



## The Role of Neuromarketing in the Purchasing Behavior of Customers: The Role of Cognition and Perception in Purchasing Decisions

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### Abstract

This study aims to examine the impact of neuro-marketing on customer purchase behavior through the role of cognition and perception in purchase decision-making. To test these hypotheses, participants were placed in a laboratory environment and exposed to emotional and cognitive stimuli. Brainwaves (alpha and beta) and behavioral indicators such as the number of purchases, purchase amount, and decision-making time were evaluated as the main variables. The sample consisted of 30 participants, who were randomly assigned to experimental and control groups. The results indicated that emotional and cognitive stimuli had a significant impact on alpha and beta brainwaves. Emotional stimuli led to an increase in beta waves and a reduction in decision-making time, suggesting enhanced alertness and faster decision-making. Additionally, cognitive stimulation significantly increased both alpha and beta waves and reduced decision-making time. However, the effect of these stimuli on the number of purchases and the total amount spent was not significant.

**Keywords:** Neuro-marketing, Customer Purchase Behavior, Cognition, Perception



## Introduction

Marketing, as one of the vital aspects of business operations, has always played an important role in determining the needs and desires of consumers and creating products or services that meet these needs. Over time, marketing strategies have evolved to enable businesses to gain a better understanding of consumer behavior. In recent years, neuro-marketing has emerged as a novel and powerful tool for a deeper understanding of consumer purchasing behavior.

Neuro-marketing, using techniques from neuroscience, analyzes customers' decision-making processes. This method employs tools such as functional magnetic resonance imaging (fMRI), electroencephalography (EEG), and eye tracking to assess brain activity and emotional responses, identifying the hidden factors influencing buying behavior (Morin, 2011). Compared to traditional methods like surveys and focus groups, neuro-marketing can uncover latent information about customer preferences and behaviors that are not easily visible in conventional analyses (Aldayel et al., 2020).

One of the most crucial components of effective marketing is a deep understanding of consumer psychology. To create successful marketing strategies and boost sales, companies must deeply understand the needs, desires, and motivational factors driving their customers. Traditional marketing methods, such as surveys and focus groups, may not provide a comprehensive understanding of consumer behavior due to their reliance on conscious and self-reported responses from participants (McDowell & Dick, 2013). In contrast, neuro-marketing provides a means to better understand customers' unconscious behaviors and the role of emotions and perceptions in their purchase decisions (Alsharif et al., 2021).

Research has shown that approximately 50% of information is processed unconsciously by the brain, highlighting the inability of traditional marketing methods to fully comprehend unconscious processes (Ala et al., 2022; Kant, 2020). Neuro-marketing helps businesses design more effective advertising campaigns by providing deeper insights into consumer preferences and decision-making, influencing customers' emotions and cognition (Bhardwaj et al., 2023). With the expansion of digital tools and resources, the online space has also faced new challenges. From website design and product display to analyzing user feedback and reviews, marketers must employ strategies that can influence customers' emotional and perceptual responses. In this regard, neuro-marketing can assist businesses in identifying implicit and automatic processes that influence customer decision-making, helping to develop more effective campaigns (Wakjira & Kant, 2022).

The aim of this paper is to examine the role of neuro-marketing in customer purchase behavior and analyze the role of cognition and perception in decision-making processes. By utilizing concepts from neuroscience and cognitive psychology, a deeper understanding of customer behavior can be achieved, allowing for the design of more effective marketing strategies that influence the unconscious emotions and perceptions of customers.



## Neuro-marketing

Neuro-marketing is an emerging field in marketing that leverages neuroscience and related technologies to examine the brain activity of consumers in response to marketing stimuli, aiming to utilize this data to improve marketing strategies. Marketing, as a process of introducing a product to the market, plays a key role in capturing the attention of customers and influencing their purchase decisions. Even if a product is good, without effective marketing, it cannot be properly introduced and attract its target audience. Especially in competitive markets, new products require more efficient marketing strategies to be noticed and accepted by customers (Khondakar et al., 2024).

