International Journal of
Computing and
Engineering
(IJCE)

Neuromarketing Unlocked: Harnessing Brain Science to Decode Consumer Insights

International Journal of Computing and Engineering
ISSN 2958-7425 (online)
Vol. 2, Issue No.1, pp. 26 - 37, 2021
www.carijournals.org

Neuromarketing Unlocked: Harnessing Brain Science to Decode Consumer Insights

[1*]Shafeeq Ur Rahaman, [2]Saurabh Kumar, [3]Praneeth Reddy Amudala Puchakayala

[1]Monks, CA, USA

[2]Facebook Inc., CA, USA

[3]Regions Bank, AL, USA

Accepted: 15th Oct, 2021, Received in Revised Form: 15th Nov, 2021, Published: 15th Dec, 2021

Abstract

Purpose: This study aims to highlight the potential applications of neuromarketing tools and technologies including fMRI, EEG, eye-tracking and GSR to explore their effectiveness in enhancing consumer engagement. The study also calls for the establishment of ethical guidelines, data privacy protections and transparency in neuromarketing.

Methodology: In this paper, a systematic literature review and analysis of empirical studies utilizing neuromarketing tools was employed. Relevant case studies were selected to illustrate the application and effectiveness of neuromarketing tools. Ethical concerns like consumer manipulation, informed consent, and the protection of vulnerable populations were also reviewed.

Findings: The study identifies the potency of neuromarketing tools in enhancing consumer insights by targeting subconscious responses. Different real-time cases demonstrate the integrity of various tools of neuromarketing in marketing campaigns and how this triggered a tremendous change in consumer engagement and loyalty. This paper also seeks to strike a balance between applying neuromarketing approaches and addressing its ethical implications in modern marketing practices.

Contribution to Theory, Policy and Practice: This study contributes to the evolving field of neuromarketing by depicting the interplay between neuroscience and marketing strategies. It advances the theoretical understanding of how consumer behavior can be scientifically analyzed in direct relation to psychological and emotional drivers that influence decisions. The study also emphasizes the importance of data privacy, informed consent, and transparency in marketing practices.

Keywords: *Neuroscience, Marketing, Consumer Behavior, Remote Sensing, Data Privacy.*

1 INTRODUCTION

The term 'neuromarketing" was first introduced in 2002, by Gerald Zaltman and other researchers (Fisher et al., 2010). Since then, this term is used and applied as a significant momentum in practical marketing by various companies and researchers. Neuromarketing is defined as the merger of neuroscience and marketing that is use to understand and predict consumer insights. Marketers access subconscious decision-making, preferences and emotional reactions to products and advertisements by applying different neuroscience tools (Kumar & Singh, 2015). These tools predict consumer behavior better than the traditional methods such as surveys and focus groups. Traditional marketing models only focus on rational decision-making and overlook the emotional and cognitive biases. Neuromarketing fills this gap by analyzing how consumers' brains react to specific advertising stimuli. This approach allows companies to optimize their marketing strategies. The growing era in neuromarketing also reflects the importance of emotions, intuition, and subconscious processes in shaping consumer behavior. Beyond the commercial interests, the importance of neuromarketing also extends to the understanding of general human preferences and behavior (Mouammine & Azdimousa, 2021). A foundational study by Madan et al. (2010) demonstrated the power of neuromarketing by revealing how brand loyalty can influence taste perception (Madan, 2010). Subsequent studies have also explored the consumer behavior towards advertising, product design, and pricing strategies. For instance, Plassmann et al. (2011) investigated the relationship between price and product quality by measuring brain responses to wines with different prices. Results showed that higher-priced wines stimulated the reward-related brain regions more intensively than lower-priced wines, regardless of actual quality (Plassmann et al., 2011). However, the rapid advancement of neuromarketing has also raised ethical and privacy concerns, particularly regarding the use of brain data for commercial purposes. Moreover, the field of neuromarketing is still relatively young and more rigorous methodologies and ethical standards are needed. Transparency and regulation should be improved to satisfy concerns regarding the reliability and replicability of neuromarketing studies (Stanton et al., 2017).

