Neuropsychological Trends

27
April 2020

Sustainability in the fashion luxury branding. Using neuroscience to understand consumers' intentions towards sustainable eco-luxury items

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ABSTRACT

The main aim of the present study was to analyze implicit consumers' responses to sustainability issues in a luxury fashion context, during the customer exploration of the store (in-store condition) of a well-known British fashion brand. Cortical EEG activity was assessed in 16 fashion-luxury consumers with a different sustainability orientation, in order to obtain insight on implicit dynamic towards eco-luxury products. Functional meaning of difference frequency EEG bands was analyzed to gain an insight on cognitive and emotional neurophysiological responses. Results highlighted an increase of theta band in right temporo-parietal brain regions suggesting an emotional negative impact elicited by sustainability pictures. Specifically, this effect was higher in the group of non-sustainability-oriented people, perhaps depending on the novelty of the stimuli either a lower sensitivity to social and environmental impact of fashion luxury industry. This study provides initial evidence about cortical oscillations and implicit emotional responses in luxury consumers during stimulation with sustainable images.

Keywords: sustainability; fashion industry; EEG; eco-luxury; consumer behaviour

1. Introduction

Today the fashion industry is quickly developing due to the increasingly frequent demands of the population, gaining success and popularity, yet additionally producing new social, environmental and economic issues which need to be addressed through worldwide arrangements. This industry is one of the major contributors to problems of social and environmental sustainability (Pedersen & Andersen, 2015).

In fact, the whole development process of a clothing item in the clothing supply chain (i.e. from the materials to the disposal, through fabric and garment production, distribution, retail and use), deals with various sustainability challenges. The last may be social (e.g. working conditions, sweatshops, child labor, labor rights, different types of risk, animal welfare) or environmental (e.g. greenhouse gas emissions, water use, toxicity, energy use) (Pedersen & Gwozdz, 2014). Their impact is highly enhanced by the exponential increase in the daily consumption of apparel and more and more fashion companies are committed to implement new sustainable practices (Joy, Sherry, Venkatesh, Wang, & Chan, 2012; Khurana & Ricchetti, 2016). Moreover, complex interconnections between sustainability issues and luxury branding have been found by studies investigating a parallel between sustainable fashion and luxury brands (Joy et al., 2012).

Regarding customers, literature pointed out that it seems they have understood the significant advantages of being sustainable and the negative consequences that unsustainable activities and practices can bring into their future. Consequently, they are more aware compared to the past and they positively adhere to environmental and social sustainable initiatives pursued by luxury fashion brands (Steinhart, Ayalon, & Puterman, 2013). Nonetheless the purchase of sustainable luxury products is still characterized by significant obstacles including their accessibility and costs, design and also the fact that consumers do not want to sacrifice esthetic attributes in favor of ethical ones.

Still, at present customers' expectations and unspoken relevant factors which lead them to prefer sustainable luxury products have been largely unexplored (Kapferer & Michaut, 2015). Recently an absence of research combining the social cognitive neuroscience field and sustainability management and practices has been highlighted by McDonald (2018), however this author also proposed possible future directions and practical strategies to fill this gap. With this mind, we developed this study with the main intention of deepening the knowledge, firstly, on the field of sustainability within the luxury industry and, secondly, on the eco-luxury consumers' implicit intentions by means of applying neuroscience tools. A well-known British fashion brand which has sustainability and eco-luxury products at the core of its business has been involved in this project. This organization defines itself as a vegetarian luxury firm which abstains utilizing or killing animals

for fashion business purposes. This distinguishes this organization in an industry where using fur and leather is very popular. Accordingly, its mission is to accomplish a responsible and legitimate business with respect to the Planet, the animals and people on it. The brand is aware of its qualities and possibilities, yet additionally of its shortcomings, conveying what is done and what needs to be done to operate in a manner which respects the environment and sustainable practices.