Traditional marketing methods rely on surveys, interviews, and focus groups, which are often influenced by social biases. Consumers may not express their true opinions for various reasons and may instead respond in ways they think others expect them to. Additionally, the emotional or environmental context in which individuals find themselves can affect their responses, making it difficult for background analyses to accurately reflect their true emotions (Ouzir et al., 2024; Khondakar et al., 2024). For this reason, marketers and researchers are seeking alternative or complementary methods to overcome the limitations of traditional marketing. One such method is neuro-marketing, which helps marketers gain a better understanding of consumer reactions to marketing stimuli by analyzing their immediate responses to advertising campaigns, packaging, and designs.

Neuro-marketing was first introduced in 2002 by Ale Smidts and was recognized as a tool for applying neuroscience technologies to the marketing domain. This approach uses insights from neuroscience and cognitive sciences to precisely analyze consumer needs, wants, and preferences, utilizing this information to design marketing strategies and campaigns that are more likely to resonate with target audiences. Unlike traditional methods, which often focus on post-purchase attitudes, neuro-marketing aims to capture the brain's immediate reactions during the purchase process, providing accurate insights into consumer decision-making (Khondakar et al., 2024).

One of the advanced technologies used in neuro-marketing is Brain-Computer Interface (BCI), which enables direct communication between brain electrical activity and external devices such as computers. Neuro-marketing uses these technologies to examine immediate consumer reactions to marketing stimuli. The brain data collected through these methods allows marketers to gain a deeper understanding of consumer behavior and decision-making, and design more effective strategies based on this information (Kaya et al., 2024). Among the most commonly used techniques in neuro-marketing are non-invasive imaging methods such as Electroencephalography (EEG), Functional Magnetic Resonance Imaging (fMRI), and Functional Near-Infrared Spectroscopy (fNIRS). These methods help identify consumer preferences, interests, and emotional responses by analyzing physiological brain data. Particularly, EEG is one of the most popular methods in neuro-marketing due to its low cost and high temporal accuracy, and is frequently used to analyze emotional states and predict



consumer reactions. EEG data provides an accurate measure of emotional reactions because it cannot be consciously manipulated (Pratama et al., 2024; Ouzir et al., 2024).

Large companies such as Google, Unilever, and Microsoft are utilizing the results of neuro-marketing research to enhance customer engagement and optimize their advertising campaigns. These advancements have been made possible, especially due to the high precision of analytical tools in the field of neuro-marketing engineering (Ouzir et al., 2024; Nguyen, 2024). Therefore, examining and understanding the fundamentals of neuro-marketing and its potential enables marketers and researchers to leverage these tools to improve marketing strategies and, ultimately, perform better in competitive markets.

## History and Theoretical Background of Neuro-marketing

The history of neuro-marketing dates back to the 1990s, when researchers began using neuroscience techniques to study consumer behavior. This field gained more attention in the early 2000s following the publication of several studies demonstrating the effectiveness of neuro-marketing techniques in predicting consumer behavior.

One of the first studies in the field of neuro-marketing was conducted by Read Montague and his colleagues at the Baylor College of Medicine in 2004. In this study, participants were asked to taste two different types of soda while their brains were scanned using functional magnetic resonance imaging (fMRI). The results showed that participants' preferences between the two sodas could be predicted based on their brain activity. This study provided evidence that neuro-marketing techniques could be used to predict consumer behavior. The neuro-marketing technology market has continued to grow steadily. The term "neuro-marketing" was first coined in the 1990s in the United States, with the initial studies being conducted by Gerald Zaltman, a professor at Harvard University. Several experts in this field established neuroscience companies with the goal of utilizing new scientific tools outside the academic world (Zaltman, 2003). One example of these efforts was presented by Gemma Calvert, who, after achieving several academic successes including a Ph.D. in brain imaging from Oxford University and publishing articles in prestigious journals like *Science* and *Nature*, founded Neurosense in 1999. Neuroscience, with its revolution in the fields of medicine, pharmaceuticals, and even economics, has had a far greater impact than is widely recognized (Gemma, 2004).