2 NEUROMARKETING TOOLS AND TECHNOLOGY

In neuromarketing, a range of advanced tools are utilized that measure real-time brain activity, physiological responses, and behavior. Each tool offers a window into different aspects of consumer behavior (Shukla, 2019). Few well-established techniques and tools are illustrated in Figure 1.

2.1 Functional Magnetic Resonance Imaging (fMRI)

fMRI is probably the most powerful tool used in neuromarketing. It gives clear measures of activity in the brain by measuring fluctuations in blood flow. The neural activity in a given section of the brain increases the consumption of oxygen, and thus, increases blood flow to this area. Based on such changes, a fMRI model can trace the particular regions of the brain that are activated by exposure to a certain advertisement or product image (Kenning et al., 2007). This technique has been widely applied to understand what impact emotional and cognitive processes make on the

behavior of consumers. fMRI can further differentiate between automatic, unconscious reactions, and more intentional decision-making processes. It is, therefore, an excellent way to understand consumer preferences that are sometimes not vocally stated (Alsharif et al., 2021). Although fMRI offers extremely high spatial resolution, it lacks temporal resolution and is somehow impractical. An fMRI scan is also an expensive technique and requires the individual to be still for a very long time. Despite all these challenges, fMRI has had a major contribution to neuromarketing research due to the neural correlates of brand loyalty, product preference, and emotional engagement (Chandwaskar, 2019).

2.2 Electroencephalography (EEG)

EEG measures the instantaneous electrical impulses generated by neurons and thus has excellent time resolution. This attribute of EEG makes it very suitable for capturing an instant response to any stimulus related to marketing, such as the first few seconds after viewing exposure to any product or advertisement. Some of the principal applications of EEG include measurement of emotional involvement, focus of attention, and memory retention (Vecchiato et al., 2011). Brainwave patterns analysis through EEG may help in understanding when the consumer is either attentive, relaxing, or emotional about the stimulus. An advertisement that provokes higher beta waves at the frontal lobe will be more attractive, and high theta waves are likely to have emotional involvement (Khurana et al., 2021). One of the major strengths of EEG lies in its lower cost and ease as compared to fMRI. Equipment used for EEG is portable, and thus it can be applied in more naturalistic settings. Indeed, the only limitations to the ability of EEG is its spatial resolution compared to fMRI. With EEG, it has thus proven impossible to specify exactly which regions of the brain are involved in processing marketing stimuli. Despite this, EEG remains one of the widely used tools in neuromarketing (Shaari et al., 2019).

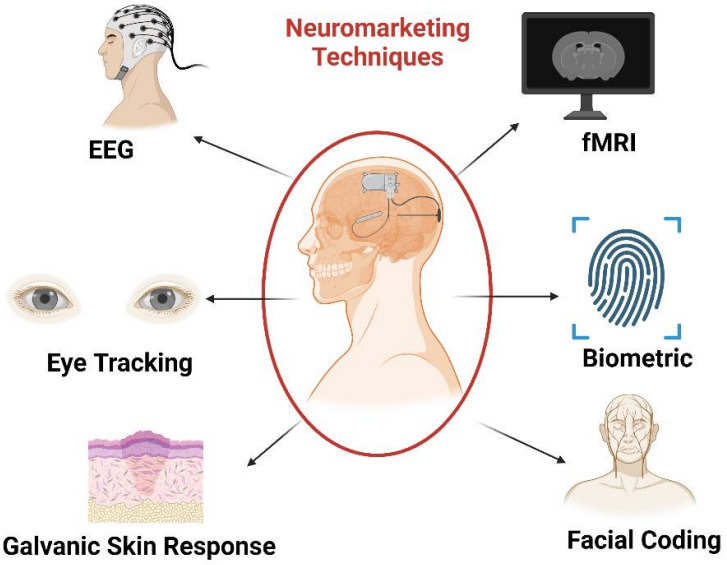

Figure 1 Well-Established Neuromarketing Tools and Technologies

2.3 Eye-Tracking

Eye-tracking technology provides a nonintrusive method for measuring visual attention since it records how long and where, when, consumer's focus their attention to marketing materials. Using data tracking the function of the eyes, marketers can find out which features are most apparent to them and which remain unseen. For instance, supermarket customers are more likely to notice and buy products that are placed at eye level than those displayed at lower levels. Eye-tracking has also been applied to Web page redesign that reveal with portion of page will get the most attention and which part is likely to be ignored (Iloka & Anukwe, 2020). Eye-tracking is frequently used in conjunction with other neuromarketing tools to get a more accurate sense of how consumers will respond. An advertisement that draws visual attention may not necessarily achieve emotional engagement. However, combining eye-tracking with EEG can clarify whether the advertisement cause high brain activity in areas associated with emotion or memory (Mansor & Isa, 2018).

