial videos are recorded. The seven videos were a part of CSR campaigns addressing environmental issues. Simultaneously, the self-reporting results from the participants were gathered for a comparison between the explicit and implicit brain responses. One of the key findings of the study is that the explicit and implicit brain responses differ to the extent that the CSR video communications' brain friendliness has to be taken into account in the future, to ensure success. The results of the study provide an insight for the future creation process, conceptualisation, design and content of the effective CSR communication, in regard to environmental issues.

Keywords: environmental protection; CSR; neuroscience; video communication; electroencephalogram (EEG)

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1. Introduction

In the wake of growing global problems that human kind is facing in terms of political, economic and social challenges, which are tangibly felt more than ever in the daily lives of all fellow humans, it becomes increasingly clear that all societal parts and all agents that create societal structures have to play their part in order to preserve the quality of life, and life itself on Earth. Furthermore, this is even more evident for the biggest challenge of them all, the global environmental crisis, which can determine the pivotal moment of the way of life for todays' generation [1–3].

The need for cooperation between all entities is additionally evident in times when global crises arise, such as the SARS-CoV-2 pandemic [4], where the impact of the crisis and the following effects are felt and are going to be felt for years to come by humanity as a whole. One such crisis that, if immediate actions are not taken, can lead to irreversible

consequences that can change life on the planet in its entirety is the global environmental crisis, as noted by Zhao [5], and is reflected in, for instance, climate change, global warming, global environmental degradation, resource depletion and biodiversity loss.

When dealing with environmental issues, all the agents of which the societal system consists have to be included in solving the environmental challenges faced by today's generation. These include, but are not limited to, governments, policy makers, non-governmental organisations, multinational corporations, big and small businesses, entrepreneurs and citizens [6–10]. Furthermore, these agents under the provided contextualisation for this paper are taken into account as agents and drivers of change for the environmental betterment.

International treaties, technological advancement, economic growth, environmental awareness and environmental empathy are the most common among the drivers of environmental change [11]. The overarching goal that has to be accomplished by these drivers is a behavioural change that would lead to tangible positive environmental effects. It becomes clearer each day that the efforts made to pursue and promote these drivers, in the context of the overarching goal, are failing when environmental progress is evaluated [12–14]. This is mostly because environmental communication and messages are either not translating into the wider sphere, thus not resulting in the behavioural change that is needed [15–18].

Although all the agents have a role in achieving the desired change, the role of big multinational corporations is becoming increasingly significant, if not the leading one [19–21].

In this regard, this paper examines the branded communications related to environmental issues, which are a product of traditional corporate social responsibility (CSR) approaches and practices between all the mentioned agents, with the purpose of re-examining current communication concepts.

For the purposes of this paper, in order to define the research problem as well as possible, a literature review was conducted in pursuit of the questions that currently remain unanswered in the field of CSR. Some of the questions that many studies seek the answers to, include, but are not limited to, the following: Do CSR communication practices work [22]? How effective are they [23]? Is it time for a new approach to CSR [24]? Can neuroscience provide the necessary improvements by utilising a new approach that can be recognised as NeuroCSR in the same manner already utilised by other disciplines (for instance, neuro politics, neuro education, neuro finance and neuro design)? Are there any differences between the implicit and explicit reactions to CSR communications? This helped in defining the focus of this study towards the standard CSR communications as the object of this research.

The emphasis of this research is on the branded communications of companies that are internationally reputable and recognised. The branded communications' efficiency and effectiveness in trying to achieve increased environmental awareness is evaluated, as well as whether that current CSR communications can lead to the behavioural changes of those to whom these messages are communicated.

This study presents the findings of a cutting-edge neuromarketing study of millennials concerning CSR commercial videos and its comparison to self-reporting, explicit responses. Seven videos from global commercial brands promoting environmental causes were selected and shown to millennials in Greece. While the millennials watched the videos, their brain and body reactions were measured with an electroencephalogram. All of the seven videos used in the study are listed in the Appendix A of this paper.

At the end of the neuromarketing test, the participants were also asked about their explicit opinions about the videos, with the purpose of gaining comparative results of standard self-reporting surveys, in order to analyse them alongside the results obtained via neuroscience methods.

Based on all the above factors, the research purpose formulated for this study is the following:

- RP. To examine the effectiveness of CSR communications, and especially of branded videos of environmental issues, by utilising neuroscientific methods vs. traditional methods.

This research's purpose is then divided into five research questions, which are the following:

- Q1. To what extent do brains implicitly find CSR communications appealing?
- Q2. To what extent do brains implicitly engage with CSR communications?
- Q3. To what extent do brains implicitly process CSR communications?
- Q4. To what extent do these results differ between genders?
- Q5. To what extent do the implicit results differ from the explicit responses?

This study attempts to answer these questions using neuroscientific research methods by studying, more precisely, the effect of CSR messages on the neurological mechanisms that create our perception, motivation, understanding, decision-making and visual attention. It also uses self-reporting, explicit methods for comparison.

The aim of this paper is to develop a more efficient model for communicating these important messages that would help brands, organisations and even governments achieve their CSR objectives. Ultimately, what is good for their CSR is good for us, the people and all other inhabitants of the planet.

2. Background and Context

Originally coined in 1953 by the American economist Howard Bowen, the term corporate social responsibility [25], is nowadays more broadly referred to as "a commitment to improve societal well-being through discretionary business practices and contributions of corporate resources" [26]. As such, corporate social responsibility (CSR) works as a form of internationally agreed upon corporate self-regulatory systems [27–29] based on the ethical responsibilities corporations have towards their communities, as originally defined by Carroll's pyramid with the economic responsibility at its base, followed by legal, ethical and philanthropic responsibilities [30].

The original aim was for corporations to make efforts and commit to the social goals of a wider community through their practices and activities, relying on altruistic practices, such as donating to specific social causes and supporting volunteering or philanthropy [31]. Throughout the years, CSR evolved into something far more impactful and became an essential part of corporate culture, stretching far beyond a single company's in-house codex. This evolution was globally supported by many national and international regulations as well as by companies that were considered as leaders in their fields that made CSR part of their good practices [32]. This significantly shifted the approach to CSR practices from being a set of activities adopted on a voluntary basis by an individual corporation as a result of its internal organisational culture, to obligatory practices accepted internationally [33]. As a result of this change, as an approach to CSR, this paper examines the effectiveness of CSR practices related to what may be the greatest threat to humanity: the global environmental crisis.

When it comes to neuroscience, it provides several conclusions about the human brain that raise questions about the effectiveness of today's CSR practices. One of these conclusions is that 95% of decision-making is unconscious, meaning that people are not fully aware of why they choose something and why they like it, or why they make specific decisions [34]. It was also noted that out of 10 million bits of information received by the brain per second, only 50 bits are processed in our conscious mind [35]. Finally, it was observed that the human brain decides unconsciously up to 11 seconds before people are aware of it [36]. This is why this paper wants to examine whether it is time for an evolution of CSR to CSR 2.0, which would be based on neuroscience, or more precisely, whether it is time for neuroCSR, which would communicate CSR messages in a more brain-friendly way.

Additionally, employing a neuroscientific approach in CSR and marketing has proven effective in many studies. Such a specific literature review was conducted by Lin et al. [37] and concentrated specifically on the effectiveness of using an electroencephalogram (EEG). This is additionally important because the study presented in this paper was conducted specifically using an EEG and neuroscientific approach. Moreover, Barnett and Cerf [38] used a neuroscientific approach as a means of predicting consumer behaviours and ex-

plained the possibilities of applying it to product recalls. Hazlett and Hazlett [39] used the same approach to track emotions based on facial electromyography, which proved to be an effective tool to find how people respond to graphic stimuli. Moreover, this paper goes beyond this method and deals with video stimuli that involves more than the recording of just the emotional responses, but additionally considers the level of brain engagement and cognitive load brains of the participants, when they engage with video CSR communications. Moreover, Hazlett and Hazlett [39] analysed the cooperation between the neuro and self-reporting results of the participants' responses, something that was performed in this paper as well, and proved to be insightful and possibly a result that can be used as a future guideline.

