



Understanding Neuromarketing: Applications, Limitations, and Ethical Consideration

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ABSTRACT

Neuromarketing has gained increasing attention in the past two decades. It is an interdisciplinary field that combines neuroscience, psychology, and marketing to examine consumer behaviour beyond the conscious level, i.e., the subconscious. It analyses neural and physiological reactions to marketing stimuli. In this way, it claims to provide deep insights into consumer preferences, emotions, and decision-making processes. Generally, these techniques are widely known and used for their commercial utility. At the same time, they also raise important ethical, methodological, and applicational concerns. This paper critically examines the concept of neuromarketing and its key applications. Further, the paper gives particular attention to its limitations and ethical implications. This paper is conceptual in nature and based on a critical and integrative review of existing literature of the past twenty years drawn from marketing, neuroscience, ethics, and related social science disciplines. The paper will make several contributions to marketing research. First, it situates neuromarketing within broader consumer behaviour research by arguing that it should be viewed as a complementary tool that will make traditional marketing research methods more effective. Second, the study views existing scholarship on Global South perspectives. The inequality in socio-economic status and differing degrees of consumer awareness raise significant concerns. Furthermore, weak data protection mechanisms serve as primary factors influencing the ethical consequences of neuromarketing practices. By challenging Western-centric perspectives within this domain, it highlights the imbalanced power dynamics that exist between corporations and consumers. Additionally, this paper aims to enrich the ethical dialogue by thoroughly investigating the following marketing-

related issues: manipulation, consumer autonomy, and the lack of robust regulatory frameworks. In conclusion, this paper underscores the importance of adopting a nuanced perspective on neuromarketing, considering its potential implications and ethical obligations to promote the responsible application of neuromarketing technologies.

Keywords: Neuromarketing, Ethics, Consumer Behaviour, Global South, Neuroscience.

1. INTRODUCTION

Understanding consumer behaviour has long been a central concern of marketing research. Conventional methods such as surveys, interviews, and focus group discussions have provided valuable insights into consumer preferences and attitudes. However, these methods are often limited by respondents' inability to articulate subconscious motivations, as well as by social desirability bias and strategic responses. In recent decades, these limitations have prompted growing interest in alternative approaches that claim to access the non-conscious dimensions of decision-making.

Neuromarketing has emerged in this context as a method that applies neuroscientific tools to study consumer responses to marketing stimuli. Drawing on developments in cognitive neuroscience and behavioural psychology, neuromarketing seeks to measure attention, emotion, and memory through physiological and neural indicators. Its growing use in advertising, branding, and digital marketing reflects broader shifts toward data-driven and technologically mediated forms of market research.

Despite its expanding influence, neuromarketing remains a contested field. While proponents emphasise its potential to improve marketing effectiveness, critics question both its scientific validity and its ethical implications. These concerns become particularly significant when neuromarketing practices are examined beyond advanced capitalist economies. In many parts of the Global South, where regulatory oversight is limited and consumer awareness remains uneven, the ethical risks associated with neuromarketing may be amplified. This paper examines neuromarketing through a critical lens, focusing on its applications, limitations, and ethical and regulatory challenges, with special attention to Global South contexts.

2. NEUROMARKETING: CONCEPTUAL BACKGROUND

Neuromarketing refers to the application of neuroscientific and biometric techniques to analyse consumer responses to products, brands, and marketing communications. “The term Neuromarketing means to study the human brain to conclude various research on the effects of marketing stimuli” (Kotler et al., 2023, p. 115). The field gained prominence in the early 2000s, coinciding with the wider adoption of brain imaging technologies and growing interest in the role of emotions in economic decision-making.

Neuromarketing is an interesting fusion of Marketing, Neuroscience, and Psychology. This blend of (Neuro and Marketing) has provided a new field and a transformative tool in understanding consumer behaviour. Harvard Business School Professor Gerald Zaltman’s argument laid the groundwork for this new field. He argued that approximately 95% purchase decisions are influenced by the consumer's subconscious mind, which indicates that the role of the conscious mind is a bare minimum (Zaltman, 2003). Nielsen's statistical analysis reveals that 90% of consumer choices are swayed by their emotional responses (Nielsen, 2024). Hence, Consumers' decision is never based solely on their conscious mind; their decisions are mostly influenced by their subconscious mind and understanding of this subconscious mind is crucial for designing effective marketing strategies. Further, the term neuromarketing will be denoted by NM.