2.4 Galvanic skin response (GSR) and other Biometric measures

Biometric measures include GSR and heart rate monitoring are also employed in neuromarketing. The GSR is a measure of the change in the electrical conductivity of the skin and depends on the activity of the sweat glands, so it can be related to emotional arousal. Heart rate variability may provide some information about levels of stress and emotional intensity. These biometric measures are often combined with EEG or eye-tracking to provide a more accurate view of the consumer experience. For instance, a consumer viewing an extremely engaging commercial may show increased GSR and heart rate that mirror higher levels of emotional arousal. When marketers connect these data together with measurements of brain activity, they can find out not only what consumers are focusing on but also with how much depth they feel about the advertisement (Kalaganis et al., 2021).

The tools used in neuromarketing offer powerful insights into subconscious consumer behavior. While each tool has its strengths and limitations, their combined use in a multimodal approach holds great promise for advancing our understanding of consumer behavior and optimizing marketing strategies.

3 INFLUENCE ON MARKETING STRATEGY

The neuromarketing tool has directed a new perspective in designing campaigns, product packaging, and advertisements. Now that marketers can measure subconscious responses far beyond the mere pull of marketing. They can craft emotionally resonant strategies that results in better decision-making and ultimately lead to more consumer engagement (Fortunato et al., 2014).

3.1 Campaign Design: Emotional Resonance and Cognitive Engagement

A crucial knowledge gained by neuromarketing is the dominance of emotions in the subconscious of consumers at the time of decision-making. Through neural data, marketers could develop the appropriate campaigns that would invoke a particular feeling-joy, nostalgia, or empathy in an effort

to have a better chance of positive consumer behavior. A study reveals that advertisements full of emotional appeals, such as heartwarming stories or humor, are more effective than reason and information based advertisements. This insight has provided more opportunities for the use of emotional storytelling in commercials that inspires feeling which ultimately creates a stronger connection with the viewer (Sebastian, 2014). It has also demonstrated the role of cognitive engagement plays in marketing. Eye-tracking studies, for example, show what particular areas of advertising or packaging a consumer looks at, and for how long. Integrating this with EEG allows marketers to tweak the content so that it provokes both attention and memory (Gurgu et al., 2020).

3.2 Product Packaging: Visual Appeal and Subconscious Associations

Neuromarketing has transformed product packaging designs by revealing how visual elements like color schemes, shapes, and text placement strike a consumer's subconscious. This is where studies with eye-tracking and EEG have played a tremendous role in pointing out which packaging design moves the attention towards them the most and elicits the desired of emotional response. For instance, research that uses eye-tracking devices has found that a consumer's tendency is to first focus on the visual elements of a package, such as images and general impressions of colors, before reading text (Cuesta, Niño, et al., 2018). Using this understanding, firms have long employed this fact by using bright colors, vivid images to catch a customer's eye at a glance and make an emotional connection. For example, curvaceous shapes in packaging have been found to evoke feelings of warmth and friendliness, whereas jagged, angular designs might be perceived as vicious. Because of neuromarketing data, marketers can trim down the design of packaging to meet desired brand identity and consumer perception (Cuesta, Niño, et al., 2018). Eye-tracking studies also show that consumers tend to look at the center of the package and thus key information, such as a product name or logo, should ideally be placed in this center for maximum visibility. These positive emotional responses evoked by packaging elements inspire a consumer to buy and thus making neuromarketing an essential tool for perfecting the packaging design (Juarez et al., 2020).

