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Neuromarketing as a Tool for Environmental Conditioning and Sustainable Consumption

Nikki Leeuwis[1,2], Maryam Alimardani[1], and Tom van Bommel[2]

[1]Department of Cognitive Science and Artificial Intelligence, Tilburg University, Tilburg, The Netherlands
[2]Unravel Research, Utrecht, The Netherlands

ABSTRACT

The impact of human factors on climate change is unequivocal. While consumers are increasingly becoming aware of their environmental footprint, this is not sufficient: contextual factors such as pricing, convenience, and packaging play a role in consumers' decision-making. This has created a gap between consumers' attitudes and behavior, which calls for intervention of behavioral sciences to change consumer behavior and consequently combat the climate crisis effectively. Consumer neuroscience methodology has been proposed as a potential tool to untangle the neural and psychological origins of consumers' behavior since subjective reports may be biased by social desirability and therefore are not a reliable measure of pro-environmental behavior. Prior studies have shown that conditioning the consumer with information on the environmental impact of products can influence their buying behavior and brain activity. This paper provides an extended exploration of past works on consumer neuroscience, environmental behavior, and conditioning techniques. We aim to unite the current theories and common practices and uncover future research directions in an effort to develop a neuroscientifically supported conditioning intervention that could promote pro-environmental behavior in consumers.

Keywords: Consumer neuroscience, Pro-environmental behavior, Cognitive dissonance, Affective conditioning, Neuromarketing, Sustainability

INTRODUCTION

Human factors acting on the climate include deforestation, greenhouse gas emission, and pollution following various sources of waste (IPCC, 2021). For example, the current human diet is a great factor in deforestation and contributes to up to 30% of greenhouse gas emission (Theurl et al., 2020). Moreover, pollution from plastics and waste related to packaging has a devastating effect on air, soil, and water quality and accelerates climate change (Boz et al., 2020). Nonetheless, companies still lack the incentive of more sustainable packaging unless implementing sustainable packaging is proven to drive sales or reduce costs (Boz et al., 2020; Phelan et al., 2021; Wandosell et al., 2021). Therefore, change in consumer behavior is essential for successfully reducing human impact on the environment.

However, behavior change is challenging. A large proportion of the population acknowledges commitment to the environment; but this is not reflected in the strength of their acts, which is known as the attitude-behavior gap (Kennedy et al., 2009). The choice to buy a sustainable product often puts consumers in a difficult decision, where they have to compromise between biospheric, altruistic, egoistic, and hedonic values (Bouman et al., 2021). Especially when a sustainable product has fewer desirable features or costs more money, a gap emerges between consumers' attitudes and behavior, which is commonly explained as cognitive dissonance (Bouman et al., 2021; Festinger, 1957; Kaiser, 2021; Rothgerber, 2013). Cognitive dissonance refers to the situation where attitudes, values, or behavior contradict each other and people try to rationalize this attitude-behavior gap to reduce the discomforting psychological tension that follows the dissonance (Festinger, 1957). In environmental research, this is evidenced by self-report studies in which consumers indicate to prefer green products, but this is not reflected in their actual behavior (Kennedy et al., 2009) nor their neural responses (Vezich et al., 2017).

On top of that, consumer shopping behavior often happens with limited deliberation due to the implicit processes that play a role in decision-making (Goucher-Lambert et al., 2017). Additionally, the choice overload that may be present in supermarkets leads to consumers simplifying their decision-making to reduce complexity (Grandi & Cardinali, 2020; Iyengar & Lepper, 2000). This suggests that interventions targeting automatic decision-making processes may be effective in pro-environmental behavior change (Marteau, 2011; Nielsen et al., 2021), perhaps more than informational interventions (Nisa et al., 2019). These automatic decision-making processes are often studied in the fields of consumer neuroscience and neuromarketing, which aim to gain insights into consumers' motivations, preferences, and decision processes through neural and behavioral measures (Javor et al., 2013). Therefore, theories and practices from these fields are essential in the implementation and evaluation of sustainability initiatives for consumer shopping behavior.

This paper provides a summary of past literature on consumer neuroscience and psychology in environmental studies and discusses the literature gap that exists. Additionally, we propose the theory of conditioning as a solution for promoting pro-environmental behavior change in consumers.