Corporate social responsibility (CSR) has become an integral part of companies' DNA around the world. Fortune Global 500 firms spend approximately USD 20 billion annually on CSR activities, with many predicting an upward trend in the coming years [40,41]. Consequently, evaluating the effectiveness of CSR activities is a key issue in CSR investment as corporations, and other stakeholders, try to understand if their activities produce the desired outcomes [42]. This study presents the findings of a cutting-edge neuro-marketing study of millennials concerning CSR videos and the implicit perception of their brains of the video stimuli that cover the topic of environmental issues. Seven videos from global commercial brands promoting environmental causes were selected and shown to millennials in Greece. While the millennials watched the videos, their brain and body reactions were measured with an electroencephalogram (EEG) and eye tracking technologies. At the end of the neuro-marketing test, the participants were also asked about their explicit opinions on the videos via the interview method in order to gather the self-reporting results of their explicit brain.

3. Materials and Methods

3.1. Study Scope

The scope of the study presented in this paper included 27 healthy participants (15 female and 12 male), all of whom were born between 1981 and 1996, which makes them part of the millennial generation, as defined by most researchers [43]. The study was conducted in Thessaloniki, Greece. Published studies using electroencephalogram (EEG) technology for evaluating marketing communications stimuli, reported effective samples consisting of as low as 15 [44], 16 [45] and 18 [46] individuals. A recent literature review paper screening 264 abstracts and analysing 113 relevant articles, found that the average number of participants of EEG-based marketing studies were slightly above 30 people [47], with multiple segmentation criteria that included demographics, target group fit and product-specific criterion, such as familiarity. In this study, the total number of 27 participants was considered as sufficient based on both the comparison with the previous EEG-based marketing studies mentioned here, and the fact that the subcategorisation of the sample was kept to a minimum to ensure relative homogeneity and thus a higher potential generalisation of findings. Our sample was based on just one generation, millennials with only a gender split applied. This kind of sample is simultaneously an advantage of this study, as well as its limitation. It is a limitation in the sense that it focuses on one generation's perceptions of the issue, but, on the other hand, the sample is an advantage because the generation in question is the one that will mostly bear the burden of climate change and environmental degradation and will be tasked with coming up with solutions to their challenges.

The participants of the study were shown seven branded videos, available online, with environmental messages. The testing was conducted in two parts. In the first part, we tested the participants' brain reactions towards these messages, in order to evaluate the effectiveness of major brands' CSR communications related to the environment, based on the results obtained by EEG. After the participants were shown the aforementioned seven videos and the EEG results were gathered, the second part of the testing was initiated. In the second part of the testing, the participants were asked to rate the commercials on a scale

from 0 to 10 by their likeability based on the participants' subjective explicit perception. This was performed in order to gain self-reporting results that would later be used in a comparison with the results gained by the EEG and eye tracking device. The idea behind this was to examine whether explicit reporting correlates to what the brain activity really reports. The seven videos used were branded video commercials, six of which were from major internationally recognised brands (H&M, Ikea, Coca-Cola, LUSH, Ralph Lauren and Apple) and one from a campaign made by the City of Oslo.

For the purpose of the study, neuro tech was used. The neuro tech used included the eye tracking bar and the electroencephalogram. The eye tracking bar was placed in front of the screen to record where the respondents are looking at. More specifically, the device used was "Tobii Pro X2 30" produced by Tobii Pro AB, Stockholm, Sweden, with a measurement scope of 30 times per second, meaning that the device can register any facial movement and sight changes meaning that the device checks eye movement 30 times each second.

Secondly, an electroencephalogram (EEG) was used. The device was placed on the respondent's head to measure the real implicit brain response to the different messages communicated in the videos. The device used for data collection was "Enobio 20" EEG headset with 20 channels and with a declarative neuro-electric measurement of 500 times per second, manufactured by Neuroelectrics, Barcelona, Catalonia, Spain. A wired communication was established with the computer, securing the reliability of the connection used for EEG data noting and collection. This device was paired with iMotions, a specialised neuro-analytics software manufacture by iMotions, København, Denmark, that integrates and analyses data from different devices, which exhibits high reliability as evidenced in similar studies [48]. Once data are registered and collected, they were transformed into digital form by applying 24-bit ADC with 500 Hz sampling frequency. A standard Neoprene headset, designed specifically for this kind of experiment, was used and placed on the study volunteers' heads. The set contains 20 EEG electrodes placed in different precise head locations following a 10–20 international formulation.

3.2. Metrics Meaning and Interpretation

For the purpose of this study, three indicators were determined as adequate indicators of brain activity and they were identified as the data that had to be registered, noted and interpreted for the purpose of gaining an insight into the brain activity of millennials as well as how the brain reacts to seven selected communicational videos containing messages regarding the environmental practices of the brands. These three indicators were emotional valence, level of brain engagement and cognitive load. Additionally, these three components were identified across the literature as the ones that that influence human behaviour the most [49–51].

3.2.1. Emotional Valence

Emotional valence is best described as a measure of how positive/negative the brain's emotional reaction to the presented stimuli is. As Demaree et al. [52] highlight, "the valence hypothesis postulates that the right hemisphere is specialised for negative emotion and that the left hemisphere is specialised for positive emotion". This means that, although overall emotional processing is generally attributed to the right hemisphere, the experience and expression of positive vs. negative emotions are specialised in different hemispheres, the right and the left, respectively [52]. Within the EEG brainwave measurement practice, the first recorded studies to portray the brain lateralisation of emotional valence were those by Davidson and his associates. For example, Davidson and Fox [53] reported that, in two studies conducted on 10-month-old infants, brain activity showed greater activation of the left frontal area than of the right, in response to video segments portraying happy facial expressions.

Emotional valence in brain lateralisation is usually evaluated by using an EEG in experimental conditions, measuring the frontal asymmetric activation of alpha brainwaves [54].

The hypothesis is that, if one hemisphere shows a higher activation of alpha brainwaves, then the other is more prominent since alpha waves, or oscillations, are believed to indicate inhibition of the cortical unction [55]. Thus, the high alpha activation of one hemisphere during an exposure to stimuli means a higher inhibition of this hemisphere, so the other hemisphere is subsequently more dominant emotionally.

Valence is the first and foremost KPI among all since it indicates the automatic acceptance or rejection of the brain toward the observed stimuli, in this case toward the video material that participating millennials were shown. The primary goal of a brand is to evoke the most positive valence as possible, meaning that, the higher the result, the more successful the brand was in creating the content, judged by the measurement of the level of acceptance and likability. In this specific study, it was judged by the level of acceptance and likability of the brands' videos among millennials.

3.2.2. Level of Brain Engagement

The second indicator measures the extent to which the brain is interested in or focused on the content to which it is exposed. In a sense, this measure can be also interpreted as how many of its resources the brain dedicates to the stimuli or how much the brain finds the stimulus "worth" of its attention. Taking into account that the brain represents, on average, just 2% of the human body mass, but that it consumes 20% of the body's available oxygen and 25% of the body's available energy in glucose [56], it becomes evident that one of the brain's main priorities is to manage energy effectively and efficiently in order to make sure it preserves energy for the actions that are predicted to be soon executed [57]. Thus, neural engagement is an indicator of a stimulus' importance from the brain's perspective.

In this study, brain engagement for the task of watching the selected videos was measured by using the engagement index that utilises beta, alpha and theta brainwaves in the following way: Beta/(Alpha + Theta) [58]. Those brainwaves are typically monitored for task engagement on frontal, central and parietal skull locations [59].

It is worth noting that, although higher engagement is generally the preferred outcome since it signifies the brain's neural investment towards a stimulus, it might actually be a negative insight regarding a video, banner, TVC or any other marketing stimulus if this heightened neural focus is accompanied by a negative valence at points that should evoke likability and more positive emotions. Such a combination would mean that the brain does not like some things that it finds as very important.

3.2.3. Cognitive Load

The third indicator represents the measure best described as how hard the brain needs to work in order to effectively process the stimuli to which it was exposed. In separating human memory systems into long-term memory and short-term, or working, memory, the relevant literature suggests that the latter is limited in its capacity to process and withhold information at any given time [60]. Thus, the working memory load, or cognitive load, is defined as a multidimensional construct representing the load, or effort, that a specific task imposes on participants [61]. In essence, this cognitive workload measure indicates the interaction between task processing requirements and human capabilities or mental resources [62].

The measurements of the cognitive load have been traditionally performed through computational, subjective, efficiency, second task and physiological methods with advantages and disadvantages for each method [58]. However, measuring the cognitive load through psychophysiological methods, such as an EEG, provides the ability for increased sensitivity to unpredictable changes in cognitive load during task exposure in a timeframe of milliseconds, making those methods very useful [63].