3.3 Advertising: Targeting Subconscious Reactions

Neuromarketing also provides the fine-tuning of advertisements since it enables marketers to get comprehension of subconscious reactions by consumers. For example, fMRI test revealed that highly emotive advertisements activate the amygdala (portions of the brain and have a role in emotional processing), thus creating better retention for memory and decision-making functions. This finding brings out the importance of emotional resonance in advertisements that evoke excitement, nostalgia, or even fear by consumers (Hsu & Chen, 2020). Neuromarketing has also proved that the ending of an advertisement is crucial for creating a lasting memory. Due to this reason, marketers are increasingly concerned with devising the advertisement that have an emotional hook coupled with a memorable closing scene. Measures of EEG and GSR yield far more information, primarily through real-time assessment of engagement. With this understanding, more emotionally charged and relevant advertisements have been developed in terms of consumers' subconscious choices (Cuesta, Martínez-Martínez, et al., 2018).

4 METHADOLOGICAL FRAMEWORK

This paper employed a systematic literature review to gain insights into empirical studies that focus on neuromarketing tools to investigate consumer behavior. For this purpose, scientific papers published in renowned, peer-reviewed journals, industry reports, and case studies from the past two decades were sourced. To demonstrate the relevance of how neuromarketing tools are used in real marketing settings, a few case studies are discussed in details below. Data was collected from databases such as PubMed, Science Direct, and Google Scholar through keywords like "neuromarketing tools," "consumer behavior," and "neuromarketing case studies." Findings were segmented under themes like emotional engagement, brand perception, and the decision-making process. Synthesized data was also cross-checked to validate consistency in insights derived from neuromarketing tools.

4.1 CASE STUDIES: NEUROMARKETING IN REAL-WORLD CAMPAIGNS

The integration of neuromarketing in marketing campaigns has triggered a tremendous change in consumer engagement and loyalty along with the overall campaign success rates. Companies now utilize neuroscientific tools in the form of assessment to optimize their advertisements, product packaging, and customer experiences. This section analyzes key case studies that make evident how neuromarketing delivers actual outcomes in real business.

4.1.1 Coca-Cola vs. Pepsi: The Neuroscience Behind Brand Preference

One of the most famous case studies in neuromarketing is the work of Read Montague and his team, who study to get at whether people have preferences between Coca-Cola and Pepsi. Typical surveys conducted through traditional methods had revealed almost a tie between the two brands, but Montague's fMRI brain scan research revealed something very different altogether. When participants drank Pepsi in a blinded taste test, the brain exhibited a lot of activation of the ventral putamen, a region that has been linked to reward processing and subjective preference for the taste of Pepsi. However, when the participants were told that they are drinking Coca-Cola, a whole different brain region, the medial prefrontal cortex, turned on. This region is associated with higher-order thinking, self-identity, and cultural associations (McClure et al., 2004). This study indicated how branding and cultural associations override the actual sensory experience of the taste. This explains why Coca-Cola maintain its markets for such a long time even after the two sodas' taste profiles became comparable. Armed with these findings, Coca-Cola continued to concentrate marketing efforts on strengthening brand identity as integrated into consumers' lives. This case study goes on to testify how neuromarketing aids marketers in knowing not only what consumers like but also why they like it, so that brands can formulate marketing strategies which are better and emotionally informative (Walla et al., 2013).

4.1.2 Campbell’s Soup: Redesigning Packaging Based on Emotional Reactions

The company Campbell's Soup redesign its packaging after an analysis came out indicating that their traditional design had lost the connection of the consumers. Researchers evaluated how the

consumers would react to the various features of its product packaging using a mix of eye-tracking and biometric measures. Eye-tracking was utilized to establish which elements of the packaging design were attracting attention and GSR was employed to measure emotional arousal for different elements in the packaging (Garber Jr et al., 2019). Results revealed that consumers did not give a response to the iconic red and white color combination, the large spoon image on the packaging, or the intensive product description on the label. They have reacted more emotionally to images, such as soups being eaten or steaming in a bowl (images like these evoke warmth, comfort, or satisfaction). These led Campbell's to redesign the packaging by shifting it from the text focus to more emotive images of the soup. The redesigned packaging started bringing the brands closer to the consumers as its sales picked up shortly after the new packaging was launched (Kumar & Mathur, 2017).

