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Harnessing Neuromarketing Techniques to Enhance Brand Engagement

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Abstract: Neuromarketing is an interdisciplinary concept that has become a unique phenomenon supplying valuable information about unconscious behaviour to increase the effectiveness of marketing strategies. The article focuses upon the impact of neuromarketing techniques on enhancement of brand management, including their current application, advantages, and ethical concerns. The research objectives are aimed at the analysis of trending neuromarketing techniques; description of benefits of neuromarketing; and outlining of its ethical considerations and threats. The paper presents a mixed-methods study, adopting in-depth interviews to collect marketers' opinions about the use of neuromarketing techniques in brand management, their advantages and challenges. The data was collected through in-depth interviews conducted in online and in-person modes. We involved 114 representatives of different companies who work in marketing field and apply neuromarketing techniques. The survey was carried out in August-November, 2023. The survey showed that neuromarketing techniques are widely used in brand management for deeper understanding of consumers' behaviour, optimization product design, or building more effective advertising. The frequency of use depends on the category of neuromarketing techniques since some of them are more applicable in brand management due to lower cost and reduced complexity. Also, we differentiated six groups of integrated neuromarketing techniques. During the survey we found that neuromarketing raises certain ethical considerations and potential threats that we need to address to enhance brand management. The study results enable us to explain practical steps to implement neuromarketing techniques in brand management. The findings may be implied by marketing departments while planning brand campaigns.

Keywords: neuromarketing, brand management, neuroimaging, consumers' behaviour, ethical considerations.

Introduction

In recent decades, constant enhancements in digital technologies have provoked a historic shift in business innovation and have apparently become an imperative for markets and society (Pascucci et al., 2023). Revolutionary breakthroughs such as artificial intelligence (AI) (Haleem et al., 2022; Verma et al., 2021), big data (Manko, 2022), chatbots (Ramesh & Chawla, 2022), Virtual Reality (VR) (Alcañiz et al., 2019; Kostyk & Sheng, 2023), blockchain technology (Wasiq et al., 2023), 5G technology (Shah et al., 2023), personalization and hyper-targeting (Tong et al., 2020) are increasingly used in marketing for tasks like customer segmentation, personalized recommendations, improvement of customer service, and predictive analytics. At the same time, some findings report on an unexpected discrepancy in contemporary marketing that are related to consumer empowerment (Darmody & Zwick, 2020; Hudders et al., 2019) and the loss of consumer privacy (Fernández-Rovira et al., 2021).

Digitalization has a profound impact on brand management since it influences how businesses build and manage their brand identities (Chukurna et al., 2022). Today, digital tools are widely used to design corporate brand experience (Marmat, 2021), monitor and manage brand awareness and reputation (Li et al., 2023) as well as maintain a positive brand image (Deepaa & Geeta, 2021). Also, digital platforms facilitate global reach, allowing brands to expand their audience beyond geographical boundaries (Meyer et al., 2023), help create and distribute branded content Dens & Poels (2023), adjust management risks and improve decision-making within marketing strategies (Chen, 2023).

According to a large number of recent studies, predicting consumer purchase behaviour is still one of the biggest challenges faced by marketers (Alsharif et al., 2023; Cenizo, 2022; Garczarek-Bąk et al., 2021). Neuromarketing as an interdisciplinary concept that comprises neuroscience, marketing, and psychology, has become a promising phenomenon that provides valuable information about unconscious behaviour to increase the effectiveness of marketing strategies (Alsharif et al., 2023) and measures physiological and neural signals to study customers' motivations, preferences, and decisions resulting in creative advertising, product development, pricing, etc. (Bhardwaj et al., 2023). Being the study of the brain's responses to advertising, neuromarketing contributes to enhancement of brand management through deeper understanding of consumer behaviour (Yadete & Kant, 2023), building effective communication between marketers and the audience (Casado-Aranda et al., 2023), product design and development (Alsharif et al., 2023; Antoniak, 2020), optimization of branding elements (Cerro Rodríguez et al., 2022), or data-driven decision-making (Garczarek-Bąk et al., 2021).

Research Aim and Questions

Since neuromarketing can reshape the traditional branding significantly, the article analyses the impact of neuromarketing techniques on enhancement of brand management, including their current application, advantages, and ethical concerns.

The purpose of the article is to delve into the interdisciplinary realm of neuromarketing, a distinctive phenomenon that sheds light on unconscious consumer behavior. The focus is squarely on the impact of neuromarketing techniques in bolstering brand management, encompassing their current applications, associated advantages, and ethical considerations. The research objectives of this article are strategically aligned to scrutinize trending neuromarketing techniques, delineate the benefits they offer, and outline the ethical considerations and potential threats they pose.

Thus, we address the following research questions: 1) What are trending neuromarketing techniques used in brand management? 2) What are the benefits of neuromarketing related to its usage? 3) What are the ethical considerations and threats of applying neuromarketing techniques in brand management?

The investigation uniquely contributes to description of effective neuromarketing techniques and explanation of potential advantages and challenges of neuromarketing implementations, and, therefore, helps build an optimal model of their implementation in brand management. To address these research question, this paper is structured as follows: In Section "Literature Review", we characterize fundamental concepts and techniques of neuromarketing, its benefits and threats as well as potentials of neuromarketing as a brand management tool. Then in Section "Method" we explain the methodology and research design. Section "Data Analysis and Results" is devoted to outline our findings regarding trending neuromarketing techniques and the peculiarities of their implementation in brand management. The research findings are analysed and interpreted in Section "Discussion", and, finally, in Section "Conclusion" we present the contributions, main limitations of the study, and future research.