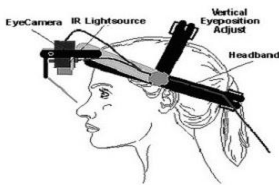
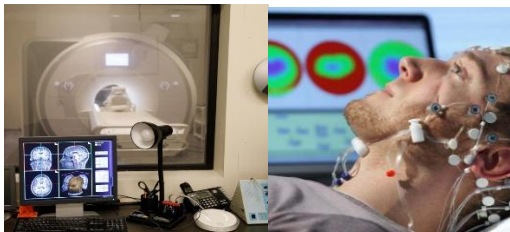
The NM Research focuses on brain imaging techniques to create products that will have more impact on consumer choice. NM, in simple words, is defined as any marketing or market research activity that uses the methods and techniques of brain science or is informed by the findings on insights of brain science. There are many technical tools used to study the consumer's mind towards various marketing stimuli. With the help of various NM tools and techniques, the neuro-marketers try to tap into the subconscious mind. Neuroscience techniques such as fMRI (functional Magnetic Resonance Imaging), EEG (Electroencephalography), Eye-tracking, and Facial coding are used to tap into consumers’ subconscious.

2.1 Neuromarketing Techniques and Tools

Unlike traditional marketing research, neuromarketing is grounded in the assumption that subconscious processes shape a substantial portion of consumer behaviour. Emotions, habitual responses, and intuitive

judgments are believed to influence choices in ways that individuals may not be fully aware of or able to verbalise. Neuromarketing seeks to capture these processes through tools such as electroencephalography (EEG), functional magnetic resonance imaging (fMRI), eye-tracking, and galvanic skin response measurements.

- fMRI (functional Magnetic Resonance Imaging): Measures changes in blood flow through strong magnetic fields to track changes in blood flow across the brain.
- EEG (Electroencephalography): Measures electrical activity and patterns in the brain through a helmet that contains around 100-300 sensors, which record the brain's electrical signals.
- Eye tracking: Measures the eye movements to identify and register gaze patterns to understand the visual path as a response to a specific stimulus.
- Biometrics: Measures skin conductance, heart rate and respiration to identify individuals or understand human behaviour.
- Facial Coding: Measures and tracks both the voluntary and involuntary movements of facial muscles; however, it does not utilise sensors.



Figures: Various Neuromarketing Tools
(Clockwise from left) – (i) FMRI, (ii) EEG, (iii) Eye Tracking, (iv)
Facial Coding

(Source: Web Platform)

While these techniques are often presented as offering objective insights, their interpretation is far from straightforward. Neural activity does not map neatly onto specific emotions or intentions, and the meanings attributed to brain responses are shaped by theoretical assumptions and contextual factors. As such, neuromarketing should be understood not as a neutral or purely scientific tool, but as a socially embedded practice influenced by commercial interests.

3. APPLICATIONS OF NEUROMARKETING

The application of NM in the Modern Business world is increasing day by day. Many companies have adopted NM techniques to gain a better understanding of their consumers' preferences. By applying NM tools such as fMRI, EEG, and eye-tracking, companies are reshaping their products to attract more customers.

3.1 Advertising and Brand Strategy

Advertising represents one of the most visible and widely studied applications of neuromarketing. By employing neuroscientific tools to measure attention, emotional arousal, and memory encoding, marketers seek to identify which components of an advertisement resonate most strongly with consumers. These insights enable the refinement of visual storytelling, sound design, pacing, and emotional cues, thereby enhancing the overall effectiveness of advertising campaigns. Unlike traditional methods that rely primarily on self-reported attitudes, neuromarketing provides access to implicit responses that often guide consumer behavior but remain difficult to articulate consciously.

Empirical studies have demonstrated that emotional and neurological responses to advertising messages can differ markedly from their intended rational effects. Lindstrom's (2008) research on anti-smoking campaigns provides a striking example. Warning labels and graphic images on cigarette packaging such as messages stating "smoking kills" or "smoking can lead to a slow and painful death", were found to have little deterrent effect on smokers. In some cases, these warnings even appeared to reinforce smoking behavior, suggesting that emotionally charged messages may activate desire or familiarity rather than discouragement. This finding highlights the complexity of emotional processing in advertising and the limitations of relying solely on explicit messaging to influence behavior.

Neuromarketing has also been applied to evaluate and redesign brand communication strategies. A notable case involves Campbell Soup Company, which conducted market research in 2005 to examine consumer recall of its advertisements and their impact on purchasing decisions. The results revealed that the company's existing advertising strategies were not effectively translating into increased sales. Subsequent neuromarketing-based investigations indicated that the product packaging failed to evoke positive emotional responses: the labels appeared uninviting, and the image of a large spoon filled with soup did not engage consumers at an emotional level. In response, Campbell redesigned its packaging to feature bowls of soup, a change intended to foster warmth, comfort, and emotional appeal, thereby strengthening purchase motivation.