In this study, cognitive load is measured with an EEG through the monitoring of the relative change of two brainwaves, namely alpha at the parietal areas and theta at the frontal ones, since those two have already been identified in previous research as the most appropriate for revealing brain responses to task difficulty [64]. As Antonenko et al. [64]

highlight, the "measurement of the changes in the alpha and theta brain wave rhythms reflects what is happening in the participant".

Although it is generally agreed that a higher load is negative and a lower load is positive, this is not always as clear as it seems, since in some cases a higher mental load can be instrumental in understanding and performing a task optimally [65]. The rule of thumb of high cognitive load, indicating the need for more cognitive resources to process messages effectively from the tested videos, and of a low cognitive load, indicating a lower demand on cognitive resources for stimuli processing, is maintained in this study. However, it should be noted that a score combining high positive valence, high engagement and a high cognitive load might not be a priori inferior to one with low cognitive load, with the former signifying the necessary overwork of mental resources to better internalise a demanding message.

The rule of thumb of high cognitive load, indicating the need for more cognitive resources to process messages effectively from the tested videos, and of low cognitive load, indicating a lower demand on cognitive resources for stimuli processing, is maintained in this study.

3.2.4. EEG Calibration and Data Presentation

Data collected by using an EEG headset can vary significantly between different members of the sample group because the exact brain activity, as recorded in brainwave reaction to a task, of each person can follow different patterns. As He and Wu [66] summarised: "Because of individual differences, algorithms trained on auxiliary subjects may not be directly applied to a new subject, because people show different neural responses even in the same task. Therefore, BCI systems (Brain Computer Interface systems) usually need to be calibrated before each use . . . ". In this study, the calibration of the EEG headset required five minutes of recording prior to the execution of the tasks by participants, with equal intervals of rest and non-rest mental states.

One of the main goals of the EEG calibration was to create a baseline of brain activity for every participant, in order for the reported data to showcase the net distance of the recorded scores from these baselines and not the actual overall brain activity, which can vary significantly, rendering data from different participants incomparable. This means that the scores reported below represent the relative performance of each variable from the calculated baseline. Simply put, the scores show the net impact of the tested videos on the participants' brains in the three variables, with "0" being the baseline and recorded scores being the average change of the measurement due to watching the tested videos, on a scale of 0 to 10. Five, the middle of the scale, for valence, represents the neutral emotional score. Below 5 valence is negative while above is positive. For neural brain engagement and cognitive load, five represents the benchmark score. The EEG results were calculated for all three indicators per second of exposure and overall, for each video.

4. Results

In this part of the paper, the results and data obtained by the study, based on all three indicators (emotional valence, level of brain engagement and cognitive load) will be presented in the following charts, and their interpretations.

4.1. Overall Results

Firstly, Figure 1 presents the aggregated total combined scores for all of the seven videos, for all the participants of the study, for the three indicators. This was calculated in order to obtain an insight into the overall state of the CSR communications today, when environmental messages are in question.

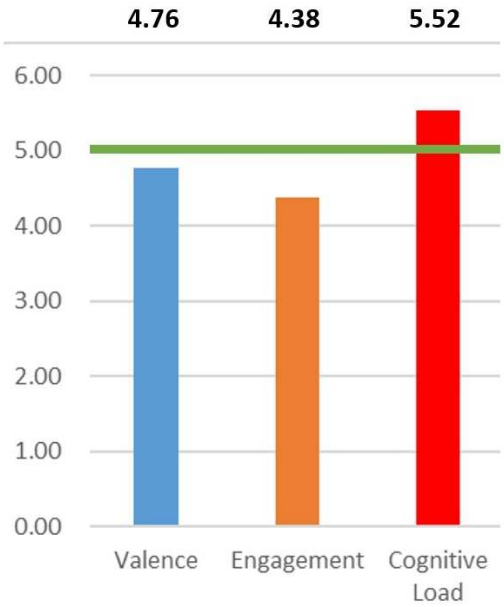

Figure 1. Total combined scores for all of the seven videos.

Secondly, in Figure 2, the idea was to examine all of the seven videos separately in order to gain an insight into whether some brands are performing better than others when communicating the environmental messages in question, when taking into account the specific videos included in this study.

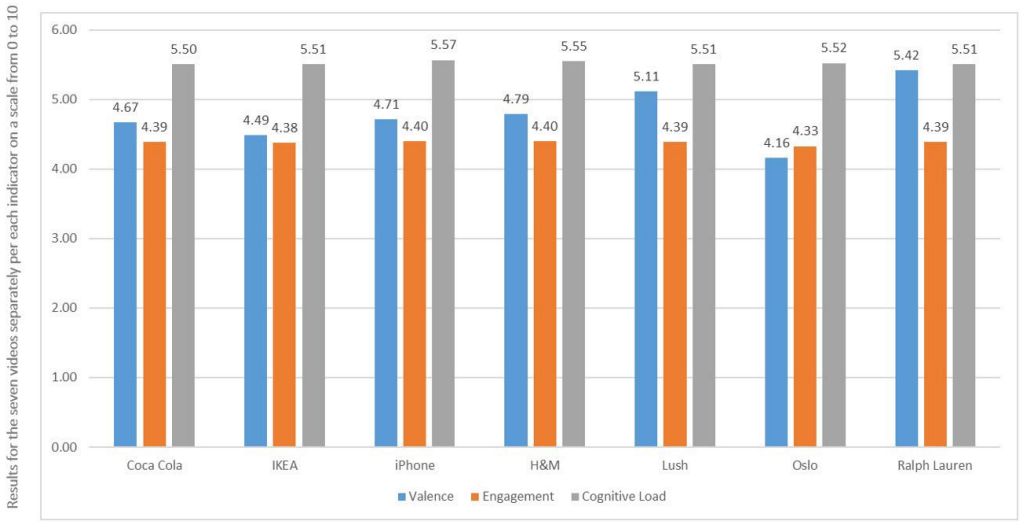

Figure 2. All videos: sata—emotional valence, brain engagement and cognitive load.

The data presented in Figure 2 shows that only 2 videos out of the 7 that were shown to the participants in the study managed to achieve results above 5 by the indicator of emotional valence, meaning that when the likability of the presented content was in question, only 2 videos managed to pass the threshold. The two videos were created by Ralph Lauren and LUSH.

Furthermore, when the values for the indicator measuring the level of importance, that the participants assigned to the videos that were shown to them are considered, the data presented in Figure 2 shows that all seven videos ranked below the value of 4.5. This means that all of the campaigns, when at least their video material is considered, failed to communicate the importance of the issue that they were trying to address, in this case, the environmental challenges.

Additionally, when the values for the indicator measuring the cognitive load of the brain were aggregated, we can observe that the brains of the participating millennials found all videos too demanding for processing, because all videos scored above 5.5 in that area. It can be noted that the CSR videos that address environmental issues have to be less demanding from the perspective of this specific criterion, otherwise they can be rendered less effective in providing engagement from the viewers. In this case, that might even be the fact regarding the scores previously mentioned for the indicator of the level of emotional valence, where only two videos managed to provide positive scores.

On the other hand, it also may be noted that it is more difficult for brains to like CSR videos than usual commercial ads, since the theme of the shown videos mostly concentrated on what individuals should do, rather than what companies should change in their practices. This cause the consumer to feel burdened and lead to the disengagement of the viewers, because they may feel pressured into doing something about the problem, which they feel that they did not cause in the first place. It may even lead to associating environmental change in their behaviour that companies try to evoke as a punishment for them, for something that somebody else caused, and then altogether abandoning the environmental cause in its entirety [67–70].

By considering the values shown in Figure 2, it may be concluded that it is more difficult for brains to perceive CSR videos as important compared to the usual commercial ads. This may be due to the fact that the regular commercial ads do not usually require a change in the behaviour and habits of the viewers [71,72].