Literature review

Neuromarketing: Fundamental Concepts and Techniques

Researchers and marketers insist that almost all consumer behaviour is based on emotions, attitudes, or preferences and happens unconsciously or subconsciously (Alsharif et al., 2023). In this context, consumers' decision-making is defined as a complex mental process that involves several mental and behavioural steps when considering, evaluating, and choosing a product or service (Klein & Sharma, 2022; Marc et al., 2022). Neuromarketing is related to consumers' decision-making because it is the study of brain responses focusing on how consumers' brains select products and services, and how these responses impact their choice (Ouzir et al., 2024). Neuromarketing is characterized by its interdisciplinary nature, and, on the one hand, it relies on the scientific methods including neuroimaging (Gill & Singh, 2022), biometric measurements (Aldayel et al., 2021), and psychological tests (Singh et al., 2023) to measure neural responses related to consumer behaviour. On the other hand, neuromarketing deals with understanding the psychological triggers and reveals subconscious processes like emotions or symbolic interpretation that influence consumer's decision-making (Chen, 2023; Kalaganis et al., 2021; Ouzir et al., 2024). Beyond emotions, neuromarketing studies human cognitive processes such as attention, perception, memory, and problem-solving (Garczarek-Bąk et al., 2021; Halkiopoulous et al., 2022). In addition, this marketing strategy includes advertising, product design, packaging, pricing, and customer experiences (Cerro Rodríguez et al., 2022). And neuromarketing, as an innovative approach which draws on neuro-scientific technologies, is oriented towards continuous progress and improvement of various technologies (Casado-Aranda & Sanchez-Fernandez, 2022).

Neuromarketing which apply neuroscience, psychology, and marketing, involves fundamental concepts that help marketers understand consumer behaviour, make data-driven decisions, and create more effective marketing strategies. According to the literature review, we distinguished the concept of emotional engagement, the concept of cognitive simplification, the concept of alternative, the neuroethical concept, and the concept of implicit associations. Table 1 shows five fundamental neuromarketing concepts.

Table 1

Fundamental neuromarketing concepts

Concept	Description
Concept of emotional engagement (Russo, Bilucaglia, Circi et al., 2022; Vences et al., 2020; Zito et al., 2021)	Neuromarketing emphasizes the importance of understanding emotions to create a stronger connection with consumers.
Concept of cognitive simplification (Garczarek-Bąk et al., 2021; Halkiopoulous et al., 2022)	Neuromarketing recognizes the importance of minimizing cognitive efforts to facilitate decision-making.
Concept of alternatives (Chen, 2023; Kalaganis et al., 2021; Nilashi et al., 2020)	Neuromarketing, when involved in decision-making, includes the evaluation of alternatives and different factors influencing choices.

Neuroethical concept (Clark, 2020; Shahriari et al., 2020)	The use of neuromarketing tools requires to respect consumer privacy, obtain informed consent, and ensure responsible and transparent use of neuromarketing methods.
Concept of implicit associations (Alsharif et al., 2023; Calvert et al., 2019)	Neuromarketing considers subconscious attitudes and preferences that consumers may not be consciously aware of.