One of the most influential neuromarketing studies in advertising and brand strategy was conducted by McClure et al. (2004). The study examined consumer preferences between Coca-Cola and Pepsi using both blind taste tests and branded conditions. While blind tests showed no consistent preference, participants exhibited stronger emotional activation in the ventromedial prefrontal cortex when they believed they were consuming Coca-Cola, accompanied by a reported preference for the brand. The significance of this study lies not in identifying a superior product but in illustrating how brand knowledge and emotional associations shape decision-making. Gladwell (2005) further contextualizes these findings by noting methodological limitations of sip tasting, where sweeter flavors, such as Pepsi, are favored in small quantities but may become less appealing in larger servings. This example underscores the difficulty of capturing authentic consumer preferences and highlights the value of integrating neuroscientific methods to better understand the cognitive and emotional evaluations that precede choice.

Beyond advertising effectiveness, neuromarketing plays a growing role in brand strategy by assessing emotional attachment and subconscious brand associations. This reflects a broader shift in marketing away from purely rational persuasion toward affective engagement. Brands increasingly aim to position themselves as symbols of identity, lifestyle, and emotional meaning rather than as mere providers of functional benefits. Neuromarketing tools enable firms to evaluate whether branding elements successfully evoke desired emotional responses and long-term brand affinity.

Supporting this perspective, Pozharliev et al. (2015) conducted an experiment comparing emotional responses to luxury and non-luxury

brands. Using EEG measures, the study presented luxury and basic brand products to female undergraduate participants in both social and solitary settings. The findings revealed that luxury brands elicited significantly stronger emotional responses in social contexts, suggesting that social visibility amplifies the emotional value of luxury consumption. Such insights offer marketers strategic guidance in positioning luxury brands as socially meaningful and emotionally rewarding experiences.

Taken together, these studies illustrate how neuromarketing enhances understanding of advertising and brand strategy by uncovering the emotional and cognitive mechanisms underlying consumer responses. While neuromarketing does not decode decision-making in absolute terms, it provides a valuable complementary framework for refining communication strategies, strengthening brand positioning, and aligning marketing efforts with the subconscious drivers of consumer behavior.

3.2 Product Design and Packaging

Product design and packaging constitute another important area in which neuromarketing has found practical application, particularly within highly competitive retail environments where consumer attention is limited and purchase decisions are often made rapidly. Neuromarketing techniques such as eye-tracking, electroencephalography (EEG), and physiological response measurement enable researchers to examine how consumers visually process packaging elements and emotionally respond to sensory cues such as colour, shape, texture, and layout. Unlike conventional design evaluations that rely on stated preferences, these methods provide deeper insight into implicit reactions that influence perceived value, shelf visibility, and overall product appeal.

Eye-tracking studies, in particular, have proven effective in identifying which visual features capture attention most efficiently and how consumers navigate packaging information during product evaluation. Complementary physiological measures allow marketers to assess emotional arousal and cognitive load associated with specific design choices, thereby supporting evidence-based decisions in packaging development. As a result, neuromarketing contributes to optimizing both functional clarity and emotional resonance in product presentation.

Empirical evidence illustrates how specific design elements influence attention and cognitive processing. Chaerani and Sari (2024) conducted a controlled study using Eye-Tracker Gazeport Analysis 3 (GP3) to examine the effects of four packaging variables - shape, texture, layout,

and eco-label, each manipulated across two levels. By keeping brand, colour, font, and eco-label type constant, the study isolated the impact of these visual features on consumer perception. The findings suggest that packaging design should be aligned with distinct marketing objectives rather than adopting a uniform approach. To maximize visual attention, a round-shaped package with a glossy texture, asymmetrical layout, and verbal eco-label was found to be most effective. In contrast, designs intended to enhance cognitive processing benefited from square shapes, glossy textures, symmetrical layouts, and visual eco-labels. Importantly, the study emphasized that informational content on labels plays a more decisive role than form-related features alone, and that packaging capable of eliciting emotional responses significantly increases purchase intention. The authors also highlight visual–haptic perception as a key emotional trigger, while noting the need for further research to identify packaging attributes that consistently generate positive affect.