4.1.3 Hyundai: Optimizing Car Design with fMRI and EEG

Hyundai is one of the prestige automobile production companies that used neuromarketing to get utmost from its autos designs. In 2011, the car manufacturer applied fMRI and EEG technologies to research consumer's emotional response of various car designs, including interior as well as exterior car features. Neural and physiological responses to different design elements, such as the headlight-shape curve of body lines, arrangement of seats, and seats' texture have been measured in this study (Bhatia, 2014). The study revealed that the flowing lines and smooth curves of car designs activated parts of the orbitofrontal cortex related to aesthetic pleasure and emotional satisfaction of the brain. However, EEG data revealed increased attention and engagement for certain aspects of interior design features, such as dashboard layout and seating comfort. Through the above data, Hyundai made the designs of the cars more responsive to better subliminal emotions out of consumers which, in turn, resulted in enhanced customer satisfaction and sales volumes for the company (Scanagatta, 2021). This case study has further illustrated how neuromarketing can make a difference not only in the advertisement and packaging of a product but even in product design.

4.1.4 The "Got Milk?" Campaign: Leveraging Neuromarketing for Emotional Appeal

Another example is the popular "Got Milk?" campaign, which ran from 1993 to 2014. Given the fact that the use of neuromarketing tools was not common back then, but the success of the campaign explained how principles of neuromarketing can be used to hit the subconscious emotional triggers. The “Goodby Silverstein & Partners advertising agency” focused on the discomfort of running out of milk, a relatable and universal experience for many consumers. Recent neuromarketing studies suggest the possibility that the campaign was successful solely through its emotive appeal (the pain or the loss created through the feeling of scarcity). Again, the feeling was activated together with simple yet memorable visuals to heighten consumer involvement and brand awareness. Success in a campaign of this nature demonstrates that deep knowledge in understanding emotional and cognitive triggers can work pretty well as a marketing strategy even without the direct application of neuromarketing tools (Lindstrom, 2011).

5 ETHICAL LANDSCAPE OF NEUROMARKETING

The application of neuroscience in marketing raises significant ethical questions, particularly regarding the potential for manipulation and the protection of consumer privacy. The whole argument end up questioning issues concerning autonomy, informed consent, and exploitation issues raised by neuromarketing. Moreover, the collection and use of neurophysiological data, for instance brain scans and biometric responses pose serious privacy risks since these data sets are considerably sensitive and personal. This section explains the ethical issues on neuromarketing and what growing commercial uses pose in terms of serious challenges.

5.1 Manipulation and Autonomy

One of the principal ethical issue with neuromarketing is that it can manipulate consumer behavior by using unconscious decision-making processes among people. Traditional marketing strategies might be persuasive enough, but they are usually based on conscious choices by consumers, as the people of the target know that they are being influenced. Neuromarketing, however, operates through the brain's emotional and cognitive systems and bypass the rational sections of the mind and target the subconscious desires directly. Critics argue that it might lead to a sort of manipulation that negates consumers' autonomy and their power to make choice with their eyes fully open (Murphy et al., 2008). Now, studies through fMRI and EEG can identify neural correlates of reward, pleasure, and attention. Researchers may thus figure out how these psychological processes may be used in the design of campaigns that evoke positive emotional responses in consumers unconsciously. Is this ethical? Should marketers influence consumers in ways that they do not fully understand or make an informed consent over? The concern is that neuromarketing practice undermines individual autonomy while they are unconscious of the factors driving their choices, and they might be deceived into making choices they would not have made in full consciousness. Most dismal of all, it might enhance on-going inequality in the marketplace (Nemorin & Nemorin, 2018).

5.2 Informed Consent and Transparency

Informed consent is another ethical issue in neuromarketing. In traditional research practices, people always know what they are enrolling for, be it a focus group or a survey. However, neuromarketing investigations by complex and highly novel technologies leave participants cloudy regarding what is being measured for and how the results are going to be used. Unlike a simple survey where questions are clear and outcomes are easy to understand, neuromarketing probes deceptively deep into cognitive processes that are not always understood by the average person (Trettel et al., 2017). Ethical neuromarketing practice should demand total transparency regarding what methods are involved and which data are being collected. Participants must be informed that their brain activity or physiological responses are measured, as well as how such measurements would apply to marketing strategies. For example, a consumer should agree to participate in research for the sign-up process of an eye-tracking study of an advertisement yet likely never be

informed that data collected may be used months or years after in the creation of highly targeting, personal marketing campaigns (Garasic, 2021).