Finally, what the data in Figure 2 shows is that it is rather demanding for brains to process CSR videos across the board. In order for people to act on certain issues, their brains demand the cognitive internalisation of the problem at hand. Environmental issues are of a wide range, complicated, interconnected and sometimes even of a counterintuitive nature. Sometimes, engaging in an activity that is considered as an environmentally beneficial action, such as riding a bicycle to work instead of coming by car or public transportation, may cause more environmental harm than good. For instance, travelling to work by bicycle demands a higher caloric intake than travelling by public transport, and that caloric intake has to be compensated for. If that compensation is performed, for example, by eating meat that was shipped from another part of the world, it means that the whole process of the compensation performed has a higher environmental footprint than the choice of travelling to work by car [73]. These are the daily choices that individuals make that seem intuitive, but are complex to understand and explain to them in what used to be the standard operating procedure in creating CSR videos. This leads to the conclusion that some environmental choices are not so simple and have to be addressed better. Furthermore, when corporations are dealing with environmental choices and are engaging on a path of addressing them in their CSR campaigns and especially, as evidenced by this study, when addressing them in their video commercials, they have to do that in a simple, but not simplistic, way. Hence, corporations have to produce material that demands a lesser cognitive load on the brains that they want to influence without losing the depth of meaning they want to convey.

These results answer research questions 1, 2 and 3 directly.

4.2. Results by Gender—Are There Any Differences?

After the overall results were obtained and analysed, the idea of the research was to examine the results based on the declared gender of the participants, and to determine whether gender does play a part when dealing with the issues of the environment. Moreover, the idea was to check if "female" and "male" participants' brains, as voluntarily selected by the participants themselves, demanded different approaches when they are communicated to, through CSR campaign videos communicating environmental issues. None of the respondents refused to declare their gender and none of the participants declared their gender as non-binary.

The difference between the genders was analysed for all seven videos across the three indicators. Figure 3 shows the difference by gender for the indicator of the emotional valence, meaning differences in the likability of the videos among the participants that declared themselves as male or female.

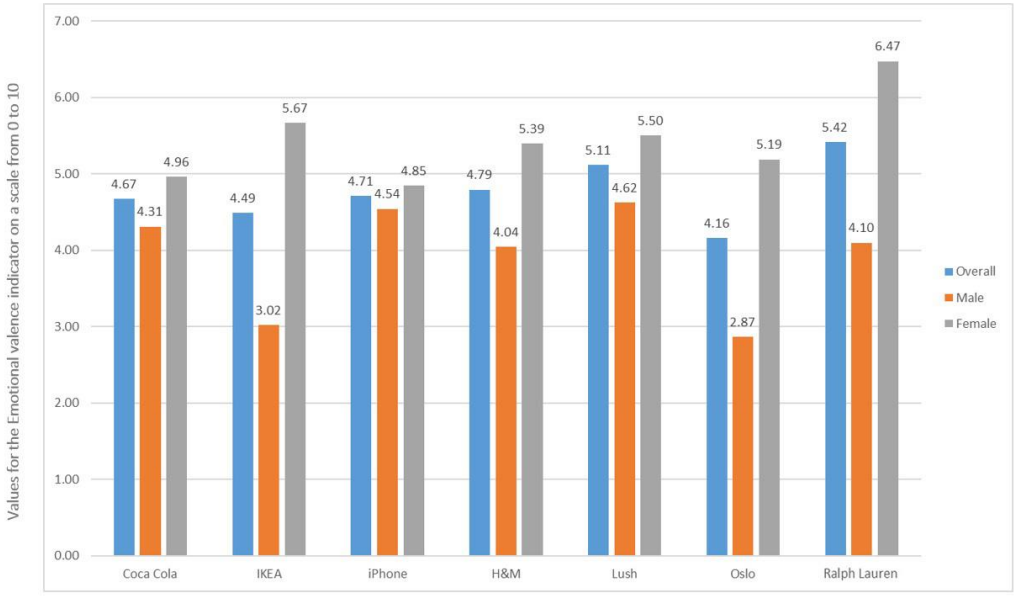

Figure 3. All videos—male/female differences; data—emotional valence.

According to the data obtained and presented in Figure 3, it can be noted that the participants that declared themselves as females scored higher values in terms of the likability in all videos that were shown to the participants. Ralph Lauren, IKEA, LUSH, H&M and OSLO all scored value above five in that order, while only two videos scored a value lower than five among the female gender, those being iPhone and Coca-Cola.

The male participants scored generally low, meaning negative, scores on all the videos on the basis of emotional valence. Additionally, not one video scored above the value five among the male viewers. Specifically, low results were noted among the male participants when the results for the Oslo and Ikea videos were examined, since the difference between male and female viewers for these videos is almost double in value by the criterion of emotional valence. Somewhat better results among the male participants were noted with the LUSH and iPhone videos, but their aggregated results remain below value five.

When examining the literature across the scientific spectrum, these results are in accordance with the notions stated by Ruether [74], Griffin [75] and Merchant [76], which later on became the basis for ecofeminism. Furthermore, the association of feminist theory and its connection to the caring concept continued and was furthered by its connection with the concept of caring for nature as one being closer to the female gender. This was based on the different social roles the genders adopt in different cultural settings, which leads to higher connectivity between the female gender and ecology, the environment and nature. Plumwood [77] and Mellor [78], who later followed, provided an additional backing of the theory. The importance of female involvement in environmental and sustainability issues was additionally explained by Odrowaz-Coates [79] through a prism of feminist political ecology.

Several notations can be made here, according to the obtained results. Firstly, the female participants' brains seemed to be more prone to environmental messages that resulted from the CSR video campaigns of the observed companies when their likability was considered. Additionally, it seems that it was much more difficult for the brains of the male gender to like CSR videos when compared with the female participants' brains.

When the differences in the results of the female participants are examined, it seems that the female participants' brains liked more concrete environmental messages in the

videos that scored above the value of five, than the business-oriented and tech-oriented CSR videos, which were the main theme of Coca-Cola and iPhone videos, respectively.

Finally, it can be noted that the best score for the male participants was registered for the LUSH video. Moreover, this may just be in line with the traditional gender roles, provided by the cultural context that males have in relation to the environment, as noted in the other literature [80]. Objectively, the LUSH video, among others, contained suspense, and it might even be claimed that it employed fear and anger as a means of attracting attention. The use of fear, and even anger, as a tool for attracting attention in marketing and to influence consumers was proved effectively by Böcker et al. [81].

When the factor of brain engagement is examined, the data obtained and presented in Figure 4 show that the male participants' brains scored higher in brain engagement, compared to the female participants' brains in 5 out of 7 videos, while the females showed lower brain engagement, apart from the iPhone and Ralph Lauren videos.

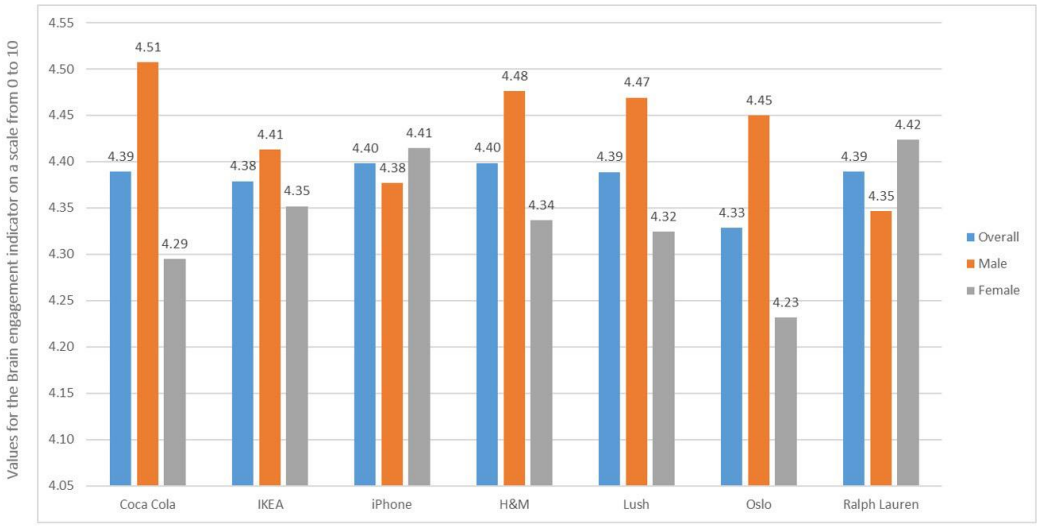

Figure 4. All videos—male/female differences; data—brain engagement.

Consequently, the question that arises is whether it is more difficult for the brains of females to engage with CSR videos than for the brains of males. This can be one of the limitations of this study, because to answer this question with more certainty it has to be addressed in a separate research. This is the mostly case because there is a variety of factors that might be at play. Several of these factors are only previewed within this paper.