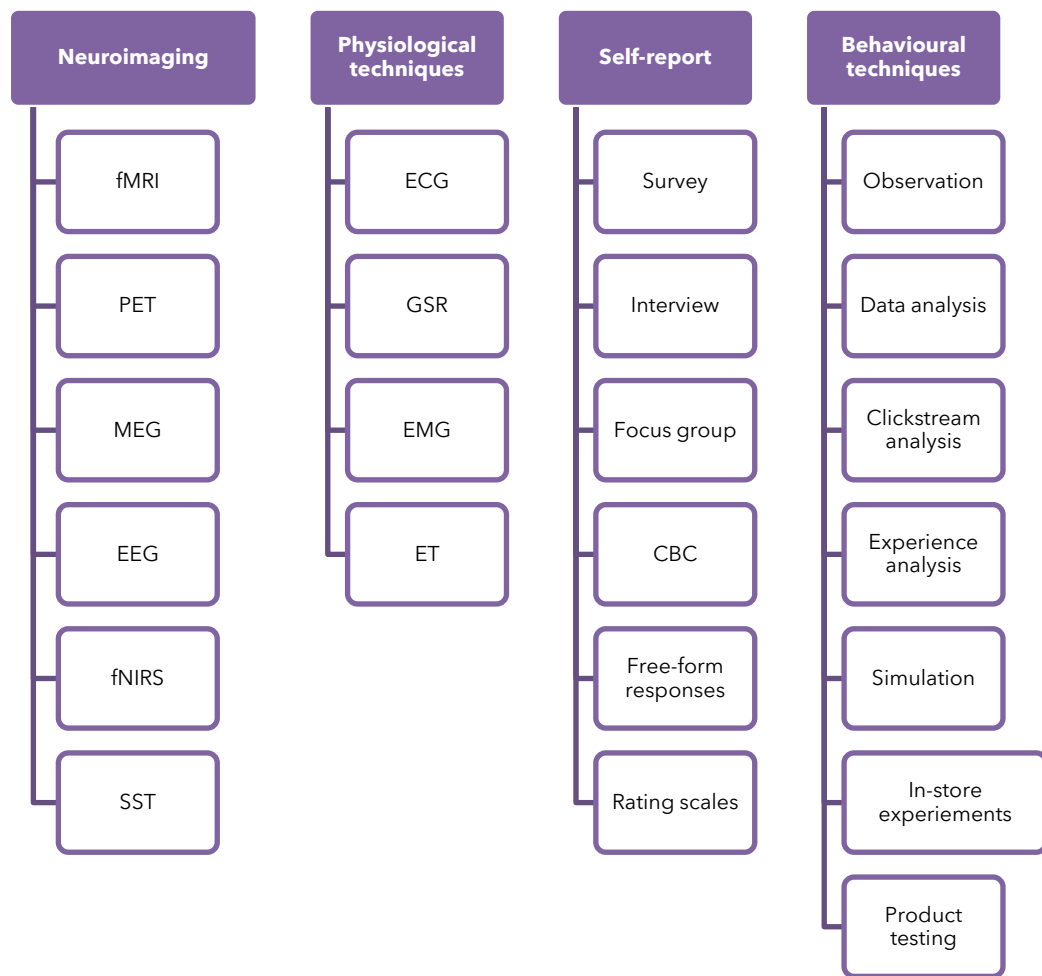
Source: compiled by the authors

Over the last decade, a lot of research have been done in application of neuromarketing concepts through different techniques. Reviewing the current research concerning the use of neuromarketing techniques in brand management, we found that they can be classified into four groups such as neuroimaging techniques, physiological techniques, self-report, and behavioural techniques (Alsharif et al., 2023). Figure 1 shows the classification of neuromarketing techniques in brand management. The first thing to note is that neuroimaging focuses on the structure and functions of the brain and nervous system. It allows researchers and marketers to pay attention how human brains respond to advertising discourse and other brand-related messages (Gill & Singh, 2022). In the context of brand management, neuroimaging techniques include the following: functional magnetic resonance imaging (fMRI) (Antoniak, 2020; Zhu et al., 2022), positron emission tomography (PET) (Rawnaque et al., 2020; Zhu et al., 2022), magnetoencephalography (MEG) (Alsharif et al., 2023; Fred et al., 2022), electroencephalography (EEG) (Costa-Feito et al., 2023; Raiesdana & Mousakhani, 2022), functional near-infrared spectroscopy (fNIRS) (Meyerding & Mehlhose, 2020), and steady state topography (SST) (Alsharif et al., 2023; Singh et al., 2023).

Physiological techniques in neuromarketing are aimed primarily at measuring various physiological responses to assess emotional and cognitive reactions of customers (Fauzi & Widyarini, 2023). They are related to electrocardiogram (ECG) (Alvino et al., 2020), galvanic skin response (GSR) (Vences et al., 2020), electromyography (EMG) (Alsharif et al., 2023; Singh et al., 2023), eye tracking (ET) (Gheorghe et al., 2023). While physiological techniques analyze implicit or unconscious responses, self-report deals with the collection of data directly from customers through their thoughts, feelings, preferences, and experiences. Self-report requires verbal or written feedback and uses surveys, interviews, focus groups, choice-based conjoint (CBC), free-form responses, and rating scales (Alsharif et al., 2023; Garczarek-Bąk et al., 2021; Hakim et al., 2020; Sánchez-Fernández et al., 2021).

Figure 1

Classification of neuromarketing techniques in brand management



Source: authors' own development

Behavioural techniques involve the analysis of consumers' behaviours and actions when purchasing, and their interactions with products and brands (Ismajli et al., 2022). These techniques are used to uncover consumers' decision-making or preferences. Behavioural techniques comprise observation, data analysis (Alsharif et al., 2023; Yadete & Kant, 2023; Mariani et al., 2022), clickstream analysis, experience analysis, simulation, in-store experiments, and product testing (Blasco-Arcas et al., 2022; Mariani et al., 2022). The researchers insist on integration of different neuromarketing techniques since it can provide a more comprehensive understanding of consumers' behaviour (Alsharif et al., 2023; Antoniak, 2020; Garczarek-Bąk et al., 2021). Each technique has its strengths and limitations and using them together allows to validate the outcomes and to facilitate more efficient use.

Boundaries of Neuromarketing

Bhardwaj et al. (2023) reveal that today market participants are highly interested in application of neuromarketing techniques for two reasons. Firstly, neuromarketing techniques may add more value to marketing plans. Secondly, advanced techniques such as neuroimaging may demonstrate better results and make a positive impact in the market. Accordingly, neuromarketing is an emerging field that may potentially revolutionize businesses market through incorporation of advanced technologies such as VR and augmented reality (AR) (Russo, Bilucaglia, Zito, 2022), cross-disciplinary collaboration between various field to gain deeper understanding of consumers' decision-making

(Singh et al., 2023). At the same time, recent findings show that neuromarketing enhances brand management because it allows to collect more real-time data (Garczarek-Bąk et al., 2021), uncover consumers' emotional triggers (Russo, Bilucaglia, Circi et al., 2022; Vences et al., 2020; Zito et al., 2021), and recognize how cultural factors influence consumers' responses to marketing stimuli (Crespo-Pereira et al., 2020).