The emotional impact of packaging design is further supported by principles derived from Gestalt theory, which posits that individuals tend to perceive visual stimuli holistically rather than as isolated components. Packaging designs that exhibit harmony, balance, and visual coherence are therefore more likely to be emotionally accepted by consumers (Tseng & Chuang, 2024). Rounded shapes, for instance, are commonly associated with softness, comfort, and approachability, making them particularly effective in product categories such as food and personal care (Zhou et al., 2021). In contrast, angular or geometric shapes often convey strength, modernity, and precision, rendering them suitable for technology-oriented or performance-driven products. When combined strategically with colour and layout, these design choices can enhance perceived quality and positively influence purchasing behaviour (Yang et al., 2024).

Neuromarketing research further demonstrates how the brain responds to such visual stimuli. EEG-based studies enable the examination of neural activity associated with packaging evaluation, providing insight into the emotional and reward-related processes underlying consumer preferences (Ali et al., 2022). Sin et al. (2024) found that visually attractive packaging stimulates activity in the orbitofrontal cortex, a brain region closely linked to emotional valuation and reward processing. This neural activation suggests that well-designed packaging does not merely attract attention but also generates positive emotional experiences that enhance product desirability. Such findings underscore the role of emotional engagement as a mediating factor between visual design and purchasing decisions.

The influence of packaging shape on emotional response and preference has been consistently supported across studies. Deng (2022) reported that packaging with rounded contours is generally preferred over designs featuring sharp edges, as smoother forms elicit more positive emotional reactions. This preference can be explained through the lens of embodied cognition theory, which argues that sensory experiences such as tactile comfort and ergonomic fit shape emotional responses and product evaluations (Chen et al., 2023). Consumers tend to associate soft, ergonomically designed packaging with warmth, friendliness, and ease of use, whereas sharper forms may evoke feelings of tension or discomfort, potentially reducing emotional appeal (Mohamad et al., 2021).

Additional neuroscientific evidence highlights the role of packaging ergonomics in sustaining consumer engagement. An EEG study by Semenova et al. (2023) demonstrated that ergonomically designed packaging increased beta wave activity in brain regions associated with attention and engagement. Elevated beta activity is indicative of heightened cognitive and emotional involvement, which has been linked to stronger purchase intentions and more favorable decision-making outcomes (Xu & Liu, 2024). These findings suggest that packaging design should not be treated merely as a visual interface but as a multisensory experience capable of shaping consumer focus, emotional response, and long-term brand attachment.

Overall, neuromarketing research on product design and packaging reveals that subtle visual and sensory cues can exert a substantial influence on consumer perception and behavior. By integrating neuroscientific insights into packaging strategy, firms can create designs that are not only aesthetically appealing but also emotionally engaging and cognitively efficient, thereby enhancing product attractiveness, strengthening brand identity, and fostering consumer loyalty.

3.3 Digital Platforms and User Experience

Neuromarketing has increasingly been incorporated into digital platforms, particularly within the domain of user experience (UX) research, as businesses seek to understand how users cognitively and emotionally interact with online environments. By analysing neural, attentional, and emotional responses, organisations attempt to optimise website structures, mobile applications, and digital advertisements to enhance engagement and conversion rates. This trend is especially relevant in the Global South, where mobile internet usage often surpasses

desktop access, making digital interfaces a primary space for consumption, interaction, and decision-making.

In digital marketing contexts, neuromarketing tools such as electroencephalography (EEG) and eye-tracking are used to examine how users respond to visual layouts, navigation elements, and interactive features. These techniques enable researchers to identify points of cognitive overload, frustration, or disengagement that may not be fully captured through traditional surveys or self-reported measures. As a result, digital platforms are increasingly designed to align with users' subconscious preferences, thereby improving usability and emotional satisfaction.

Empirical studies conducted by Yadava et al. and Çakar et al. demonstrate the application of neuromarketing techniques in understanding consumer behaviour within e-commerce environments. Yadava et al. developed a predictive modelling framework to assess consumer preferences by analysing EEG signals associated with “likes” and “dislikes” toward e-commerce products. In their study, participants were exposed to 42 product images, primarily consisting of apparel and accessories such as shirts, sweaters, shoes, school bags, and wristwatches. Following exposure, participants were asked to indicate their preferences. The analysis of neural data allowed the researchers to identify patterns associated with favourable and unfavourable product evaluations, offering valuable insights for digital retailers seeking to anticipate consumer demand more accurately.

In contrast, Çakar et al. focused on the user experience of first-time buyers during online product searches, incorporating both product attributes and pricing variables. To simulate realistic purchasing conditions, participants were provided with a gift card valued at approximately 73 USD and instructed to select three products from an e-commerce platform while maximising the use of the allocated amount. The study revealed that many participants experienced negative emotional responses when they encountered usability barriers, such as difficulty locating essential interface elements like “add to cart” buttons or sorting options. These findings highlight how poor interface design can generate frustration and cognitive strain, ultimately discouraging purchasing behaviour.