BACKGROUND

Consumer Neuroscience and Decision-Making

Various research has investigated consumers' attitudes and intentions when they engage in pro-environmental behavior (PEB; see Brosch, 2021; Pagan et al., 2020), however, these studies mainly employed self-report measurements, which are prone to social desirability bias (Ariely & Berns, 2010; Vezich et al., 2017). Contrary to questionnaires, consumer neuroscience methodology provides an objective measure and a promising tool to understand the neural and cognitive mechanisms underlying sustainable behavior (Goucher-Lambert et al., 2017; Sawe & Chawla, 2021; van Geffen et al., 2016; Wang & van den Berg, 2021).

For instance, it has been shown that individuals with pro-environmental beliefs have differentiated neural patterns as compared to their peers (Baumgartner et al., 2019; Lee et al., 2014; van Geffen et al., 2016). Lee et al. (2014) showed that theta activations in the frontal electrodes were higher among sustainable consumers compared to non-green consumers during the processing of an advertising message for a green product, but this brain activity did not differentiate during the processing of price information. Frontal theta activity is related to working memory (Bastiaansen & Hagoort, 2003) and attention (Aftanas & Golocheikine, 2001). Thus, this result could mean that when green consumers read an advertisement that matches their environmental goals, they are faced with greater demand for working memory resources as they have to activate their personal values (Lee et al., 2014).

Other evidence for the promise of neuroscientific tools follows from an fMRI study where subjects watched advertisements for sustainable and regular products. Favorable ratings for regular ads were related to neural activations associated with personal value and reward, however positive ratings for green ads were not reflected by any differentiated brain activity (Vezich et al., 2017). This suggests that subjective reports may be biased, for example by social desirability and therefore are not a reliable measure of PEB. Neural indicators on the other hand could be a reliable measure, as they show differentiating activations in the gamma band in response to images related to climate change for subjects with a higher environmental belief (van Geffen et al., 2016). Gamma band activations are related to emotion (Yang et al., 2020) thus this pattern might provide evidence that climate change visualizations can induce change in neural and emotional activations depending on the environmental worldview a person has. Further exploration of the neural indicators of pro-environmental values and behavior could pinpoint the exact neural dynamics that underlie the attitude-behavior gap.

Cognitive Dissonance and Attitude-Behavior Gap

Typically, studies of consumer neuroscience operate from the perspective that reward and loss are the drivers of human decision-making (Javor et al., 2013). Within decision-making, integration of goals and reward information is related to activity in the dorsolateral prefrontal cortex (DLPFC) (Miller & Cohen, 2001) and this area might therefore initiate reward- and emotion-motivated behavior (Manohar et al., 2021). The DLPFC – among the posterior medial frontal cortex (pMFC), anterior insula and other brain regions - is also identified in studies looking into the neural correlates of cognitive dissonance (Izuma & Murayama, 2019). It is shown to be causally related to attitude or behavior change following a cognitive dissonance situation: Harmon-Jones et al. (2008) trained subjects to increase their relative left DPLFC activity, and these subjects changed attitudes after the exercise while subjects that were trained to decrease their left DLPFC did not show any sign of choice justification compared to measurements before the training. This was replicated using transcranial Direct Current Stimulation (tDCS) by Mengarelli et al. (2015), showing that DLPFC is responsible for cognitive control leading to behavioral/attitude adjustment. The pMFC is related to conflict monitoring

and thereby serves as a detector of cognitive dissonance in the brain (Izuma & Murayama, 2019).

Only limited research into the neural responses during cognitive dissonance has been done in the sustainability setting. Colosio et al. (2017) showed that stronger cognitive dissonance triggered a larger negative frontocentral response similar to error-related negativity. This provides motivation for further investigation of appropriate neural indicators underlying cognitive dissonance and their interplay with sustainable choices.