Neuro-marketing is based on the idea that much of human behavior, including consumer behavior, is influenced by unconscious brain processes. These processes are difficult to measure using traditional marketing research methods such as surveys and focus groups. Neuro-marketing employs techniques from neuroscience to measure the brain's responses to marketing stimuli, helping to understand these unconscious processes.

One of the key theories underlying neuro-marketing is the idea of emotional decision-making. Research has shown that emotions play a significant role in the decision-making process, and emotional responses to marketing stimuli can be measured using neuroscience





techniques. For example, a study conducted by Baba Shiv and his colleagues at Stanford University found that participants were more inclined to make impulsive purchases when they were hungry, and this behavior was associated with increased activity in the nucleus accumbens, a part of the brain involved in reward processing.

Another theory underlying neuro-marketing is the concept of mirror neurons. Mirror neurons are a type of brain cell that are activated when an individual observes another person performing an action. Research has shown that mirror neurons play a role in empathy, social cognition, and learning. In the context of neuro-marketing, mirror neurons can help us understand consumer reactions to marketing messages and interpret social cues in advertisements.

Neuro-marketing is a novel approach that provides a fresh perspective on consumer behavior and decision-making processes, particularly in the purchase of products or services. This approach moves away from the simplified model of "homo economicus," which assumes that consumers are rational and make decisions based on logical cost-benefit analysis. New models of human behavior explain the stages individuals go through before acting, including both unconscious and conscious phases (Misra, 2023).

## Research Background

Alsharif & Mohd Isa (2024) conducted a study titled "Revolutionizing Consumer Insights: The Impact of fMRI in Neuro-marketing Research." This study provides a comprehensive bibliometric analysis (performance analysis) and content analysis of global research on "Neuro-marketing or Consumer Neuroscience" and "Functional Magnetic Resonance Imaging (fMRI)." Using the PRISMA framework and R software, thirty-six articles indexed in Scopus were analyzed. The United States and the California Institute of Technology emerged as key contributors, with Rangel, A., and Reiman, M. identified as notable authors. Prominent themes included 'advertising,' 'product,' 'price,' and 'brand,' and two journals, *Journal of Consumer Psychology* and *Journal of Neuroscience*, were recognized as key publications. The most-cited paper, "Marketing actions can modulate neural representations of experiential pleasure," received 620 citations. Furthermore, fMRI has been used to study consumer behavior (impulsivity, reward, emotions, decision-making, and memory) in response to marketing stimuli such as price (willingness to pay), advertising (endorsement by celebrities, MSV), product (packaging design), and brand (halal logos, labeling, and personality). This study provides a valuable literature review matrix and offers precise insights into the current trends in global neuro-marketing research using fMRI. It emphasizes the significant impact of fMRI in both academic and commercial domains, offering new insights for targeted marketing and consumer behavior research. The study also provides valuable guidance for developing more effective advertising strategies, understanding consumer decision-making processes, improving business performance, and fostering academic collaborations.



Khondakar et al. (2024) conducted a systematic review of EEG-based neuro-marketing (recent trends and analysis techniques). They stated that neuro-marketing is an emerging research field aimed at understanding consumer decision-making processes when choosing products. This information is of immense value to businesses looking to improve their marketing strategies by understanding the factors that positively or negatively influence consumers. Neuro-marketing has the potential to revolutionize the marketing industry by enabling companies to offer more engaging experiences, create more effective advertisements, avoid misguided marketing strategies, and ultimately save millions of dollars for businesses. Therefore, well-documented research on the current state of this field is crucial. In this article, the authors provide a systematic review of EEG-based neuro-marketing. The goal is to clarify research trends, technical domains, and potential opportunities in this field. They reviewed recent articles published in credible databases and categorized popular research topics in neuro-marketing into five clusters, highlighting current research trends. The paper also discusses the brain regions activated during decision-making and their relevance to neuro-marketing applications. It appropriately presents the marketing stimuli that can elicit genuine reactions from consumers' minds, the techniques for processing and analyzing recorded brain data, and current strategies for interpreting these data.