Such neuromarketing-based investigations are particularly valuable for developers and designers aiming to improve digital user experiences. Subtle design flaws, when repeated across large user bases, can translate into substantial financial losses for online retailers. This issue is

especially pronounced in industries such as footwear, where products are manufactured in numerous designs and variations. Producing large quantities of shoes without accurately predicting consumer preferences can be both labour-intensive and economically inefficient, as many designs fail to attract sufficient demand.

By integrating neuromarketing insights into digital platform design, businesses can reduce the risk of product failure, streamline decision-making processes, and create more intuitive and emotionally engaging user interfaces. Ultimately, understanding how users neurologically and emotionally experience digital environments enables companies to design platforms that not only meet functional requirements but also foster positive engagement, trust, and long-term consumer relationships.

3.4 Expanding Use in the Global South

Neuromarketing research has historically been rooted in Western academic and commercial environments, particularly in Europe and North America. However, in recent years, its application has gradually expanded into emerging economies across the Global South, including countries such as India, Brazil, and several nations in Southeast Asia. This expansion is largely driven by multinational corporations seeking to tap into rapidly growing consumer markets. Despite this increasing presence, neuromarketing practices in the Global South are often transferred directly from the Global North, with limited consideration for local socio-cultural, economic, and behavioural contexts. Such an approach raises important concerns regarding cultural bias, ethical accountability, and the unequal distribution of both benefits and risks associated with neuromarketing interventions.

A key issue in this regard is the assumption that consumer cognitive and emotional responses are universal and can be analysed using standardised frameworks developed in Western settings. Cultural norms, symbolic meanings, literacy levels, and consumption practices vary significantly across regions, and the application of neuromarketing tools without contextual adaptation may lead to misleading interpretations. Moreover, populations in the Global South may be more vulnerable to subtle forms of influence due to lower levels of regulatory oversight, digital literacy, and consumer awareness, further intensifying ethical concerns related to manipulation and autonomy.

Empirical evidence highlighting the imbalance in global neuromarketing research production is provided by Cardoso et al. (2022), who conducted

a bibliometric analysis using data from the Scopus database covering the period from 2007 to 2020. Their findings reveal a pronounced dominance of Global North countries in neuromarketing scholarship. Spain emerged as the leading contributor, accounting for approximately 48 per cent of total publications, followed closely by the United States with 39 per cent. Spanish research primarily focuses on advertising, particularly online advertisements and television commercials, with an emphasis on understanding the influence of visual and auditory stimuli on audience behaviour. These studies extensively employ technologies such as eye tracking, galvanic skin response, electroencephalography (EEG), and functional magnetic resonance imaging (fMRI).

The United States, ranking second, also demonstrates a strong research focus on television advertising, reflecting the commercial orientation of neuromarketing studies in the country. China occupies the third position, contributing around 24 per cent of the total publications. Although China is classified as part of the Global South in many global development frameworks, its contribution to neuromarketing research is substantially higher than that of other Southern countries. Chinese institutions primarily concentrate on consumer association, branding strategies, and tourism-related marketing, often linking these themes to colour perception and televised promotional content.

An institutional-level analysis further underscores the geographical concentration of neuromarketing research. Cardoso et al. (2022) identified the Complutense University of Madrid as the most productive institution, with 21 publications, followed by Roma La Sapienza University in Italy and Zhejiang University in China, each contributing 19 articles. Notably, Spain alone accounts for three additional universities within the top ten most productive institutions, reinforcing its central role in shaping neuromarketing discourse. When the top twenty contributing countries are categorised into the Global North and Global South, the imbalance becomes even more evident. Of these countries, fifteen belong to the Global North, while only five are from the Global South, with China being the sole country making a substantial contribution.

This unequal distribution of research output suggests that neuromarketing knowledge production remains heavily skewed towards the Global North. As a result, theoretical frameworks, methodological standards, and ethical guidelines are predominantly shaped by Western perspectives. The limited participation of Global South countries restricts the development of context-sensitive neuromarketing research that reflects diverse consumer realities. Addressing this gap requires

greater academic investment, cross-regional collaboration, and the development of ethical frameworks that account for socio-cultural diversity. Without such efforts, the expansion of neuromarketing in the Global South risks reinforcing existing inequalities in knowledge production, commercial power, and consumer protection.

| Sr. No. | Global Division | No. of Countries |
|---------|-----------------|------------------|
| 1. | Global North | 15 |
| 2. | Global South | 05 |