Conditioning and Behavior Change

The study into behavior change has emerged with theories of implicit learning called conditioning. During conditioning, a neutral stimulus is paired with an appetitive/aversive stimulus in order to elicit a response (Purves et al., 2008). While the classical focus of conditioning was mainly on behavior, an emotional paradigm emerged within: evaluative conditioning (also called affective or emotional conditioning) aims at a change in the liking of the conditioned stimulus (Hofmann et al., 2010). For example, a neutral face paired with an attractive face, makes the neutral face more positively valenced (Baeyens et al., 1992). Evaluative conditioning was used for the education on healthy eating in several studies: the food is paired with affective (Halbeisen & Walther, 2021) or aversive (Hollands et al., 2011) images and consequently the preferences are changed. In the context of environmental research, Meijers et al. (2021) studied whether exposing subjects to images depicting the environmental impact of products in a virtual reality (VR) supermarket could influence their shopping decisions toward more environmentally friendly choices. This intervention was able to impact their self-reported buying behavior until two weeks after the experiment, showing that evaluative conditioning can be a valuable asset in environmental research.

The neural underpinnings of evaluative conditioning are strongly related to emotional responses; for example, Bosshard et al. (2019) paired (dis-)liked brand names with (un-)pleasant sounds and observed that while there were no changes in explicit liking of the brands, variations were observed in the implicit measures: EEG frontal asymmetry (FA) increased for disliked brands when coupled to pleasant sounds and similarly decreased for liked brands that were coupled to unpleasant sounds. FA is an indicator of approach or withdrawal (Pizzagalli et al., 2005), which has been related to decision-making in such fields as advertising (Ohme et al., 2010), sales (Baldo et al., 2015), and emotions (Zhao et al., 2018). In addition to EEG power spectra, event-related potentials have also been found discriminative for valence after participants were conditioned to associate pseudowords with positive, neutral or negative pictures (Kuchinke et al., 2015). These studies support the hypothesis that neural responses can be modulated by associative learning and can further be used as a tool in examining the potential of affective stimuli to generate approach-related tendencies.

Affective conditioning is considered to be effective for behavior change as emotions play an important role in decision-making (Brosch, 2021),

and because consumer shopping behavior often relies on implicit processes (Goucher-Lambert et al., 2017). While conditioning is a voluntary way of learning, it falls under non-declarative (implicit) memory because the expression of the memory happens independently of consciousness: it is evidenced by changed behavior, even when the subject cannot access the drivers of that change (Purves et al., 2008). Although the behavioral studies showed preliminary evidence on the potential effect of learning on sustainable behavior change, none of them provided emotional or cognitive measures of the mechanism underlying such effect. Investigating the effect of evaluative conditioning on both behavioral and neural measures would be necessary to uncover the value of conditioning in pro-environmental behavior change.

FUTURE DIRECTION

The studies discussed in the previous chapter provide early evidence for the viability of neuromarketing and associative/affective conditioning in sustainability research. However, the current landscape of research illustrates a map of sparse and isolated studies, each focusing on a different aspect of consumer behavior or neuroscience in environmental research. For example, van Geffen et al. (2016) proposed the power of neuroscientific tools to study how processing of climate change imagery is regulated by the individual's environmental attitudes but a framework in which such neural findings can be translated into learning tools for behavior change was not further investigated. On the other hand, while there is strong evidence for the role of emotions in climate change perceptions and actions (Brosch, 2021), no study other than Meijers et al. (2021) has employed affective conditioning to induce sustainable behavior change. Studies that did investigate pro-environmental behavior change, for example by including sustainable product-labels, only measured self-reported purchase intention (Hahnel et al., 2015) or left out contextual pricing factors (Jin et al., 2018).

Therefore, to uncover the motivators behind consumer behavior change, individual and contextual factors should be taken into consideration, as their weighting might contribute to cognitive dissonance (Bouman et al., 2021). The challenge remains to further intertwine the aforementioned lines of research in consumer neuroscience, cognitive dissonance, conditioning and behavior modification in order to develop an effective intervention for promotion of pro-environmental choices in consumers.

CONCLUSION

When environmental, behavioral, and neural sciences join efforts, there is a significant potential for the design of interventions that touch upon a multidimensional approach to encourage sustainable behavior among consumers. On one hand, consumer neuroscience provides the tools to probe psychological and neural origins of consumers' behavior including the assessment of cognitive dissonance and on the other hand, theories of conditioning could provide a design of behavior change interventions. In this paper, we summarized the state of the art in consumer neuroscience and its employment in environmental studies. Based on research gaps identified in this

paper, future studies can further examine the possibility of coupling theories from behavioral science, environmental science and consumer neuroscience to design effective conditioning paradigms and thereby promote sustainable consumption among general population.

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