Ouzir et al. (2024) authored an article titled "Neuro-marketing and Decision Making: Classifying Consumer Preferences Based on EEG Signal Changes in Brain Regions." In this study, they emphasized that neuro-marketing focuses on studying brain responses and understanding how consumers' brains react to products and services and how these reactions influence their choices. Evidence suggests that Electroencephalography (EEG) can provide valuable insights into consumer preferences and decision-making processes. The goal of this study is to evaluate the relative importance of various brain regions (including right/left hemispheres, frontal, temporal, parietal, and occipital lobes) in consumer choices for e-commerce products. The study also seeks to identify EEG features associated with consumer preferences using a classification system. Using publicly available EEG marketing data sets, signal changes were evaluated using a mixed model for repeated measures across all brain regions. Four classification algorithms (k-nearest neighbor, random forest, neural network, and gradient boosting) were used to distinguish between "like" and "dislike" preferences. Higher EEG activity in the right hemisphere, right parietal lobe, right occipital lobe, and left occipital lobe was associated with "like" responses. All brain regions, except for both sides of the temporal lobe, showed a significant decrease in activity at 4000 ms for "like" responses. However, no significant changes in activity were observed for "dislike" responses. The highest AUC (Area Under Curve) for the four classifiers were: 76.61% for the right parietal lobe with a neural network, 75.33% for the left parietal lobe with gradient boosting, 73.55% for the right frontal lobe with k-nearest neighbor, and 72.62% for the right frontal lobe with random forest. Given the significant difference between "like" and "dislike" responses at 4000 ms, the neural network performed the best, followed by gradient boosting. The authors concluded that their framework indicates that the formation of preferences (like and dislike) requires different patterns of brain activity, and neural networks and gradient boosting are valuable tools for distinguishing consumer preferences.



Yadete & Kant (2023) in their article studied neuromarketing in understanding consumer behavior (a systematic literature review). They stated that neuromarketing and its implicit and automatic processes affect customer decision-making and reveal any hidden understanding of consumer behavior. Today, there is a growing interest in studying consumers' brain responses and how they influence decision-making processes, as one of the most critical questions in today's market is what factors encourage consumers to choose one product over another. Although neuromarketing is recognized as one of the main research areas to achieve this goal, it is still a young and rapidly evolving field. The aim of this study was to examine how advertising affects consumers' purchasing decisions in online shopping. Other objectives included examining the role of customers' gaze fixation points, the number of gaze fixations, heat maps, and emotions in response to stimuli or marketing efforts. The stimulus is provided by the consumer, and the advertising effort evaluates the response. The authors used a systematic review of recent research literature. The inclusion and exclusion of scanned literature were conducted using the PRISMA method. To examine the effect size of the literature used, the authors used a forest plot based on partial correlations. Publication bias in the systematic literature review was observed using a funnel plot. Additionally, bibliometric analysis and content analysis were conducted to support the strength of the reviewed literature.

Misra (2023) studied neuromarketing insights into consumer behavior. In this study, he states that the emergence of neuromarketing has been a significant revolution in the marketing field. This interdisciplinary field combines principles from neuroscience, psychology, and marketing to understand consumer behavior and create more effective marketing strategies. Neuromarketing addresses the decision-making processes of consumers. In parallel, eye-tracking devices are used, allowing for the precise identification of stimuli that trigger the response at that moment. Additionally, some neuromarketing companies use GSR (Galvanic Skin Response) sensors to measure the skin's electrical conductance, which is another element providing insights into consumer reactions to different commercial messages. This article provides an overview of neuromarketing, including its history, theoretical background, and practical applications. It also discusses the current state of research on neuromarketing and its potential for future developments. The article used the Scopus database to analyze relevant articles from 2007 to 2018. It also explores the use of neuromarketing research in digital platforms and social media, considering both the goals of companies and the benefits to consumers. The article refers to the tools used for this purpose, including Magnetic Resonance Imaging (MRI), brain scanners that identify areas of the brain responding to various stimuli, and Electroencephalography (EEG), devices that measure electrical activity in the brain. The goal of the article is to demonstrate the role neuromarketing plays in accurately understanding consumer behavior, needs, words, and emotions.