Firstly, when considering gender differences regarding the results obtained for the level of brain engagement, it might be that the male participants' brains engaged better than the female participants' brains when viewing business-oriented videos, such as the Coca-Cola video and the H&M video, where males scored the highest (these videos, among other things, explain their new business models as well as its environmental benefits).

Secondly, the third highest scoring video among males was the LUSH video that, as already mentioned, uses a shark as a way to inspire suspense and fear/anger. This may be the case, but it also may be just a collaborative bias towards the general perception of traditional gender roles.

However, it may be that, although females scored significantly higher than males in the likability of these videos as a result of their general theme of environmental protection featuring in all of them, they engage less with video communication in general than male brains [82,83].

Female participants' brains engaged with the tech-oriented video (iPhone) more than males, showing that stereotypes do not always apply. Then, this conclusion has to be a part of a separate study, because males and females do not only respond differently to the theme of the video stimuli, but also when consumer products are in question, as specific products can make a difference in their reception [84]. One of the reasons why the

brain engagement scores among genders had the lowest difference when the iPhone video was examined is that the product itself is aimed towards millennials and has the highest consumer base within that specific age group, hence the iPhone is the object of high interest among millennials, regardless of their gender.

When the third indicator, cognitive load, was examined, the results obtained can be seen in Figure 5 and can lead to several conclusions. Firstly, females had higher brain processing in 5 out of 7 videos, which may mean several things. Once again, it can be that, simply, female brains react differently to video stimuli than male brains on average. Secondly, it may be that, traditionally, the advertisement industry employs more men that tailor communications toward the male audience or that is approved by executive positions, usually taken up by males, rather than females, as evidenced in the study by Crewe and Wang [85]. The latter study addressed these inequalities by examining the state of the advertisement industry in the City of London, which would explain why video communication demands less brain processing by males than females. Thirdly, it can be that females process information differently than males, in terms of both information acquisition and recall, especially from verbal input [86]. So, it can be the case that a higher cognitive load is due to the fact that the females absorb by default more details and information from a message than males concerning main messages, supporting text, storylines and articulated arguments.

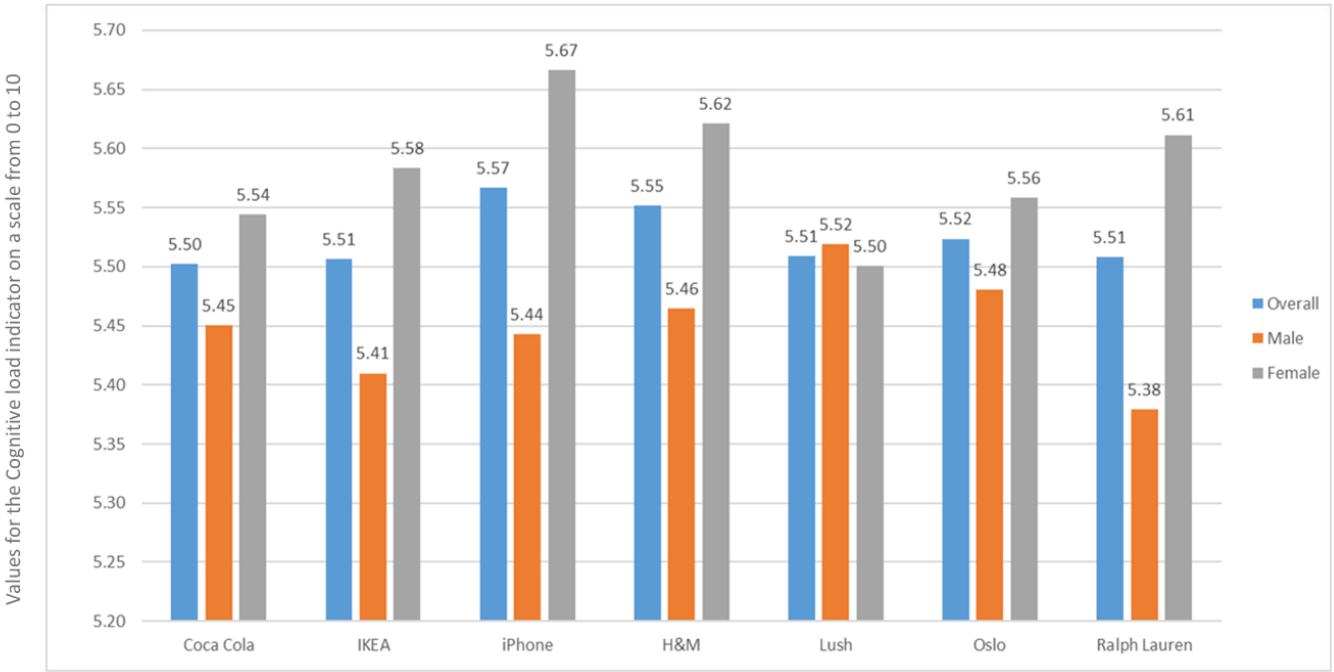

Figure 5. All videos—male/female differences; data—cognitive load.

These results answer research question 4 directly.

4.3. Comparison of Self-Reporting Results to Neuro Results

In regard to the previous results, the aim of the study was to examine how the brains of the participants of the study react to the shown videos and how these scores compare to self-reporting. A questionnaire was administered after the neuro-test examination, for which participants were asked to rate the presented video material on a standard Likert scale with a range from 0 to 10 in order to be comparable with the 0 to 10 scales used in presenting the EEG data.

This was performed in order to check how much our implicit brain and our explicit self-report differ from each other, although the authors of this paper acknowledge that the sample size, although sufficient for neuro research, can be misleading when self-reporting

is in question. Nevertheless, for comparative purposes, it was found that the sample was sufficient to make certain conclusions. This is especially true in the regard that the same participants that underwent an EEG are the ones that underwent the self-reporting study, meaning that they were directly comparable, considering that it still represents the neuro based study of one's implicit brain and one's explicit self. Additionally, for communication to be effective, it has to performed well on both of these levels. Hence, the idea was to examine whether some of the videos succeeded to perform as intended on the viewers' explicit and implicit responses. The comparative results are presented in Table 1.

Table 1. Comparison of self-reporting results to neuro results on likability.

Self-Reporting Ranking	Self-Reporting Scores	Neuro Ranking	Neuro Scores
1. H&M	8.74	1. RL	>5
2. LUSH	8.30	2. LUSH	>5
3. Coca-Cola	7.04	3. iPhone	4.5–5
4. IKEA	6.96	4. Coca-Cola	4.5–5
5. iPhone	6.44	5. H&M	4.5–5
6. Oslo	6.00	6. IKEA	<4.5
7. RL	5.92	7. Oslo	<4.5

The results presented in Table 1 lead to several conclusions. Firstly, judging by the data obtained, the LUSH video can be considered as the most likable video, since it scored highly in both methods, meaning it achieved its planned purpose of reaching the viewers, and, while doing so, it successfully communicated its environmental message on both levels, explicit and implicit. By scoring above 5 on the neuro scale and in the self-reporting scale with a value of 8.30, this makes it the most successful video out of the seven videos that were used in the study.

Secondly, the campaign presented by Ralph Lauren scored the lowest likability on the self-reporting scale, but it seems that the participants' brains beg to differ, since this video scored the highest on the neuro scale. This might be the most interesting result of all, regarding how big of a disparity this video made in the values that the participants explicitly assigned to it, and the values their implicit brain assigned to it.

Thirdly, it can also be noted that the City of Oslo CSR campaign video failed to communicate the desired environmental message, because it scored the lowest on the neuro scale and the second lowest on the self-reporting scale.

Fourthly, it is also interesting to note that what the participants considered to be the best video, the video belonging to H&M, scored quite low on the neuro scale since it was ranked fifth out of the eight videos.

These results answer research question 5 directly.

5. Discussion

Overall, going back to the established research questions, several answers and conclusion have to be discussed.

The first to be discussed is research question 1: do brains really engage with CSR communications?

The brains of the millennials did not engage enough with the CSR videos with an environmental message. This is a very surprising result since the surveys show that people considered CSR in general, and specifically environmentally friendly policies, as very important for their buying decisions [87].