Table 1: Neuromarketing Studies (Scopus) Across the Globe
{Source: Calculated from the work of Cardoso et al. (2022)}

4. METHODOLOGICAL AND STRUCTURAL LIMITATIONS

Despite its increasing prominence in both academic research and commercial practice, neuromarketing is subject to several methodological and structural limitations that constrain its analytical robustness and broader applicability. One of the most persistent methodological challenges is the reliance on small and often non-representative samples. Due to the high financial costs, specialised equipment, and controlled laboratory settings required for neuromarketing experiments, studies frequently involve limited numbers of participants. This restricts the generalisability of findings across diverse populations and raises questions about the external validity of neuromarketing insights, particularly when they are applied to heterogeneous consumer markets.

In addition to sampling constraints, the technical complexity of neuromarketing tools presents significant barriers to large-scale implementation. Technologies such as electroencephalography (EEG), functional magnetic resonance imaging (fMRI), and eye-tracking systems require advanced infrastructure, skilled personnel, and rigorous experimental controls. These requirements not only increase research costs but also limit the feasibility of conducting longitudinal or comparative studies. As a result, many neuromarketing investigations prioritise experimental precision over ecological validity, often failing to capture the complexity of real-world consumption environments.

The interpretation of neuroscientific data constitutes another critical limitation. Neural responses are inherently multifactorial and context-dependent, influenced by prior experiences, emotional states, cultural conditioning, and situational variables. Attributing specific consumer motivations, preferences, or decision-making processes to isolated

neural activations risks oversimplifying the relationship between brain activity and behaviour. This interpretative challenge is further intensified by the tendency to treat neuroscientific evidence as inherently more objective or authoritative than traditional social science data - a phenomenon frequently described as “neuro-authority.” Such privileging of brain-based explanations can obscure the social, cultural, and structural dimensions of consumption that shape consumer behaviour beyond individual neural processes.

Structural constraints further exacerbate these methodological challenges, particularly in the context of the Global South. Limited access to advanced research infrastructure, funding shortages, and a lack of interdisciplinary collaboration between neuroscience, marketing, and social sciences restrict the development of locally grounded neuromarketing research. Consequently, many studies conducted in these regions rely on theoretical models, experimental designs, and interpretative frameworks developed in Western contexts. This dependence reinforces epistemic asymmetries in knowledge production and raises concerns about the cultural relevance and ethical appropriateness of applying such findings to non-Western consumer populations.

Taken together, these methodological and structural limitations highlight the need for a more cautious and reflexive approach to neuromarketing research. Addressing these challenges requires greater methodological transparency, interdisciplinary integration, and context-sensitive research designs. Without such efforts, neuromarketing risks overstating its explanatory power while underestimating the complex socio-cultural processes that underpin consumer behaviour.

5. ETHICAL DIMENSIONS OF NEUROMARKETING

The rapid development of neuromarketing has generated significant ethical debate due to its unique capacity to access and interpret consumers’ subconscious cognitive and emotional processes. While neuromarketing offers valuable insights into consumer behaviour that may enhance marketing effectiveness and decision-making, it simultaneously raises concerns that extend beyond conventional marketing ethics. Issues related to consumer autonomy, privacy, informed consent, and data governance have become central to scholarly discussions, as neuromarketing techniques often rely on highly sensitive neural and biometric data. The ability to influence preferences below the level of conscious awareness challenges established norms of voluntary choice and transparency in market interactions. Consequently, ethical

evaluation of neuromarketing is essential not only to protect individual consumers but also to ensure social trust, fairness, and accountability in increasingly data-driven commercial environments.

5.1 Influence, Manipulation, and Autonomy

One of the most prominent ethical debates surrounding neuromarketing concerns its potential influence on consumer autonomy through the targeting of subconscious cognitive and emotional processes. Unlike traditional marketing approaches that primarily appeal to conscious reasoning, neuromarketing techniques aim to access neural responses that operate below the threshold of awareness. This shift raises fundamental questions about the boundary between legitimate persuasion and unethical manipulation. When consumers are influenced without conscious recognition, their ability to exercise independent judgment may be compromised, thereby challenging the normative assumption of autonomous decision-making in market exchanges. These concerns are particularly salient in contexts characterised by educational inequality and limited consumer literacy, where individuals may be less equipped to critically assess persuasive stimuli.