It is worth mentioning that the use of neuromarketing is described from different perspectives. Being a neuroscientific method, neuromarketing, mainly, raises privacy concerns requires obtaining informed consent (Clark, 2020). While neuromarketing techniques analyse brain activities, it is crucial to interpret the results accurately and avoid misinterpretation of data (Birknerová et al., 2022). Also, some studies admit that the effectiveness of neuromarketing techniques may vary according to geography (Cardoso et al., 2022a; Crespo-Pereira et al., 2020; Traymbak et al., 2023) across different industries, products, and services (Azman et al., 2023; Russo, Bilucaglia, Circi et al., 2022; Crespo-Pereira et al., 2020). It is important to recognize that not all marketing strategies derived from neuromarketing research may be universally applicable and neuromarketing itself should be seen as a complementary tool that represents a holistic understanding of consumer's behaviour when integrated with other methods.

Taking these ideas into consideration, we found that neuromarketing has a number of advantages oriented towards enhancement of brand management (Alsharif et al., 2023; Cerro Rodríguez et al., 2022). Some findings show that marketers when apply neuromarketing techniques, face certain threats and challenges that can lead to potential manipulation (Antoniak, 2020), poor reliability and validity of data (Traymbak et al., 2022), high expenses (Antoniak, 2020; Gill & Singh, 2022), or absence of standardization guidelines (Antoniak, 2020; Luna-Nevarez, 2021). Table 2 presents advantages, threats and challenges of neuromarketing.

Table 2

Advantages, threats and challenges of neuromarketing

Advantages	Threats and challenges
Access to consumers' subconscious responses and emotions (Haidinger & Koller, 2023; Traymbak et al., 2023)	Ethical concerns including the questions of informed consent, privacy, security, and the potential manipulation of consumers through neuroscientific techniques (Antoniak, 2020; Bilgin Turna & Babus, 2021; Clark, 2020; Mohd Isa et al., 2019)
Data objectivity based on the analysis of brain activity, physiological responses, or eye movements (Alsharif et al., 2023; Gill & Singh, 2022)	
Identification of emotional and cognitive triggers (Dutta, 2023)	Complex interpretation of data, reliability and validity of findings (Traymbak et al., 2023)
Optimisation of advertising effectiveness (Sánchez-Fernández et al., 2021)	Integration with traditional methods (Alsharif et al., 2023; Bhardwaj et al., 2023)
Improvement of product design and packaging (Cerro Rodríguez et al., 2022)	High expenses for the equipment and expertise (Antoniak, 2020; Gill & Singh, 2022)
Use pf personalized marketing strategies (Alsharif et al., 2023; Dutta, 2023)	Limited accessibility for small companies (Bhardwaj et al., 2023; Brenninkmeijer et al., 2020; Constantinescu et al., 2019)
Implementation of innovation algorithms Morton (2022)	Limited generalization of the outcomes (Cenizo, 2022)

Measurement of consumer loyalty and trust (Cardoso et al., 2022a)	Possible misinterpretation of the findings (Birknerová et al., 2022)
Building of persuasive communication model (Casado-Aranda et al., 2023)	Consumers' scepticism (Brenninkmeijer et al., 2020)
Optimization of pricing strategies (Alsharif et al., 2023)	Lack of standardization and regulations (Antoniak, 2020; Luna-Nevarez, 2021)

Source: authors' own development

Therefore, neuromarketing has the potentials to significantly impact brand management by establishing the neurological and psychological processes and explaining consumers' behaviour. Figure 2 shows the ways in which neuromarketing can contribute to brand management. While neuromarketing has great potentials for brand management, it's important to use these outcomes ethically, respecting consumer's privacy and ensuring transparency in various practices.

In addition, some researchers state that the effectiveness of neuromarketing in practice depends on several factors. They include the availability and advancement of neuromarketing technologies like neuroimaging (Gill & Singh, 2022) or data processing tools (Yadete & Kant, 2023; Mariani et al., 2022); the use of research protocols and methodology (Zhu et al., 2022), public perception of neuromarketing and its ethical implications (Antoniak, 2020; Bilgin Turna & Babus, 2021; Clark, 2020), the interdisciplinary implementations (Cardoso et al., 2020b), and establishment of industry-specific standards (Azman et al., 2023; Crespo-Pereira et al., 2020).

Figure 2

Potentials of neuromarketing in brand management



Source: authors' own development

Addressing these factors may contribute to the successful implementation of neuromarketing strategies, foster ethical and responsible use, and, therefore, enhance brand management significantly.

Research Methodology

Design

The present study is aimed to assess the impact of neuromarketing techniques upon brand management and to outline the potentials to enhance it. The objective of the research was achieved through various methodological procedures, including a literature review on neuromarketing techniques and a combination of analysis methods. The paper presents a mixed-methods study, adopting in-depth interviews to collect marketers' opinions about the use of neuromarketing techniques in brand management, their advantages and challenges when implementing.