This means that brands fail to create and communicate successfully the content that captures the brain's attention. In fact, the CSR videos in this study scored worse in brain engagement than in the previous neuro tests of TV commercials contacted for commercial neuromarketing purposes by members of our team. Brands have to address the issue and acknowledge the fact that engaging the brain in CSR is not easy, meaning that a fresh approach is needed. One of the solutions for this problem is that more of the studies, similar to this one, have to be conducted, and neuroscience-based testing has to be included during

the creation and the design process of the CSR campaigns, if companies want to succeed in communicating the desired messages, especially when these messages are addressing environmental issues. Consequently, a new approach to CSR has to evolve to CSR 2.0, which will not neglect neuroscience, meaning that it will take into consideration what consumer brains are demanding from the brands. NeuroCSR provides the right tools to achieve this goal.

Secondly, when research question 2 (do brains really like CSR communications?) is analysed, it can be concluded that CSR messages are failing to evoke likeability across the board, or positive motivation in the brains of millennials, when the overall results are checked. Out of the seven branded CSR videos with environmental messages that were tested using neuro methods, only two passed the threshold of positive brain motivation, while five scored negatively. Although the male to female comparison shows that companies are doing a better job when likability is in question among the female viewers, this is still not enough to achieve behavioural change towards environmental conduct, which would lead to a lasting positive change for the betterment of the environment. This is quite an insightful research result.

When the brain activates its negative emotional system, it tends to avoid the messages and situations that caused this, developing negative reactions and distancing behaviours. This raises a question of why brands push millennials away from their CSR communications. Should they not be doing exactly the opposite?

Based on the findings of this study, a more brain-friendly approach in CSR communications is necessary. Otherwise, brands might be doing more harm than good in trying to attract people to their CSR efforts.

Finally, when research question 3 (do brains really understand CSR communications?) is considered, the millennial brain finds the processing of CSR messages very demanding.

The neuro study presented in this paper of branded CSR videos with environmental messages, reveals that they demand a considerable processing effort from the participants' brains. A higher processing load means that more valuable energy is spent by the brain, which can lead to negative associations or even a rejection of the message. This is very worrying, since both likeability and engagement, the other two major neuro variables, scored low results. A low likability, low engagement and high processing load is an adverse combination for CSR communications.

CSR communications have to be re-imagined in ways that would make it easier for the brain to process and absorb the information. Overwhelming audiences with information should stop and the focus has to be shifted towards brain-friendly persuasion.

Simple but emotionally powerful and engaging messages are the key for successful CSR communications.

6. Conclusions

Overall this study provided several insights that are of significant importance for further research as well as for the changes that need to be made in CSR communications in general.

The CSR videos used in this research did not accomplish what they intended to. Overall, they failed in positively impacting the emotions in the brain of the study participants.

Furthermore, based on the results obtained during the research, it can be concluded that the used CSR videos are too demanding for processing, meaning that they fail in establishing a time-efficient understanding among the intended audience. Without an established understanding, it is impossible to achieve the desired impact, let alone behavioural change.

Additionally, the overall scores for the indicator of the level of engagement show that the videos are not as engaging as expected. Failure to engage means failure to evoke interest. Additionally, failure to evoke interest leads to the disengagement and distancing of the participants from the shown content, and it can even lead to the opposite effect where,

instead of increasing their interest for the subject of environmental protection, viewers start caring less, as the subject was presented to them as one of not such a high importance.

The brains of the female participants reacted more positively (emotionally) and this fact was explained within the interpretation of the results, but at the same time they had to use much more of their brain processing power.

The brains of the male participants reacted less positively (emotionally), in regard to the videos, but at the same time they were more engaged than the female brains.

Finally, the results differed significantly when a comparison was made between the implicit brain scores and the explicit answers, which were obtained through interviews.

The results obtained using the interview method show a high level of subjectivity of the study participants' explicit answers. This is not to say that the self-reporting results should be disregarded when creating CSR campaign strategies, but rather that they are not sufficient to ensure the desired outcomes of the CSR campaigns. In order to create successful CSR campaigns, brands need to include neuro based studies of the brain and use them as guidance for their communications.

In regard to the limitations of this study, several have to be noted and have been recognised as directions of future research.

Firstly, the scope of the study was limited to one generation in particular. They were chosen as the participants of the study as the generation that was stranded at the frontier of the global climate and environmental challenge. This is far from saying that this is the only generation impacted by these issues. Hence, the future research should include other generations as well, especially generation Z, and in due time generation Alpha.

Secondly, the study was limited by the authors' discretion to the selected seven videos, because conducting the study that would cover all the CSR videos that were in circulation would be physically impossible, due to their quantity as well as due to the authors' resource limitations. This led the authors to select the seven videos that would cover as broad a scope as possible. The aim was to include videos that would cover all of the mentioned environmental change drivers. Hence, the seven videos chosen included the government sector and policy makers with their CSR campaigns, such as the Oslo campaign, and different branches of industry. From the IT sector, Apple was selected, H&M and Ralph Lauren were selected as the representatives of the fashion industry, LUSH as a representative of the cosmetics industry and IKEA as one of the leading home furnishing retailers. It would be interesting to see similar studies conducted in specific branches of industries, or the study that would compare different governmental approaches to CSR campaign videos around the world.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Video A1: COCA-COLA, available online at https://www.youtube.com/watch?v=MD6ORHLbaAA, accessed on 15 June 2020;
Video A2: IKEA, available online at https://www.youtube.com/watch?v=NqFQ3aquBsY, accessed on 15 June 2020;

Video A3: APPLE, available online at https://www.youtube.com/watch?v=BojVVZod8qo, accessed on 15 June 2020;
Video A4: H&M, available online at https://www.youtube.com/watch?v=7i4JSzB8VlU, accessed on 15 June 2020;
Video A5: LUSH COSMETICS, available online at https://www.youtube.com/watch?v=cxDgMktHPfo, accessed on 15 June 2020;
Video A6: OSLO, available online at https://www.youtube.com/watch?v=M2G_hvIrrKk, accessed on 15 June 2020;
Video A7: RALPH LAUREN available online https://www.youtube.com/watch?v=sK_8898E2VY, accessed on 15 June 2020.