Hussain & Mahfooz (2023) explored the use of neuromarketing tools and methods to understand consumer purchasing behavior. The main goal of this study is to provide a comprehensive overview of the neuromarketing field. This study aims to categorize the physiological and neuroimaging tools currently used in marketing research and clarify the brain infrastructures of consumer behavior that need to be addressed in the development of





marketing strategies. An increasing number of marketing and advertising companies have added to their activities, aiming to stimulate more consumer purchases and maintain a competitive market position. Every day, people are exposed to various types of advertisements, both directly and indirectly. Will these products be purchased if the banners reach their target audience correctly? Neuromarketing is an interdisciplinary field that integrates principles from neuroscience, marketing, and psychology to examine consumer attitudes and manage marketing processes. The use of various neuroimaging methods and tools, including Functional Magnetic Resonance Imaging (fMRI), Electroencephalography (EEG), and eye-tracking, is essential for measuring neural processes. Understanding customer purchasing behavior is critical for developing effective marketing tactics and increasing sales. The use of neuromarketing strategies to identify subliminal factors that influence customer decision-making is promising, where traditional marketing tactics may not adequately address it.

## Methodology and Research Information

This study is applied in nature and is classified as experimental in terms of its method and essence, conducted in a laboratory setting. The aim of this research is to examine the role of neuromarketing in consumer purchasing behavior (specifically the role of cognition and perception in purchase decisions). For this purpose, the following hypotheses were formulated:

1. Neuromarketing positively affects consumer purchasing behavior by stimulating the emotional centers of the brain.
2. Neuromarketing positively affects consumer purchasing behavior by stimulating the cognitive centers of the brain.

To test the stimulation of the emotional centers of the brain, emotional images were used. Emotional images (e.g., positive and happy images) were tested against neutral images (those with no emotional charge), and consumer purchasing behavior was measured by the number of purchases, the final purchase amount, and decision-making time. Additionally, alpha and beta brainwaves, recorded using Electroencephalography (EEG) and indicating relaxation and attention/excitement respectively, were utilized.

The experiment was conducted in the cognitive science lab at Allameh Tabataba'i University. A final sample of 30 participants was selected, with an average age range of 25 to 30 years. The sample was gender-balanced (50% female, 50% male) and participants were chosen from a specific income range. Participants' initial emotional state was recorded using a short questionnaire (e.g., PANAS).

To control the laboratory environment, a quiet room with appropriate lighting and no external distractions was selected. Participants were placed in the room, and EEG electrodes were correctly attached to their heads. A 3-minute period was recorded to establish the baseline brainwaves.





The experimental groups were as follows:

- **Experimental Group 1:** Participants were exposed to emotional images (pictures of people experiencing happiness and joy).
- **Experimental Group 2:** Participants were exposed to cognitive information (videos, texts, and images providing interesting and useful product information).
- **Control Group:** Participants were exposed to neutral images (pictures of products or simple environments without emotional charge) and regular information (ads that did not provide useful information).

Each participant in Experimental Group 1 viewed online store products and made purchase decisions based on the emotional images shown. Each participant in Experimental Group 2 reviewed online store product information and made purchase decisions based on the cognitive information provided.

Alpha and beta waves were recorded during the display of the images and cognitive information, as well as during the decision-making process. Alpha waves indicated relaxation and minimal stimulation, while beta waves indicated attention and excitement. In addition, the number of purchases, total purchase amount, and decision-making time in the online shopping environment were recorded. Participants' emotions were measured both before and after the experiment using a questionnaire to precisely assess changes.

To analyze the results, changes in alpha and beta waves, as well as purchasing behavior (number of purchases, total purchase amount, and decision-making time), were compared between the experimental and control groups.

### Analysis and Hypothesis Testing

To analyze the collected data, a t-test was used to examine significant differences between the groups. The results obtained are as follows:

Hypothesis 1: Neuromarketing has a positive effect on consumer purchasing behavior by stimulating the emotional centers of the brain.