Research design is based upon epistemological principal that form new knowledge and generate implications (Bhardwaj et al., 2023). It involves the systematic planning of the research considering theoretical assumptions in management studies. Epistemology is responsible for explanation of knowledge influence and formulation of research methodology (Boon & Van Baalen, 2019). Further, because knowledge is knowledge is objective, observable, and measurable, we selected applicable research methods, collected and analysed data, interpreted the findings and generated new knowledge oriented towards enhancement of brand management. Hence, the research design was planned that was used to achieve the research objective and answer the research questions (Figure 3).

Figure 3

Planned research design



Source: authors' own development

Participants

The data was collected through in-depth interviews conducted in online and in-person modes. We involved 114 representatives of different companies who work in marketing field and apply neuromarketing techniques themselves. The survey was conducted in August-November 2023. All the participants were informed about the survey, and we ensured that the participants understood their rights and elaborated their responses accurately. We conducted the interviews on the principles of clarity, transparency, encouragement, and confidentiality. The interviews consisted of open-ended and closed-ended questions. This combination allowed the participants to express their thoughts freely and we managed to gather specific and quantifiable information. Also, we implemented validation checks to identify unreliable responses. This can include cross-verifying responses with other data points or conducting follow-up interviews for clarification.

We differentiated the participants according to their professional experience in brand management, departments, or teams they collaborate to implement neuromarketing techniques,

and number of campaigns completed. The latter one means that a participant facilitated or organized neuromarketing research, participated in brand storying, developed personalized recommendations and content based on consumers' preferences to enhance brand engagement. Table 3 shows the participants' profiles in detail.

Table 3

Participants' profiles

Descriptor		Quantity
Professional background (in years)		
	Below 5	18
	6-10	40
	11-15	32
	16-20	17
	Over 21	7
Department or team		
	Marketing Department	21
	Research and Development Team	5
	Market Research Team	11
	Data Analytics or Business Intelligence Teams	13
	Product Management Team	17
	Digital Marketing Team	13
	Brand Management Team	14
	External Consultant	17
	Ethics and Compliance Team	3
Projects completed		
	Less than 5	19
	6-10	41
	11-15	33
	16-20	10
	21-25	7
	26-30	4

Source: authors' own development

Instruments

We selected the research instruments validity and reliability (Lehmann et al., 2023), appropriateness for the study population (Taherdoost, 2022), feasibility and practicality (McLeod, 2021). At the same time, conducting the research, we ensured that the use of research instruments meets the ethical standards and safeguards the rights of participants (Arellano et al., 2023; Potthoff et al., 2023). It is necessary to state that all the research instruments were selected to directly address these questions and designed with the items that reliably capture the participants' attitudes and beliefs on the problem. Importantly, we correlated the research instruments with research objective, population, and research design. The use of selected instruments contributed to the research process, and they served as tools to collect data in a systematic and structured manner, interpret the findings, and generate new knowledge that can be applied in management studies or in the sphere of innovative marketing solutions. Table 4 shows the detailed analysis of all the research instruments used during the investigation to answer three research questions.

Table 4*Research questions and instruments*

Research question	Instruments used
1) What are trending neuromarketing techniques used in brand management?	online interview with closed-ended questions, real-time observation, modelling, quantitative analysis
2) What are the benefits of neuromarketing related to its usage?	in-person interview with open-ended questions, computer-assisted personal interviews, simulation, in-place experiments, descriptive analysis
3) What are the ethical considerations and threats of applying neuromarketing techniques in brand management?	in-person interview open-ended and closed-ended questions, telephone interviews, paper surveys, qualitative analysis, validation checks

Source: authors' own development

Results

Trending neuromarketing techniques used in brand management

The survey showed that neuromarketing techniques are widely used in brand management for deeper understanding of consumers' behaviour, optimization product design, or building more effective advertising. But the frequency of use depends on the category of neuromarketing techniques since some of them are more applicable in brand management due to lower cost and reduced complexity. We found that self-report and behavioural techniques are used mostly among marketers. According to respondents, rating scales (25,9 %), interviews (23,7 %), free-form responses (22,6 %), and surveys (22,1 %) are most popular self-report techniques during brand campaigns. At the same time, data analysis (27,2 %), consumers' experience analysis (23,1 %), observation (21,9 %), and product testing (20,6 %) are most frequently applied among behavioural techniques. Also, the survey showed that certain neuroimaging techniques like PET (1,1 %), MEG (1,7 %), and fMRI (2,3 %) are used least often as they require special training, implementation of specific equipment. Since these techniques are of high value, they are inaccessible for small companies. Table 5 analyses the frequency of use of neuromarketing techniques in brand management.

Table 5*The analysis of neuromarketing techniques used in brand management*

Neuromarketing technique	Frequency of use (%)				
	Always	Often	Sometimes	Rarely	Never
<i>Neuroimaging</i>					
fMRI	2,3	11,2	23,4	36,7	26,4
PET	1,1	12,4	25,6	42,1	18,8
MEG	1,7	9,8	23,1	45,9	19,5
EEG	3,4	15,2	27,3	49,2	4,9
fNIRS	3,5	17,6	26,4	40,1	12,4