References

1. Ferreira, I.; Van Der Horst, K.; Wendel-Vos, W.; Kremers, S.; Van Lenthe, F.J.; Brug, J. Environmental correlates of physical activity in youth—A review and update. *Obes. Rev.* **2007**, *8*, 129–154. [CrossRef] [PubMed]
2. Arnold, H.E.; Cohen, F.G.; Warner, A. Youth and Environmental Action: Perspectives of Young Environmental Leaders on Their Formative Influences. *J. Environ. Educ.* **2009**, *40*, 27–36. [CrossRef]
3. Schusler, T.M.; Krasny, M.E. Environmental Action as Context for Youth Development. *J. Environ. Educ.* **2010**, *41*, 208–223. [CrossRef]
4. Priesemann, V.; Brinkmann, M.M.; Ciesek, S.; Cuschieri, S.; Czypionka, T.; Giordano, G.; Gurdasani, D.; Hanson, C.; Hens, N.; Iftekhar, E.; et al. Calling for pan-European commitment for rapid and sustained reduction in SARS-CoV-2 infections. *Lancet* **2021**, *397*, 92–93. [CrossRef]
5. Zhao, J. Reimagining Corporate Social Responsibility in the Era of COVID-19: Embedding Resilience and Promoting Corporate Social Competence. *Sustainability* **2021**, *13*, 6548. [CrossRef]
6. Leonard, H.J.; Leonard, H.J.L. *Pollution and the Struggle for the World Product: Multinational Corporations, Environment, and International Comparative Advantage*; Cambridge University Press: Cambridge, UK, 1988.
7. Stern, P.C. Understanding individuals' environmentally significant behavior. *Environ. Law Rep. News Anal.* **2005**, *35*, 10785.
8. Jenkins, H. Small Business Champions for Corporate Social Responsibility. *J. Bus. Ethics* **2006**, *67*, 241–256. [CrossRef]
9. Popescu, G.H. The role of multinational corporations in global environmental politics. *Econ. Manag. Financ. Mark.* **2016**, *11*, 72–78.
10. Ćirović, M.; Petrović, N.; Milenković, N. Environmental Awareness and Causal Behavioural Patterns—Why Do We Make "Wrong" Environmental Choices? In Proceedings of the 38. Mednarodna Konferenca O Razvoju Organizacijskih Znanosti, Portorož, Slovenija, 20 March 2019; p. 177.
11. Van Neuss, L. The drivers of structural change. *J. Econ. Surv.* **2019**, *33*, 309–349. [CrossRef]
12. Botero, C.A.; Weissing, F.J.; Wright, J.; Rubenstein, D.R. Evolutionary tipping points in the capacity to adapt to environmental change. *Proc. Natl. Acad. Sci. USA* **2015**, *112*, 184–189. [CrossRef]
13. Rockström, J.; Steffen, W.; Noone, K.; Persson, Å.; Chapin, F.S., III; Lambin, E.; Foley, J.; Folke, C.; Schellnhuber, H.J.; Nykvist, B.; et al. Planetary boundaries: Exploring the safe operating space for humanity. *Ecol. Soc.* **2009**, *14*, 1–33. [CrossRef]
14. Steffen, W.; Richardson, K.; Rockström, J.; Cornell, S.E.; Fetzer, I.; Bennett, E.M.; Sörlin, S. Planetary boundaries: Guiding human development on a changing planet. *Science* **2015**, *347*, 1259855. [CrossRef] [PubMed]
15. Burgess, J.; Harrison, C.M.; Filius, P. Environmental Communication and the Cultural Politics of Environmental Citizenship. *Environ. Plan. A Econ. Space* **1998**, *30*, 1445–1460. [CrossRef]
16. Diedring, K. Framing Environmental Messages: Examining Audience Response to Humor, Shock, and Emotional Treatments. Ph.D. Thesis, University of South Florida, Tampa, FL, USA, 2008.
17. Bertolotti, M.; Catellani, P. Going Green, but Staying in the Black: How Framing Impacts the Agreement with Messages on the Economic Consequences of Environmental Policies. *Front. Psychol.* **2021**, *12*, 1192. [CrossRef] [PubMed]
18. Yin, C.; Zhang, Y.; Lu, L. Employee-Oriented CSR and Unethical Pro-Organizational Behavior: The Role of Perceived Insider Status and Ethical Climate Rules. *Sustainability* **2021**, *13*, 6613. [CrossRef]
19. Shrivastava, P. The role of corporations in achieving ecological sustainability. *Acad. Manag. Rev.* **1995**, *20*, 936–960. [CrossRef]
20. Rogers, K.S. Ecological security and multinational corporations. *Environ. Chang. Secur. Proj. Rep.* **1997**, *3*, 29–36.
21. Simmons, C. Will you be on our board of directors? We need help: Media corporations, environmental change, and resource dependency theory. *J. Mass Commun. Q.* **2012**, *89*, 55–72. [CrossRef]
22. Lewin, L.D.; Warren, D.E.; Alsuwaidi, M. Does CSR make better citizens? The influence of employee CSR programs on employee societal citizenship behavior outside of work. *Bus. Soc. Rev.* **2020**, *125*, 271–288. [CrossRef]
23. Sen, S.; Bhattacharya, C. Does Doing Good Always Lead to Doing Better? Consumer Reactions to Corporate Social Responsibility. *J. Mark. Res.* **2001**, *38*, 225–243. [CrossRef]
24. Newell, P.; Frynas, J.G. Beyondcsr? Business, poverty and social justice: An introduction. *Third World Q.* **2007**, *28*, 669–681. [CrossRef]
25. Bowen, H.R. *Social Responsibilities of the Businessman*; University of Iowa Press: Iowa City, IA, USA, 2013.

26. Kotler, P.; Lee, N. Best of Breed: When it Comes to Gaining a Market Edge While Supporting a Social Cause, "Corporate Social Marketing" Leads the Pack. *Soc. Mark. Q.* **2005**, *11*, 91–103. [CrossRef]
27. Sheehy, B. Defining CSR: Problems and Solutions. *J. Bus. Ethics* **2015**, *131*, 625–648. [CrossRef]
28. Borelli, C. The Commitment to Art as a Corporate Strategic Decision. Master's Thesis, Double Degree, LUISS Guido Carli University, Rome, Italy, Italy and Paris Dauphine University, Paris, France, 2019.
29. Sánchez-Teba, E.M.; Benítez-Márquez, M.D.; Bermúdez-González, G.; Luna-Pereira, M.D.M. Mapping the Knowledge of CSR and Sustainability. *Sustainability* **2021**, *13*, 10106. [CrossRef]
30. Carroll, A.B. The pyramid of corporate social responsibility: Toward the moral management of organizational stakeholders. *Bus. Horiz.* **1991**, *34*, 39–48. [CrossRef]
31. Kotler, P.; Lee, N. *Corporate Social Responsibility: Doing the Most Good for Your Company and Your Cause*; John Wiley & Sons: New York, NY, USA, 2008.
32. Wu, Q.; Cherian, J.; Samad, S.; Comite, U.; Hu, H.; Gunnlaugsson, S.B.; Oláh, J.; Sial, M.S. The Role of CSR and Ethical Leadership to Shape Employees' Pro-Environmental Behavior in the Era of Industry 4.0. A Case of the Banking Sector. *Sustainability* **2021**, *13*, 9773. [CrossRef]
33. Sheehy, B. Understanding CSR: An empirical study of private regulation. *Monash Univ. Law Rev.* **2012**, *38*, 103–127.
34. Zaltman, G. *How Customers Think: Essential Insights into the Mind of the Market*; Harvard Business Press: Boston, MA, USA, 2003.
35. Nease, B. *The Power of Fifty Bits: The New Science of Turning Good Intentions into Positive Results*; HarperCollins: New York, NY, USA, 2016.
36. Koenig-Robert, R.; Pearson, J. Decoding the contents and strength of imagery before volitional engagement. *Sci. Rep.* **2019**, *9*, 3504. [CrossRef]
37. Lin, M.H.J.; Cross, S.N.; Jones, W.J.; Childers, T.L. Applying EEG in consumer neuroscience. *Eur. J. Mark.* **2018**, *52*, 66–91. [CrossRef]
38. Barnett, S.B.; Cerf, M. A ticket for your thoughts: Method for predicting content recall and sales using neural similarity of moviegoers. *J. Consum. Res.* **2017**, *44*, 160–181.
39. Hazlett, R.L.; Hazlett, S.Y. Emotional response to television commercials: Facial EMG vs. self-report. *J. Advert. Res.* **1999**, *39*, 7–23.
40. Meier, S.; Cassar, L. Stop talking about how CSR helps your bottom line. *Harv. Bus. Rev.* **2018**, *31*, 1–6.
41. Hopkins, M. CSR and international development. In *CSR and Sustainability*; Routledge: London, UK, 2017; pp. 60–79.
42. Chae, M.-J. Driving Consumer Engagement through Diverse Calls to Action in Corporate Social Responsibility Messages on Social Media. *Sustainability* **2021**, *13*, 3812. [CrossRef]
43. Dimock, M. Defining generations: Where Millennials end and Generation Z begins. *Pew Res. Cent.* **2019**, *17*, 1–7.
44. Telpaz, A.; Webb, R.; Levy, D.J. Using EEG to Predict Consumers' Future Choices. *J. Mark. Res.* **2015**, *52*, 511–529. [CrossRef]
45. Gordon, R.; Ciorciari, J.; Van Laer, T. Using EEG to examine the role of attention, working memory, emotion, and imagination in narrative transportation. *Eur. J. Mark.* **2018**, *52*, 92–117. [CrossRef]
46. Khushaba, R.N.; Wise, C.; Kodagoda, S.; Louviere, J.; Kahn, B.E.; Townsend, C. Consumer neuroscience: Assessing the brain response to marketing stimuli using electroencephalogram (EEG) and eye tracking. *Expert Syst. Appl.* **2013**, *40*, 3803–3812. [CrossRef]
47. Bazzani, A.; Ravaioli, S.; Trieste, L.; Faraguna, U.; Turchetti, G. Is EEG Suitable for Marketing Research? A Systematic Review. *Front. Neurosci.* **2020**, *14*, 1343. [CrossRef]
48. Kulke, L.; Feyerabend, D.; Schacht, A. A Comparison of the Affectiva iMotions Facial Expression Analysis Software with EMG for Identifying Facial Expressions of Emotion. *Front. Psychol.* **2020**, *11*, 329. [CrossRef]
49. Berggren, N.; Koster, E.; Derakhshan, N. The effect of cognitive load in emotional attention and trait anxiety: An eye movement study. *J. Cogn. Psychol.* **2012**, *24*, 79–91. [CrossRef]
50. Chen, S.; Epps, J. Automatic classification of eye activity for cognitive load measurement with emotion interference. *Comput. Methods Programs Biomed.* **2013**, *110*, 111–124. [CrossRef] [PubMed]
51. Lambert, S.; Dimitriadis, N.; Taylor, M.; Venerucci, M. Understanding emotional empathy at postgraduate business programmes: What does the use of EEG reveal for future leaders? *High. Educ. Ski. Work-Based Learn.* **2021**, *11*, 1180–1191. [CrossRef]
52. Demaree, H.; Everhart, D.; Youngstrom, E.; Harrison, D.W. Brain Lateralization of Emotional Processing: Historical Roots and a Future Incorporating "Dominance". *Behav. Cogn. Neurosci. Rev.* **2005**, *4*, 3–20. [CrossRef] [PubMed]
53. Davidson, R.J.; Fox, N.A. Asymmetrical Brain Activity Discriminates Between Positive and Negative Affective Stimuli in Human Infants. *Science* **1982**, *218*, 1235–1237. [CrossRef] [PubMed]
54. Palmiero, M.; Piccardi, L. Frontal EEG Asymmetry of Mood: A Mini-Review. *Front. Behav. Neurosci.* **2017**, *11*, 224. [CrossRef]
55. Sikka, P.; Revonsuo, A.; Noreika, V.; Valli, K. EEG Frontal Alpha Asymmetry and Dream Affect: Alpha Oscillations over the Right Frontal Cortex during REM Sleep and Presleep Wakefulness Predict Anger in REM Sleep Dreams. *J. Neurosci.* **2019**, *39*, 4775–4784. [CrossRef]
56. Dimitriadis, N.; Psychogios, A. *Neuroscience for Leaders: Practical Insights to Successfully Lead People and Organizations*; Kogan Page Publishers: London, UK, 2020.
57. Hutchinson, J.B.; Barrett, L.F. The Power of Predictions: An Emerging Paradigm for Psychological Research. *Curr. Dir. Psychol. Sci.* **2019**, *28*, 280–291. [CrossRef]