To our knowledge, before only one study investigated neural processes during passive viewing of emotionally significant pictures of branded products and electrophysiological findings suggested that luxury brands attracted more sustained motivated attention than the basic brands, specifically when in presence of another person (Pozharliev, Verbeke, Van Strien, & Bagozzi, 2015). Nevertheless electroencephalography (EEG) can be considered as a useful tool to provide quick and detailed insights on consumers' brain activity. Indeed, it has a time resolution of milliseconds related to the electrical activity generated mainly on the cortical structures of the brain, moreover, EEG devices are relatively inexpensive and easy-to-use if compared to other techniques (such as magnetoencephalography). For this reason, within the neuromarketing field previous studies exploited the potential of EEG recordings and cortical oscillations (through frequency band analysis), investigating their functional meaning in relation to various marketing contexts, such as product choice condition, TV advertising presentation or more ecological situation as in-store consumer's experience (Balconi, Stumpo, & Leanza, 2014; Vecchiato et al., 2011).

In this study, we decided to apply the EEG technique on a sample of fashion luxury consumers, with a different degree of interest in sustainability issues. Our main objective was to investigate differences in subjects' cortical activity related to stimuli about sustainability issues, in order to obtain an insight on implicit dynamic towards eco-luxury products. Pattern of cortical activity related to cognitive and emotional aspects towards sustainable pictures was hypothesized for subjects focused on sustainability than for subjects not focused on sustainability.

2. Method

2.1 Sample

The sample included 16 healthy italian female participants (M = 25.94; SD = 6.98) identified as fashion and luxury subjects. None of them presented cognitive deficits and they all had normal or corrected-to-normal vision No history of psychiatric or neurological impairments was observed and the presence of other deficits on perceptive or cognitive levels was excluded. Two different groups of participants were

created according to their sensitivity towards sustainability issues: a first group of eight females (M = 28.87; SD = 9.12) focused on sustainability (Sustainable Group, SG); a group of eight (M = 30; SD = 1.19) not oriented on sustainability issues (Non-Sustainable Group, NSG). The study has been designed following the principles of the Declaration of Helsinki. Informed written consent was obtained at the beginning of the study. Procedures and methods were approved by the Ethics Committee where the work was carried out.

2.2 Procedure and materials

During the experimental phase participants were seated on a chair in a dimly lit room in-store facing a computer monitor (distance: 70 cm). The material consisted of 10 pictures depicting topics related to sustainability: five were focused on environmental and five on social sustainability issues (Figure 1). Order, duration of presentation and the size of each picture were controlled (14 cm x 10 cm): they were displayed randomly to the participants for 6 seconds, with an inter-stimulus interval of 8 seconds. They were presented using E-Prime 2.0 software (Psychology Software Tools Inc., Sharpsburg, PA, USA) running on a personal computer with a 15-inch screen. Participants were asked to observe each stimulus during EEG cortical activity recording, and to watch the images for the entire time of exposure. Three minutes of resting baseline was registered at the beginning of the experiment, before the picture series.

Figure 1. Examples of stimuli depicting environmental (left) and social (right) sustainability issues.

2.3 EEG recording and data analysis

A 16-channel portable EEG wireless System (Live-Amp: Brain Poducts, Munchen) was used to record cortical activity. Data were then processed via Analyzer2 software (Brain Products GmbH, Gilching, Germany). Fifteen active electrodes were included in the montage on positions Fp1, Fp2, F3, Fz, F4, T7, C3, Cz, C4, T8, P3, Pz, P4, O1, O2 (placement according to the 10-20 International System) (Jasper, 1958). The cap was fixed with a chin strap to prevent shifting during the task. The impedance of recording electrodes was monitored for each subject prior to data collection and it was always kept below 5 kΩ. Blinks were also visually monitored. The data were acquired using a sampling rate of 250 Hz and then filtered offline with a 0.5-45 Hz IIR bandpass filter (slope: 48db/octave). Ocular artifacts (eye movements and blinks) were corrected using an eye-movement correction algorithm that employs a regression analysis in combination with artifact averaging. Data were then visually inspected for ocular, muscle, and movement artifacts. After EOG correction and visual inspection only artefact-free-trials were considered. Fast Fourier Transform (Hamming window, resolution: 0.5 Hz) was applied to artifact-free segments to compute the average power spectra. Finally, average power for the main EEG frequency bands (Delta - 0.5-3.5 Hz, Theta - 4-7.5 Hz, Alpha – 8-12.5 Hz, Beta - 13-30 Hz) were extracted.