SST	2,6	11,9	22,2	39,9	23,4
<i>Physiological techniques</i>					
ECG	9,8	11,9	28,9	45,1	4,3
GSR	7,5	14,5	32,1	50,2	3,2
EMG	8,1	19,1	25,2	45,4	2,2
ET	6,1	16,5	27,9	48,3	1,2
<i>Self-report</i>					
surveys	22,1	33,6	30,2	11,2	2,9
interviews	23,7	35,1	26,9	9,3	5,0
focus groups	19,9	28,3	30,2	15,5	6,1
CBC	17,3	22,4	33,6	13,6	13,1
free-form responses	22,6	30,8	28,7	10,4	7,5
rating scales	25,9	29,5	31,1	9,3	4,2
<i>Behavioural techniques</i>					
observation	21,9	23,5	30,8	12,3	11,5
data analysis	27,2	28,6	29,9	13,1	1,2
clickstream analysis	20,4	26,9	25,7	14,9	12,1
experience analysis	23,1	24,7	26,9	20,3	5,0
simulation	18,7	20,4	28,5	22,1	10,3
in-store experiments	18,8	19,7	31,2	23,4	6,9
product testing	20,6	22,0	32,6	19,3	5,5

Source: authors' own development

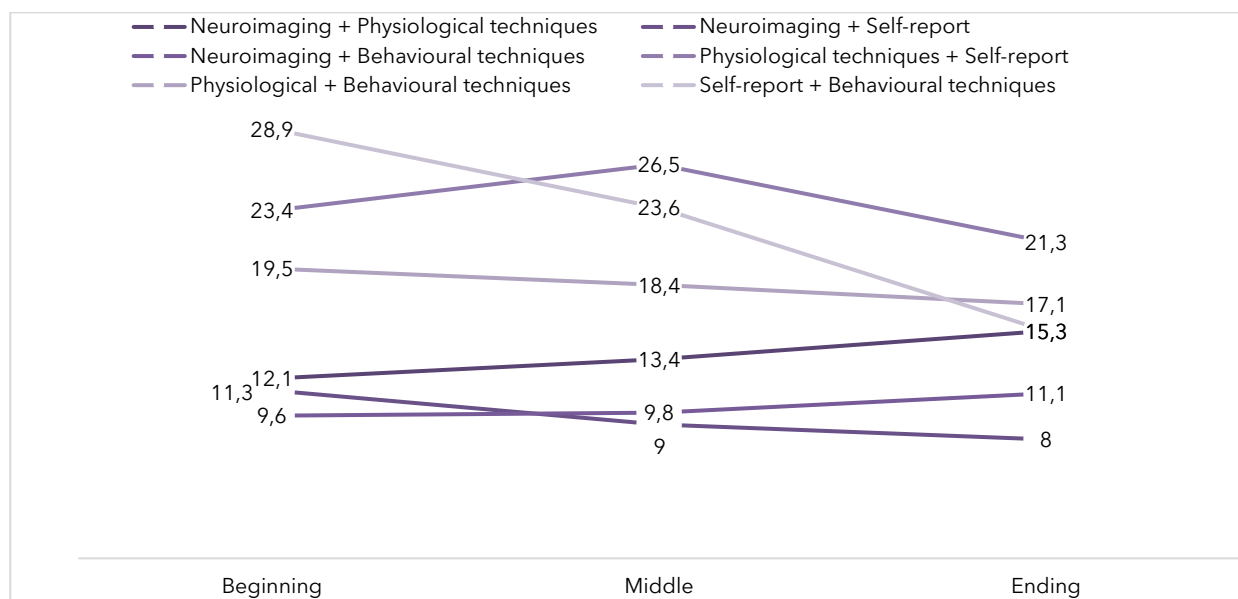
Also, considering the fact that integration of different neuromarketing techniques increases their impact (Alsharif et al., 2023; Antoniak, 2020; Garczarek-Bąk et al., 2021), we investigated the tendencies to combine the methods among marketers. We formed six groups of integration: Neuroimaging + Physiological techniques; Neuroimaging + Behavioural techniques; Neuroimaging + Self-report; Physiological + Behavioural techniques; Physiological techniques + Self-report; Self-report + Behavioural techniques. The measures were conducted three times: in the beginning, in the middle and in the end of brand campaign. The findings show that Self-report + Behavioural techniques are mostly applied in the beginning (28,9 %) and in the middle of brand campaign (23,6 %). 23,4 % of marketers use Physiological techniques + Self-report in the beginning, and 26,5 % - in the middle of brand campaign. In addition, the survey demonstrated that Neuroimaging + Self-report is least used in the end of brand campaign since only 8 % of participants preferred this type of integration. Figure 4 shows the use of integrated neuromarketing techniques among marketers in the different stages of brand campaign.

Positive impact of using of neuromarketing techniques in brand management

The survey conducted among the employees involved in brand management showed that the use of neuromarketing techniques enhances the efficiency of brand campaigns and helps to understand consumers' behaviour deeply. We found that self-report techniques are considered to be the most effective. 43,1 % of marketers apply it in brand campaigns and admit its sufficient efficiency that contributes to advertising optimisation. At the same time, 8,9 % of respondents find self-report of high efficiency and 25,7 % - of medium efficiency. 22,1 % of participants consider self-report of low efficiency, and only 0,2 % find self-report ineffective in brand campaigns. Also, behavioural techniques are considered effective as well. 6,5 % of marketers think these techniques change brand campaign considerable. 23,4 % are sure the behavioural techniques have medium efficiency, 39,7 % - sufficiently efficiency.