Scholars have further highlighted practices such as overclaiming, misleading data interpretation, and stealth marketing as key contributors to the erosion of trust in the neuromarketing industry. Overclaiming refers to the exaggeration of neuroscientific or biometric findings beyond what empirical evidence can reasonably support. Such practices often emerge when research outcomes are shaped to align with the strategic interests of sponsoring corporations, thereby compromising scientific integrity (Thomas et al., 2017; Penrod, 2022a, 2022b). Inflated or selectively reported findings are sometimes disseminated publicly to stimulate consumer demand through fear-based appeals or overly optimistic narratives, which may induce purchasing decisions that consumers would not otherwise make.

Stealth marketing represents an even more contentious ethical issue. By employing subtle cues informed by neuroscientific insights, such strategies may influence consumer behaviour without explicit awareness, thereby bypassing conscious deliberation altogether (Mule, 2021; Penrod, 2022a, 2022b). Critics argue that such practices risk overriding individual autonomy by exploiting cognitive biases and emotional vulnerabilities. From this perspective, the ethical concern is not merely the effectiveness of neuromarketing but its potential to undermine the moral agency of consumers, transforming them from active decision-makers into passive targets of behavioural control.

Consequently, the manipulation–autonomy debate remains central to assessments of neuromarketing’s ethical legitimacy.

5.2 Privacy and Ownership of Neuro-Data

Another critical ethical dimension of neuromarketing relates to the privacy and ownership of neural and biometric data. Neurodata are qualitatively different from conventional consumer data, as they may reveal deeply personal information, including emotional states, cognitive traits, preferences, and vulnerabilities. Once collected, such data are difficult to anonymise fully and, if misused, may expose individuals to long-term risks that extend beyond the marketplace (Luna-Nevarez, 2021). As a result, concerns regarding data security, unauthorised access, and secondary use are particularly acute in neuromarketing research.

These risks are amplified in many Global South contexts, where regulatory frameworks governing data protection remain underdeveloped or inconsistently enforced. In such environments, neurodata may be subject to commercial exploitation, surveillance, or cross-sectoral use without adequate safeguards. The literature consistently identifies violations of consumer privacy as one of the most significant ethical challenges associated with neuromarketing (Fortunato et al., 2014; Ulman et al., 2015). The rapid expansion of neuromarketing firms, now numbering in the hundreds globally, has further intensified concerns regarding accountability and oversight.

From a neuroethical standpoint, questions of data ownership are inseparable from broader societal implications. Neuroethics, as a field, reflects on the moral dimensions of neuroscientific practices and their applications in social, economic, and political domains (Santos et al., 2014). The ability of organisations to extract and analyse neural information introduces asymmetries of power between corporations and consumers, potentially reinforcing existing inequalities. Vulnerable populations such as children, older adults, and individuals with cognitive impairments are particularly at risk, given their limited capacity to evaluate how their neuro-data are collected, interpreted, and monetised (Caratù, 2019; Fortunato et al., 2014; Kritika, 2025). Thus, privacy concerns in neuromarketing extend beyond individual harm to encompass issues of social justice and distributive ethics.

5.3 Consent and Transparency

Closely linked to concerns about autonomy and privacy are issues of informed consent and transparency. Obtaining meaningful consent in neuromarketing research is inherently challenging, as participants may lack a clear understanding of how their neural and biometric data are collected, analysed, stored, and potentially reused in the future. This problem is exacerbated in digital and AI-driven environments, where data collection often occurs passively, and opacity is built into complex technological systems (Hensel et al., 2017a; Wang, 2022).

Early critiques of neuromarketing, such as the *Nature Neuroscience* editorial (2004), framed the field as an attempt to locate a hypothetical “buy button” in the human brain, capable of generating irresistible advertising effects. Consumer protection groups have since expressed concern that such applications could intentionally induce specific neurological responses, thereby undermining free will. Neuroimaging studies suggesting that neural activity may precede conscious intention have further intensified these debates by raising philosophical questions about agency and decision-making (Madan, 2010).

However, subsequent scholarship has emphasized that ethical scrutiny of neuromarketing should not be isolated from broader debates in communications, sociology, psychology, and political science. Morin (2011), for instance, argues that neuroscience-based approaches can contribute positively to society by enhancing understanding of how individuals process, store, and recall information, as well as how marketing practices may trigger negative outcomes such as excessive consumerism. From this perspective, neuromarketing is not inherently unethical but requires responsible governance and ethical reflexivity.

Transparency regarding data collection practices, research objectives, and commercial intentions is therefore essential. Consumers must be informed about who is collecting their data, the purposes for which it is used, and the potential implications of participation (Wilson, Gaines, & Hill, 2008). While some scholars argue that current neuromarketing capabilities do not yet pose substantial ethical threats (Stanton et al., 2017), the prevailing consensus underscores the need for clear regulatory frameworks, professional ethical standards, and institutional oversight. Without such mechanisms, the promise of neuromarketing risks being overshadowed by public mistrust and ethical controversy, ultimately undermining its legitimacy as a scientific and commercial practice.