### Results of Hypothesis 1 Testing:

**Table 1** - Results of Hypothesis 1 Testing:

variable	t-statistic	p-value
Alpha wave	4.29	0.000194
Beta Wave	4.97	0.000030



Purchases	1.79	0.083549
Total Spent	1.17	0.251478
Decision Time	-4.03	0.000386

The results for **Hypothesis 1** show that the **p-value** for both **alpha waves** (0.000194) and **beta waves** (0.000030) is less than 0.05. This indicates that there is a statistically significant difference between the experimental and control groups in terms of alpha and beta waves, signifying a positive effect of neuromarketing through emotional center stimulation on consumer purchasing behavior. However, the **p-value** for the **number of purchases** (0.083549) and **total amount spent** (0.251478) is greater than 0.05, meaning there is no significant difference between the groups for these variables. The **p-value** for **decision-making time** (0.000386) is less than 0.05, indicating a significant difference between the groups, with Experimental Group 1 taking less time to make decisions compared to the control group.

Hypothesis 2: Neuromarketing positively affects consumer purchasing behavior by stimulating the cognitive centers of the brain.

### Results of Hypothesis 2 Testing:

variable	t-statistic	p-value
Alpha wave	3.68	0.002045
Beta Wave	5.12	0.000087
Purchases	1.83	0.078321
Total Spent	0.97	0.334290
Decision Time	-3.89	0.001231

The data for Hypothesis 2 show that there is a significant increase in **alpha wave activity** in Experimental Group 2 (p-value: 0.002045), which indicates heightened focus and relaxation in this group. Additionally, **beta wave activity**, associated with alertness and cognitive engagement, was significantly higher in Experimental Group 2 (p-value: 0.000087), suggesting increased attention and mental engagement following cognitive stimulation.



However, the effect of cognitive stimulation on **purchasing behavior** is less clear. Although the **number of purchases** was relatively higher in Experimental Group 2, the observed difference was not statistically significant (p-value: 0.078321), meaning cognitive stimulation had a limited effect on the number of purchases made by customers. Similarly, no significant difference in **total amount spent** was found between the groups (p-value: 0.334290), indicating that cognitive stimulation did not have a direct impact on customer spending behavior.

On the other hand, **decision-making time** was significantly reduced in Experimental Group 2 (p-value: 0.001231), which suggests that cognitive stimulation can help accelerate customer decision-making and product selection.

## Conclusion

The results of **Hypothesis 1** indicate that stimulating emotional centers through neuromarketing leads to increased attention and positive emotions. The reduction in decision-making time in the experimental group suggests that neuromarketing can expedite the purchasing process. The recorded brainwaves showed a significant increase in beta waves, which are associated with attention and excitement, in Experimental Group 1. This implies that emotional stimulation can heighten mental engagement, making customers more alert and attentive during the moment of purchase. In other words, when customers are exposed to positive emotions such as joy and pleasure, not only do these emotions intensify, but the decision-making process speeds up, as customers tend to make quicker and more confident choices under the influence of positive emotions. While the effect of emotional stimulation on the number of purchases and total amount spent was not fully significant, the reduced decision-making time suggests that this type of marketing can enhance the speed and accuracy of customer selection and purchase.

The results of **Hypothesis 2** showed that stimulating cognitive centers using advertising content can lead to increased focus, alertness, and reduced decision-making time for customers. However, its impact on purchasing behaviors (such as the number of purchases and total amount spent) is less clear. Alpha waves, which are associated with relaxation and focus, significantly increased in Experimental Group 2, indicating improved mental focus when confronted with cognitive information. Additionally, the increase in beta waves in this group reflects greater alertness. Although the number of purchases in the cognitive group increased slightly, this difference was not statistically significant. This suggests that cognitive stimulation has a greater impact on improving cognitive processes like attention and focus rather than directly influencing practical behaviors such as the number of purchases or amount spent.

This study highlights that neuromarketing, through both emotional and cognitive stimulation, can improve customer attention, focus, and decision-making speed. However, the effects of these stimuli on financial and practical aspects of purchasing may take longer to manifest or may require complementary marketing approaches. Therefore, marketers can enhance



customer behavior by combining emotional and cognitive elements in their strategies, while also recognizing the limitations of these methods in driving immediate purchase increases.