Figure 4

The use of integrated neuromarketing techniques (%)

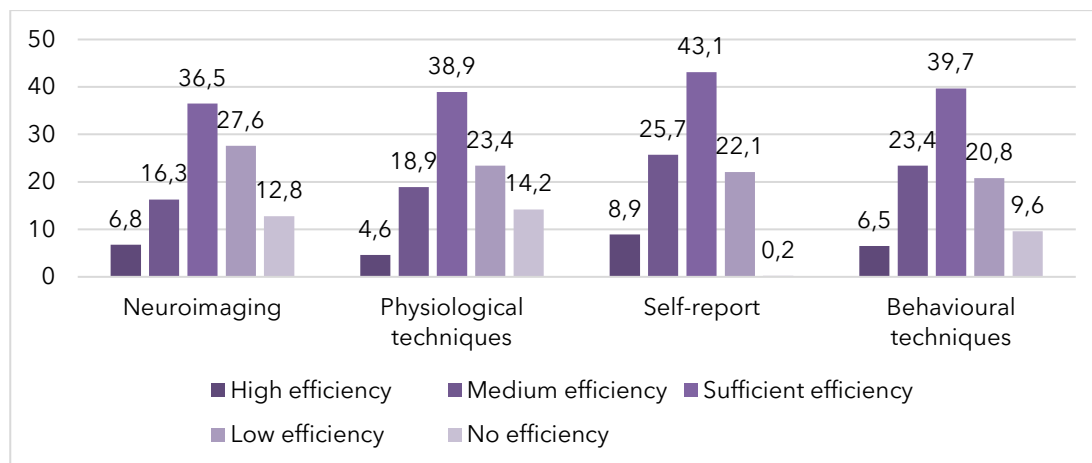


Source: authors' own development

Only 20,8 % of participants consider behavioural techniques of low efficiency, and 9,6 % think they are no effective in brand campaigns. The findings show that neuroimaging and physiological techniques are less effective. Thus, 12,8 % of marketers consider neuroimaging inefficient for brand management due to a number of threats and challenges, and 14,2 % think physiological do not make positive impact on brand management. Figure 5 shows the evaluation of efficiency of neuromarketing techniques in brand management.

Figure 5

The efficiency of neuromarketing techniques



Source: authors' own development

At the same time, the participants state that the use of neuromarketing techniques bring a number of advantages for brand management. Table 6 presents the advantages describes by the respondents during the survey.

Table 6

Advantages of neuromarketing techniques used in brand management

Neuromarketing technique	Advantages
Neuroimaging	
fMRI	Allows to analyse the specific brain sections activated during different cognitive tasks; Identifies the specific brain structures that respond to marketing stimuli; Describes brain activity over relatively short time intervals; Is safe for participants; Has relatively high objectivity of responses; Contributes to creating advertising and branding strategies that leave a lasting impression on consumers.
PET	Allows for the measurement of neurotransmitter activity in the brain; Provides high sensitivity in detecting and measuring changes in physiological processes; Helps assess regional blood flow patterns associated with different cognitive and emotional processes; Allows to track changes in brain activity and responses to marketing interventions over an extended period; Enables to investigate different aspects of brain function simultaneously; Allows to assess activity across the entire brain; Assesses the changes in dopamine release which is associated with consumers' reward and motivation.
MEG	Shows high precision in measuring brain activity; Provides more direct indicator of brain function compared to some other imaging techniques; Is safe for participants;

	Captures the activity of multiple brain regions simultaneously; Allows for a more naturalistic experimental setting compared to some other neuroimaging techniques; is particularly sensitive.
EEG	Provides excellent temporal resolution; Is more cost-effective than some other neuroimaging techniques; Is non-invasive and does not involve exposure to ionizing radiation or the use of contrast agents; Can be easily integrated into different experimental designs; Provides real-time feedback on brain activity; Allows to collect data in different environments.
fNIRS	Uses lightweight, portable devices; Is a non-invasive technique that does not require exposure to ionizing radiation or the use of contrast agents; Is advantageous for real-world consumer interactions; Captures changes in brain activity over seconds; Is more affordable than some other neuroimaging techniques; Is suitable for use with individuals of different age groups, including children and older adults; Is advantageous for investigating of complex cognitive processes related to consumers' behaviour.
SST	Has high temporal resolution; Is able to measure ongoing changes; Uncovers subconscious reactions and processes; Offers objective measurements of brain activity; Helps identify and quantify emotional responses to marketing stimuli; Provides information about the specific brain regions activated during different marketing tasks; Allows to tailor the messages and content to correlate consumer preferences.
Physiological techniques	
ECG	Is sensitive technique; Outcomes can be correlated with emotional states; Is used to assess stress levels and stress responses; Provides real-time feedback on changes in heart rate and heart rate variability; Helps to tailor marketing strategies to specific demographic or personality profiles; Provides more comprehensive understanding of the emotional and physiological responses to marketing stimuli; Is relatively cost-effective and easy to implement.
GSR	Is highly sensitive to changes; Allows to track physiological responses; Enables the identification of specific moments that evoke emotional responses; Is non-invasive techniques; Is relatively cost-effective; Can be used in longitudinal studies to assess changes in physiological responses over time.