Regulatory Concerns and Governance Gaps

At present, neuromarketing operates within a fragmented regulatory landscape. Existing consumer protection and data privacy frameworks were not designed to address neuroscientific data and often fail to account for its sensitivity. While professional associations have proposed ethical guidelines, these remain voluntary and lack enforcement mechanisms.

In the Global South, regulatory gaps are more pronounced. Weak institutional capacity, limited public debate, and the dominance of multinational corporations create conditions in which ethical oversight is minimal. There is a need for context-specific regulatory approaches that recognise local socio-economic realities while aligning with global ethical standards. (Singh et al., 2025) developed a framework on the neuromarketing ethics that will guide the businesses, neuromarketers, marketing research companies, regulatory bodies, and governments to consider the interests of diverse stakeholders involved and address the potential agency conflicts.

6. CONCLUSION

This paper has critically examined neuromarketing as an emerging interdisciplinary domain that seeks to uncover the subconscious dimensions of consumer behaviour by integrating insights from neuroscience, psychology, and marketing. While neuromarketing offers novel methodological tools for understanding attention, emotion, and decision-making processes, the analysis demonstrates that its contributions must be interpreted with caution. Rather than positioning neuromarketing as a standalone or superior approach, this study argues that it is most effective when employed as a complementary framework that enhances, rather than replaces, established methods in consumer behaviour research.

The review of key application areas, ranging from advertising and brand strategy to product design, packaging, and digital user experience, highlights the practical value of neuromarketing in refining marketing communication and consumer engagement. Empirical studies illustrate how neural and physiological measures can reveal discrepancies between stated preferences and actual responses, thereby offering deeper insights into emotional and cognitive processes. However, these applications also expose the complexities of translating neuroscientific findings into real-world marketing strategies, particularly given the contextual and situational nature of consumer decision-making.

At the same time, the paper foregrounds the ethical challenges inherent in neuromarketing practices. Concerns related to manipulation, consumer autonomy, data privacy, informed consent, and transparency remain central to ongoing debates. The capacity of neuromarketing tools to influence consumers at a subconscious level raises fundamental questions about voluntary choice and fairness in market interactions. These ethical issues become especially pronounced in contexts where regulatory frameworks are weak and consumer awareness is limited, increasing the risk of exploitation and asymmetrical power relations between corporations and consumers.

The study further identifies significant methodological and structural limitations that constrain the explanatory power of neuromarketing research. Small sample sizes, high costs, technical complexity, and interpretative ambiguities limit the generalisability of findings. Moreover, the tendency to privilege neuroscientific data as inherently authoritative risks marginalising the social, cultural, and economic dimensions of consumption. These limitations underscore the importance of methodological reflexivity and interdisciplinary collaboration in advancing neuromarketing research.

Importantly, by engaging with Global South perspectives, this paper highlights the uneven global distribution of neuromarketing knowledge production and application. The dominance of Western research paradigms and the limited participation of Global South institutions reinforce epistemic dependence and raise concerns about cultural bias and ethical accountability. Addressing these disparities requires greater investment in locally grounded research, context-sensitive methodologies, and inclusive ethical frameworks that reflect diverse consumer realities.

In conclusion, this paper underscores the necessity of adopting a nuanced and responsible approach to neuromarketing. While the field holds considerable potential to enrich consumer research and marketing practice, its future relevance depends on balancing innovation with ethical responsibility, methodological rigour, and social sensitivity. Developing robust regulatory mechanisms, enhancing transparency, and fostering interdisciplinary and cross-regional collaboration are essential steps toward ensuring that neuromarketing technologies are applied in ways that respect consumer rights and contribute to equitable and sustainable market practices.

Suggestions and Future Directions

Based on the critical review of existing literature and the discussions presented in this paper, several key suggestions emerge for researchers, practitioners, and policymakers to ensure the responsible and effective development of neuromarketing.

- Clear ethical guidelines and regulatory frameworks must be developed to address concerns related to consumer autonomy, data privacy, and potential manipulation.
- Future studies should prioritise larger, more diverse, and culturally representative samples to improve the generalisability of neuromarketing findings.
- Greater transparency and informed consent mechanisms are essential to reduce power asymmetries between corporations and consumers, particularly in digital environments.
- There is a need to strengthen neuromarketing research infrastructure and interdisciplinary expertise in the Global South to reduce dependence on Western-centric knowledge production

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