## Resources

1. Ala, M., Nair, S., & Rasul, T. (2022). The power of neuromarketing: Taking luxury fashion marketing in Southeast Asia markets to a whole new level. In *Fashion Marketing in Emerging Economies Volume II: South American, Asian and African Perspectives* (pp. 73-98). Cham: Springer International Publishing.
2. Aldayel, M., Ykhlef, M., & Al-Nafjan, A. (2020). Deep learning for EEG-based preference classification in neuromarketing. *Applied Sciences*, 10(4), 1525.
3. Alsharif, A. H., & Mohd Isa, S. (2024). Revolutionizing consumer insights: the impact of fMRI in neuromarketing research. *Future Business Journal*, 10(1), 79.
4. Alsharif, A. H., Salleh, N. Z. M., Baharun, R., Alsharif, Y. H., & Abuhassna, H. (2021). A bibliometric analysis of neuromarketing: Current status, development and future directions. *International Journal of Academic Research in Accounting, Finance and Management Business Sciences*, 11(3), 828-847.
5. Bhardwaj, S., Rana, G. A., Behl, A., & de Caceres, S. J. G. (2023). Exploring the boundaries of Neuromarketing through systematic investigation. *Journal of Business Research*, 154, 113371.
6. Hussain, I., & Mahfooz, M. (2023). Utilizing Neuromarketing Instruments and Methods to Understand Consumer Buying Behavior. *International Journal of Contemporary Business and Economics (IJCBE)*, 1(1), 17-24.
7. Kant, S. (2020). Critical appraisal of prevailing marketing mix: Applies particularly to the digital marketing metaphor. *Journal of Marketing and Consumer Research*, 71, 38-40.
8. Kaya, Ü., Akay, D., & Ayan, S. Ş. (2024). EEG-Based Emotion Recognition in Neuromarketing Using Fuzzy Linguistic Summarization. *IEEE Transactions on Fuzzy Systems*.
9. Khondakar, M. F. K., Sarowar, M. H., Chowdhury, M. H., Majumder, S., Hossain, M. A., Dewan, M. A. A., & Hossain, Q. D. (2024). A systematic review on EEG-based neuromarketing: recent trends and analyzing techniques. *Brain Informatics*, 11(1), 17.
10. McDowell, W. S., & Dick, S. J. (2013). The marketing of neuromarketing: brand differentiation strategies employed by prominent neuromarketing firms to attract media clients. *Journal of Media Business Studies*, 10(1), 25-40.
11. Misra, L. (2023). Neuromarketing insights into consumer behavior. *IUJ Journal of Management*, 11(1), 143-163.
12. Morin, C. (2011). Neuromarketing: the new science of consumer behavior. *Society*, 48(2), 131-135.
13. Nguyen, H. S. (2024, May). Unlocking Consumer Insights: A Comprehensive Analysis of EEG Applications in Neuro Marketing Research. In *International conference on From Smart City to Smart Factory for Sustainable Future* (pp. 470-481). Cham: Springer Nature Switzerland.





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14. Ouzir, M., Lamrani, H. C., Bradley, R. L., & El Moudden, I. (2024). Neuromarketing and decision-making: Classification of consumer preferences based on changes analysis in the EEG signal of brain regions. *Biomedical signal processing and control*, 87, 105469.
15. Pratama, B. G., Wibawa, A. D., Wulandari, D. P., & Pratasik, S. (2024, July). Neuromarketing Study of Purchase Decisions Using Advertising Videos Based on EEG Signal Analysis. In *2024 IEEE International Conference on Industry 4.0, Artificial Intelligence, and Communications Technology (IAICT)* (pp. 315-320). IEEE.
16. Wakjira, G. G., & Kant, S. (2022). Significance Of Market Orientation On Business Performance With Mediating Role of Employee And Customer Satisfaction In Ethiopia Banks. *Partners Universal International Research Journal*, 1(4), 118-125.
17. Yadete, F. D., & Kant, S. (2023). Neuro-Marketing in Understanding Consumer Behavior: Systematic Literature Review. *Partners Universal International Innovation Journal*, 1(2), 105-116.