3. Results

A set of mixed repeated measures ANOVAs with independent within factors *Region of Interest* (ROI) (2: Frontocentral (F3; F4; C3; C4), and Temporoparietal (T7; T8; P3; P4)), *Content* (2: Environmental and Social), *Laterality* (2: Left and Right) and as between factor the *Group* related to the interest in sustainable issues (2: Sustainable vs Non-Sustainable) was applied to dependent EEG measures. This mixed repeated measures ANOVA was performed for each frequency band (Delta, Theta, Alpha, Beta) in order to highlight the differences between two groups. Post-hoc comparisons were applied to the data in case of significant effects. Simple effects for significant interactions were further checked via pair-wise comparisons, and Bonferroni correction was used to reduce multiple comparisons potential biases. For all the ANOVA tests, the degrees of freedom have been corrected using Greenhouse-Geisser epsilon where appropriate. The normality of the data distribution was preliminary assessed by checking kurtosis and asymmetry indices. The size of statistically significant effects has been estimated by computing partial eta squared (η^2) indices.

3.1 EEG: Theta band activity

Dependent measures (power data) were entered into four mixed repeated measures analyses of variance (ANOVA) (one for each frequency band), with Group as between factor and three repeated factors: ROI (2) × Content (2) × Laterality (2).

About Theta band, repeated measure ANOVA showed a main effect for ROI (F[1,14] = 83.78, p < .001, η^2= .85). Higher levels of theta band were found in Temporoparietal regions of interest than in Frontocentral areas. In addition, an interaction effect ROI × Laterality was found (F[1,14]= 4.59, p < .05, η^2= .24), with higher presence of theta in right compared to left Temporoparietal areas. Moreover, an interaction effect Group × ROI was found (F[1,14]= 4.70, p = .048, η^2= .25), with higher levels of theta power in temporoparietal areas for NSG than SG (see Figure 2). About Delta, Alpha and Beta, no significant effects were found for main or interaction effects.

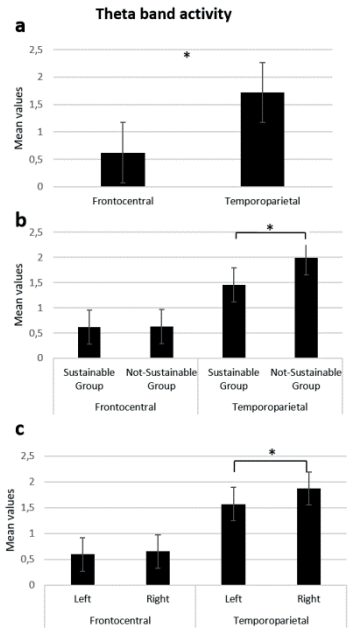

Figure 2. Significant differences in EEG theta band activity as a function of a) Region Of Interest (ROI; Frontocentral and Temporoparietal), b) ROI x Group (Sustainable and Not-Sustainable), c) ROI x Laterality (Left and Right)

4. Discussion

The present study aimed to respond to the need of using the knowledge derived from social and cognitive neuroscience in the field of sustainability applied to fashion luxury industry. It provided first evidences on the application of a neuroscientific technique (i.e. EEG) to investigate the implicit intentions of fashion luxury consumers', with a different degree of interest in sustainability issues. Three major results were obtained and described in relation to emotional responses towards pictures depicting sustainable issues.