5.3 Data Privacy and Security

The privacy risks associated with neuromarketing are remarkable, particularly when the nature of data collected is highly sensitive. Neurophysiological data like brain scans, biometric readings, and emotional responses contain a person's state of mind, preferences, and vulnerabilities in an almost too intimate way. Unlike traditional marketing data, neurodata reveals aspects of human cognition that are not easily altered or anonymized. Such sensitive information will probably expose the user to potential misuse or exploitation, besides considerable issues of privacy (Clark, 2020). For example, neurodata collected and stored by companies can be used for purposes far beyond marketing purposes, such as political manipulation or direct manipulation of public opinion. Furthermore, third parties might hack and misuse data that results breaches of personal privacy. The brain data is inherently sensitive in nature, and therefore, there should be greater regulatory provisions to ensure that such information is taken as seriously and protected as one's medical data under Health Insurance Portability and Accountability Act (HIPAA) in the United States (Clark, 2020).

5.4 Regulatory and Ethical Guidelines

The increasing growth of neuromarketing elicit the risk for unethical practice and poses an enhanced need for regulatory frameworks that protect consumers while allowing innovative marketing research. At present, standards around the globe for neuromarketing are heterogeneous; existing ethical codes are voluntary and industry-driven (Ulman et al., 2015). Some organizations, like the Neuromarketing Science and Business Association (NMSBA), have designated rules for ensuring ethicality in neuromarketing research through measures of transparency, proper consent of the participants, and maintenance of privacy. For instance, the guidelines should be clear about the type of information gathered and how it would be treated, plus robust security measures should be taken to safeguard neurodata from access by unauthorized people. However, such guidelines are not legally binding, and the application of ethical standards in the practice remains uneven (Scanagatta, 2021). Indeed, there is growing opinion among scholars and policymakers to further scrutinize neuromarketing

6 CONCLUSION

Neuromarketing unlocks subconscious behavior of costumers through neuroimaging tools including fMRI, EEG, and eye-tracking technology and offers the unprecedented insights into decisions. This review, therefore, confirms that marketing strategies have been largely influenced by neuromarketing and campaign and product design effectiveness can be improved by hitting emotional and cognitive triggers.

7 RECOMMENDATIONS

However, there still continues to be a lot of debate on consumer manipulation and data privacy. Therefore, strong ethical standards and regulatory mechanisms should be put in place to ensure that the application of neuromarketing will respect a consumer's autonomy and secure private information from the consumers. Innovation should never accompany irresponsibility.