58. McMahan, T.; Parberry, I.; Parsons, T.D. Evaluating Player Task Engagement and Arousal Using Electroencephalography. *Procedia Manuf.* **2015**, *3*, 2303–2310. [CrossRef]
59. Berka, C.; Levendowski, D.J.; Lumicao, M.N.; Yau, A.; Davis, G.; Zivkovic, V.T.; Olmstead, R.E.; Tremoulet, P.D.; Craven, P.L. EEG correlates of task engagement and mental workload in vigilance, learning, and memory tasks. *Aviat. Space Environ. Med.* **2007**, *78*, B231–B244.
60. Kalyuga, S. Knowledge elaboration: A cognitive load perspective. *Learn. Instr.* **2009**, *19*, 402–410. [CrossRef]
61. Haapalainen, E.; Kim, S.; Forlizzi, J.F.; Dey, A.K. Psycho-physiological measures for assessing cognitive load. In Proceedings of the 12th ACM International Conference on Ubiquitous Computing, Copenhagen, Denmark, 26–29 September 2010; pp. 301–310.
62. Sweller, J.; Ayres, P.; Kalyuga, S. Measuring Cognitive Load. In *Cognitive Load Theory*; Explorations in the Learning Sciences, Instructional Systems and Performance Technologies; Springer: New York, NY, USA, 2011; Volume 1. [CrossRef]
63. Nuamah, J.; Seong, Y.; Yi, S. Electroencephalography (EEG) classification of cognitive tasks based on task engagement index. In Proceedings of the 2017 IEEE Conference on Cognitive and Computational Aspects of Situation Management (CogSIMA), Savannah, GA, USA, 27–31 March 2017; pp. 1–6.
64. Antonenko, P.; Paas, F.; Grabner, R.; Van Gog, T. Using Electroencephalography to Measure Cognitive Load. *Educ. Psychol. Rev.* **2010**, *22*, 425–438. [CrossRef]
65. De Jong, T. Cognitive load theory, educational research, and instructional design: Some food for thought. *Instr. Sci.* **2010**, *38*, 105–134. [CrossRef]
66. He, H.; Wu, D. Channel and Trials Selection for Reducing Covariate Shift in EEG-based Brain-Computer Interfaces. In Proceedings of the 2019 IEEE International Conference on Systems, Man and Cybernetics (SMC), Bari, Italy, 6–9 October 2019; pp. 3635–3640.
67. Tokar, B. *Earth for Sale: Reclaiming Ecology in the Age of Corporate Greenwash*; South End Press: Boston, MA, USA, 1997.
68. Buchholz, R.A. Corporate responsibility and the good society: From economics to ecology. *Bus. Horiz.* **1991**, *34*, 19–31. [CrossRef]
69. Haq, G.; Cambridge, H.; Owen, A. A targeted social marketing approach for community pro-environmental behavioural change. *Local Environ.* **2013**, *18*, 1134–1152. [CrossRef]
70. Kurtycz, A. Understanding environmental behavioural change through communication: A new perspective of environmental education. *Int. J. Environ. Sustain. Dev.* **2005**, *4*, 35. [CrossRef]
71. Skard, S.; Thorbjørnsen, H. Is Publicity Always Better than Advertising? The Role of Brand Reputation in Communicating Corporate Social Responsibility. *J. Bus. Ethics* **2014**, *124*, 149–160. [CrossRef]
72. Kao, T.-F.; Tu, J.-C. Research on Corporate Social Responsibility Advertising Design. In *Sustainability through Innovation in Product Life Cycle Design*; Springer: Singapore, 2017; Volume 2, pp. 367–381.
73. Matsumoto, S. The Opportunity Cost of Pro-Environmental Activities: Spending Time to Promote the Environment. *J. Fam. Econ. Issues* **2013**, *35*, 119–130. [CrossRef]
74. Ruether, R.R. *New Woman, New Earth: Sexist Ideologies and Human Liberation*; Seabury Press: New York, NY, USA, 1975; p. 11336.
75. Griffin, S. *Woman and Nature: The Roaring inside Her*; The Women's Press: London, UK, 1978.
76. Merchant, C. Earthcare: Women and the Environment. *Environ. Sci. Policy Sustain. Dev.* **1981**, *23*, 6–40. [CrossRef]
77. Plumwood, V. *Feminism and the Mastery of Nature*; Routledge: London, UK, 2002.
78. Mellor, M. Ecofeminism: Linking Gender and Ecology. In *The SAGE Handbook of Environment and Society*; SAGE Publications Ltd.: London, UK, 2007; pp. 66–77.
79. Odrowaz-Coates, A. Definitions of Sustainability in the Context of Gender. *Sustainability* **2021**, *13*, 6862. [CrossRef]
80. McCright, A.M.; Dunlap, R.E. Bringing ideology in: The conservative white male effect on worry about environmental problems in the USA. *J. Risk Res.* **2013**, *16*, 211–226. [CrossRef]
81. Böcker, K.; Baas, J.; Kenemans, J.; Verbaten, M. Stimulus-preceding negativity induced by fear: A manifestation of affective anticipation. *Int. J. Psychophysiol.* **2001**, *43*, 77–90. [CrossRef]
82. Hamann, S.; Herman, R.A.; Nolan, C.L.; Wallen, K. Men and women differ in amygdala response to visual sexual stimuli. *Nat. Neurosci.* **2004**, *7*, 411–416. [CrossRef] [PubMed]
83. Kerkhoven, A.H.; Russo, P.; Land-Zandstra, A.; Saxena, A.; Rodenburg, F.J. Gender Stereotypes in Science Education Resources: A Visual Content Analysis. *PLoS ONE* **2016**, *11*, e0165037. [CrossRef] [PubMed]
84. Verma, S. Do Consumers Respond Differently to Advertising Stimuli: An Empirical Study. *South Asian J. Manag.* **2009**, *16*, 71–85.
85. Crewe, L.; Wang, A. Gender inequalities in the City of London advertising industry. *Environ. Plan. A Econ. Space* **2018**, *50*, 671–688. [CrossRef]
86. Ragland, J.; Coleman, A.; Gur, R.C.; Glahn, D.C.; Gur, R.E. Sex differences in brain-behavior relationships between verbal episodic memory and resting regional cerebral blood flow. *Neuropsychologia* **2000**, *38*, 451–461. [CrossRef]
87. Cox, T.A. *How Corporate Social Responsibility Influences Buying Decisions*; Cllutch: Washington, DC, USA, 2019.