A first main effect of this study was that electrophysiological cortical responses in right temporoparietal area for theta band augmented for both groups of participants interested in the luxury fashion field, when observing pictures on sustainability issues in-store. Moreover, the power of theta band in temporoparietal regions was significantly higher for non-sustainability-oriented people compared to sustainability-focused consumers.

Firstly, it is possible to suppose that the presence of theta band in right temporoparietal areas for both our groups of consumers could reflect a strong negative emotional response going on, elicited by the observation of sustainable-oriented stimuli. In fact, according to previous studies theta rhythm correlate with cognitive functions of high level when detected over the frontal areas, while a strong emotional processing is related to its presence evoked over the right parieto-occipital regions (Başar, Schürmann, & Sakowitz, 2001; Dolcos & Cabeza, 2002; Junghöfer, Bradley, Elbert, & Lang, 2001). Our result is in line with an enhanced activation of late positive potential in posterior brain areas for high emotional stimuli depicting luxury branded products rated as positive (Pozharliev et al., 2015); however, in this case stimuli regarded pictures on sustainability issue that were not completely neutral: that is, both social and environmental pictures could have subjectively implied a certain level of emotional value and arousal.

Specifically, the right hemisphere lateralization effect we found suggested that mainly a negative emotion pattern was displayed by our luxury consumers, beyond orientation towards sustainability. Indeed, the brain lateralization effect derived from the exposure to emotional cue have been already explored by previous studies, which found a synchronization of low-frequency oscillations mainly within the right hemisphere when negative more than positive emotional patterns were displayed (Balconi, Grippa, & Vanutelli, 2015; Balconi & Mazza, 2009, 2010). Overall, these results represent a first evidence that sustainability-oriented pictures selected for this study (both social and environmental) elicited an emotional negative impact that implies a high emotional engagement in our group of luxury participants, that aroused them while observing and being exposed to these sensitive topics.

Secondly, in contrast with our hypothesis and expectations, theta power in temporoparietal sites was detected in the group of non-sustainability-oriented people with a significant higher level, when compared to the sustainability-oriented group. This effect representing a higher emotional response could be due to the novelty of the sensitive stimuli on sustainability for the NSG group, since they self-reported to be at a lower level of knowledge on sustainability themes unlike the other group. On the other hand, another possible explanation for this unexpected inter-group difference could be linked to the characteristics of our sample: indeed, it could be possible that our participants within the sustainable group were not completely or truly devoted to sustainability-oriented practices, thus being less sensitive to social and environmental impact of fashion luxury industry. For this reason, pictures on sustainability themes elicited a lower emotional response in the sustainable compared to the non-sustainable group.

However, future research must keep in mind some caveats of this study that are the reduced sample size, the gender of participants (only females were recruited) and the difficulty of exploring deeply the sustainability orientation as trait or tendency of our participants. For instance, reward sensitivity and decisional processes (Balconi, Finocchiaro, & Campanella, 2014), empathy traits predicting prosocial behavior (Balconi & Canavesio, 2013) and social ranking perception (Balconi & Vanutelli, 2016) may intervene in this complex social context and would be interesting to deepen. In the next future, it will be interesting to explore consumers' attitude toward sustainability with other methods and on a wider population, in order to generalize our results and to understand how to convey messages on sustainability. Moreover, to integrate supplementary neuroscientific indices, such as physiological or hemodinamic measures could help in unveiling possible additional implicit affective responses to sustainable topics (Balconi, Grippa, & Vanutelli, 2015). There are even reward sensitivity, social perception,

On the whole, we believe professionals' marketers could exploit our findings in novel and different ways. For instance, professionals aimed at promoting sensitivity on sustainable luxury topics, but also at facilitating the purchase of them by different categories of luxury consumers (with but also without an enhanced engagement in sustainability) could try to create interactive platforms in-store to provide information on their eco-luxury products manufacturing. In addition, to implement new programs of effective communication employing images or videos of the positive outcomes of engaging in a sustainable shopping could be useful to orient consumers' emotional decision-making during purchase dynamics. These suggestions could be relevant specifically for company with a strong sustainable brand's policy.

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