REFERENCES

1. Alsharif, A. H., Salleh, N. Z. M., & Baharun, R. (2021). Neuromarketing: The popularity of the brain-imaging and physiological tools. *Neuroscience Research Notes*, *3*(5), 13-22. https://doi.org/10.31117/neuroscirn.v3i5.80
2. Bhatia, K. (2014). Neuromarketing: Towards a better understanding of consumer behavior. *Optimization*, *6*(1), 52-62. https://doi.org/10.5539/ijms.v10n1p90
3. Chandwaskar, P. (2019). A Review on: Neuromarketing as an emerging field in consumer research. https://doi.org/10.4018/978-1-5225-4834-8.ch001
4. Clark, K. R. (2020). A field with a view: Ethical considerations for the fields of consumer neuroscience and neuromarketing. In *Developments in neuroethics and bioethics* (Vol. 3, pp. 23-61). Elsevier. https://doi.org/10.1016/bs.dnb.2020.03.002
5. Cuesta, U., Martínez-Martínez, L., & Niño, J. I. (2018). A case study in neuromarketing: Analysis of the influence of music on advertising effectivenes through eye-tracking, facial emotion and GSR. *Eur. J. Soc. Sci. Educ. Res*, *5*(2), 73-82. https://doi.org/10.26417/ejser.v5i2.p84-92
6. Cuesta, U., Niño, J. I., & Martínez-Martínez, L. (2018). Neuromarketing: analysis of packaging using Gsr, eye-tracking and facial expression. Papper presented at The European Conference on Media, Communication & Film, https://doi.org/10.2478/ejser-2018-0035
7. Fisher, C. E., Chin, L., & Klitzman, R. (2010). Defining neuromarketing: Practices and professional challenges. *Harvard review of psychiatry*, *18*(4), 230-237. https://doi.org/10.3109/10673229.2010.496623
8. Fortunato, V. C. R., Giraldi, J. d. M. E., & de Oliveira, J. H. C. (2014). A review of studies on neuromarketing: Practical results, techniques, contributions and limitations. *Journal of Management Research*, *6*(2), 201. https://doi.org/10.5296/jmr.v6i2.5446
9. Garasic, M. D. (2021). Informed consent, clinical research, COVID-19 and contact tracing apps: Some neuroethical concerns. *BioLaw Journal-Rivista di BioDiritto*(2S), 85-95. https://doi.org/10.4324/9781003213215-3
10. Garber Jr, L. L., Hyatt, E. M., & Boya, Ü. Ö. (2019). Packaging in context. In *Context* (pp. 565-584). Elsevier. https://doi.org/10.1016/b978-0-12-814495-4.00027-1
11. Gurgu, E., Gurgu, I.-A., & Tonis, R. B. M. (2020). Neuromarketing for a better understanding of consumer needs and emotions. *Independent Journal of Management & Production*, *11*(1), 208-235. https://doi.org/10.14807/ijmp.v11i1.993
12. Hsu, L., & Chen, Y.-J. (2020). Neuromarketing, subliminal advertising, and hotel selection: An EEG study. *Australasian Marketing Journal*, *28*(4), 200-208. https://doi.org/10.1016/j.ausmj.2020.04.009
13. Iloka, B. C., & Anukwe, G. I. (2020). Review of eye-tracking: A neuromarketing technique. *Neuroscience Research Notes*, *3*(4), 29-34. https://doi.org/10.31117/neuroscirn.v3i4.61

14. Juarez, D., Tur-Viñes, V., & Mengual, A. (2020). Neuromarketing applied to educational toy packaging. *Frontiers in psychology*, *11*, 2077. https://doi.org/10.3389/fpsyg.2020.02077
15. Kalaganis, F. P., Georgiadis, K., Oikonomou, V. P., Laskaris, N. A., Nikolopoulos, S., & Kompatsiaris, I. (2021). Unlocking the subconscious consumer bias: a survey on the past, present, and future of hybrid EEG schemes in neuromarketing. *Frontiers in Neuroergonomics*, *2*, 672982. https://doi.org/10.3389/fnrgo.2021.672982
16. Kenning, P., Plassmann, H., & Ahlert, D. (2007). Applications of functional magnetic resonance imaging for market research. *Qualitative Market Research: An International Journal*, *10*(2), 135-152. https://doi.org/10.1108/13522750710740817
17. Khurana, V., Gahalawat, M., Kumar, P., Roy, P. P., Dogra, D. P., Scheme, E., & Soleymani, M. (2021). A survey on neuromarketing using EEG signals. *IEEE Transactions on Cognitive and Developmental Systems*, *13*(4), 732-749. https://doi.org/10.1109/tcds.2021.3065200
18. Kumar, H., & Mathur, N. (2017). Neurodesign An Art of Product Packaging-Understanding Customers Psychology of Colour with the Help of Neuromarketing-a Review Paper. https://doi.org/10.32920/25164605
19. Kumar, H., & Singh, P. (2015). Neuromarketing: An emerging tool of market research. *International Journal of Engineering and Management Research (IJEMR)*, *5*(6), 530-535. https://doi.org/10.21276/ijemr
20. Lindstrom, M. (2011). *Brand sense: Sensory secrets behind the stuff we buy*. Simon and Schuster. https://doi.org/10.1108/ijshe.2005.24906aae.010
21. Madan, C. R. (2010). Neuromarketing: the next step in market research? *Eureka*, *1*(1), 34-42. https://doi.org/10.29173/eureka7786
22. Mansor, A. A. B., & Isa, S. M. (2018). The impact of eye tracking on neuromarketing for genuine value-added applications. *Global Business and Management Research: An International Journal*, *10*(1), 1-11. https://doi.org/10.18638/gv.2016.4.1.744
23. McClure, S. M., Li, J., Tomlin, D., Cypert, K. S., Montague, L. M., & Montague, P. R. (2004). Neural correlates of behavioral preference for culturally familiar drinks. *Neuron*, *44*(2), 379-387. https://doi.org/10.1016/j.neuron.2004.09.019
24. Mouammine, Y., & Azdimousa, H. (2021). A REVIEW OF NEUROMARKETING ORIGINS AS A NEW MARKETING RESEARCH METHOD. *Marketing Science & Inspirations*, *16*(4). https://doi.org/10.46286/msi.2021.16.4.5
25. Murphy, E. R., Illes, J., & Reiner, P. B. (2008). Neuroethics of neuromarketing. *Journal of Consumer Behaviour: An International Research Review*, *7*(4-5), 293-302. https://doi.org/10.1002/cb.252
26. Nemorin, S., & Nemorin, S. (2018). A theory of manipulation: critical perspectives. *Biosurveillance in New Media Marketing: World, Discourse, Representation*, 15-42. https://doi.org/10.1007/978-3-319-96217-7_2
27. Plassmann, H., Yoon, C., Feinberg, F. M., & Shiv, B. (2011). Consumer neuroscience. *Wiley International Encyclopedia of Marketing. West Sussex, UK: John Wiley & Sons*. https://doi.org/10.1002/9781444316568.wiem03051
28. Scanagatta, C. (2021). Exploring the consumer's brain: a neuromarketing approach. https://doi.org/10.47750/cibg.2021.27.03.048

29. Sebastian, V. (2014). Neuromarketing and evaluation of cognitive and emotional responses of consumers to marketing stimuli. *Procedia-Social and Behavioral Sciences*, *127*, 753-757. https://doi.org/10.1016/j.sbspro.2014.03.349
30. Shaari, N., Syafiq, M., Amin, M., & Mikami, O. (2019). Electroencephalography (EEG) application in neuromarketing-exploring the subconscious mind. *Journal of Advanced Manufacturing Technology (JAMT)*, *13*(2 (2)). https://doi.org/10.1002/9781119200079.ch2
31. Shukla, S. (2019). Neuromarketing: a change in marketing tools and techniques. *International Journal of Business Forecasting and Marketing Intelligence*, *5*(3), 267-284. https://doi.org/10.1504/ijbfmi.2019.104044
32. Stanton, S. J., Sinnott-Armstrong, W., & Huettel, S. A. (2017). Neuromarketing: Ethical implications of its use and potential misuse. *Journal of Business Ethics*, *144*, 799-811. https://doi.org/10.1007/s10551-016-3059-0
33. Trettel, A., Cherubino, P., Cartocci, G., Rossi, D., Modica, E., Maglione, A. G., Di Flumeri, G., & Babiloni, F. (2017). Transparency and reliability in neuromarketing research. *Ethics and Neuromarketing: Implications for Market Research and Business Practice*, 101-111. https://doi.org/10.1007/978-3-319-45609-6_6
34. Ulman, Y. I., Cakar, T., & Yildiz, G. (2015). Ethical issues in neuromarketing:"I consume, therefore I am!". *Science and engineering ethics*, *21*, 1271-1284.https://doi.org/10.1007/s11948-014-9581-5
35. Vecchiato, G., Astolfi, L., De Vico Fallani, F., Toppi, J., Aloise, F., Bez, F., Wei, D., Kong, W., Dai, J., & Cincotti, F. (2011). On the use of EEG or MEG brain imaging tools in neuromarketing research. *Computational intelligence and neuroscience*, *2011*(1), 643489. https://doi.org/10.1155/2011/643489
36. Walla, P., Mavratzakis, A., & Bosshard, S. (2013). Neuroimaging for the affective brain sciences, and its role in advancing consumer neuroscience. *Novel Frontiers of Advanced Neuroimaging*, 119-140. https://doi.org/10.5772/51042