EMG	Provides information about emotional expressions such as smiles and other facial movements; Provides real-time data; Has high temporal resolution; Is a non-invasive technique that involves attaching electrodes to the skin surface; Provides objective measurements; Helps interpret the emotional impact of marketing stimuli; Providing more detailed information in comparison with other physiological techniques; Can be applied in various contexts.
ET	Studies the visual attention of consumers; Helps understand the responses on various elements of advertisements, product packaging, or websites capture; Generates quantitative data; Provides and understanding of how people engage with visual content; Is valuable when testing for websites, apps, or product interfaces; Aids in optimizing package design; Is used to to compare different design variations and identify which version is more effective when capturing consumers' attention and conveying information.
Self-report	
surveys	Is cost-effective; Allows to collect the data from a large number of participants; Is efficient and can be administered quickly; Can be adapted to various research objectives; Enables to analyze and quantify consumer opinions and behaviours; Facilitates statistical analysis; Allows participants to express their opinions and attitudes directly; Can be used in longitudinal studies to track changes in consumer attitudes and behaviours over time.
interviews	Allows to gain in-depth analysis of participants' thoughts, feelings, and experiences; Can be used to clarify and interpret neuroimaging or physiological data; Provides an opportunity to explore participants' personal contexts, such as individual preferences, past experiences, and cultural influences; Offers direct feedback on marketing stimuli; Allows to explore individual differences in consumer preferences and behaviours; Fosters a sense of involvement in the study for teh participants; Is flexible technique; Provides understanding of the context in which consumers encounter marketing stimuli.
focus groups	Allows to explore consumers' perceptions, attitudes, and opinions regarding marketing stimuli; Provides the analysis of the contextual factors; Can be used to generate hypotheses and ideas for further investigation; Provides feedback on advertisements, product designs, or other materials; Allows to identify possible innovations or factors that may influence consumers' responses; Is useful for exploring cultural and social dynamics;

	Can be used to validate the findings obtained through neuroimaging measurements.
CBC	Is designed to measure consumer preferences; Creates a simulated purchase environment where participants make choices among different product or service profiles; Estimates the relative importance of different product attributes; Can simulate different market scenarios; Is used to evaluate consumers' desire to pay for different product features; Allows to identify distinct consumer segments with different preferences.
free-form responses	Provides in-depth analysis of participants' thoughts, feelings, and perceptions; Provides freedom for participants to express ideas; Captures the emotional nuances of participant experiences; Provides contextual understanding; Has high flexibility; Identifies the language and terminology that participants use when discussing products, brands, or marketing stimuli.
rating scales	Provides quantitative data; Allows for the standardization of responses across participants; Is easy to apply; Enables to compare responses between different groups, stimuli, or conditions; Allows to indicate the intensity or degree of participants' responses; Allows participants to express their agreement or disagreement; Allows for the efficient collection of a large amount of data from participants.
Behavioural techniques	
observation	Allows to study consumers' behaviour in natural settings; Provides an opportunity to identify behavioural patterns; Captures non-verbal cues, including body language, facial expressions, and gestures; Allows for real-time analysis of consumer behaviour; Provides a contextual understanding of consumer behaviour; Provides in-depth analysis of how consumers interact with and use products; Helps identify the areas of frustration in the consumers' experience; Can be used to validate or complement self-reported data obtained through surveys or interviews; Is valuable for assessing the effectiveness of product placement and merchandising strategies.
data analysis	Allows to identify patterns and trends within neuroscientific data; Helps determine the reliability and generalizability of the findings; Provides quantitative measures of the impact of marketing stimuli; Is used to conduct correlation analyses to explore relationships between neuroscientific measures and other variables; Allows to analyze multiple variables simultaneously; Is involved in the collection of data from multiple neuroscientific modalities; Allows to explore individual differences.
clickstream analysis	Helps understand how consumers engage with online content and make decisions; Helps identify popular pages, products, or content on a website;

	Identifies the characteristics of high-engagement sessions; Is useful for understanding user attention; Enables to tailor marketing strategies for specific user groups; Is crucial for e-commerce.
experience analysis	Offers a qualitative understanding of consumers' subjective experiences with marketing stimuli; Assesses participants' thoughts, emotions, and reactions articulated in their own words; Considers the broader context in which consumer interactions occur; Includes environmental factors, social influences, and situational dynamics; Identifies consumers' challenges; Allows to explore unconscious factors; Is effective for testing and evaluating the overall consumers' experience on websites, apps, or physical products; Helps understand how consumers perceive and interpret brand messages; Is valuable for exploring cultural variations in consumer experiences.
simulation	Is aimed to replicate real-world situations; Provides participants with immersive experiences; Enables to observe participants' behaviours in the controlled and dynamic environment; Allows for a deeper understanding of consumer behavior in specific contexts; Helps identify the areas for further improvements; Allows to study dynamic decision-making processes; Can be adapted to various platforms, including VR, AR, or computer simulations; Offers a risk-free environment for exploring different marketing strategies or scenarios.
in-store experiments	Takes place in authentic retail settings, providing a realistic environment; Allows for a better understanding of how consumers interact with products, displays, and the overall shopping environment; Facilitates the observation of actual product interactions; Allows for the evaluation of the impact of store layout, design, and merchandising strategies on consumer behaviour; Enables the creation of detailed consumers' journey maps; Offers the advantage of immediate feedback on consumer responses; Enables cross-category comparisons.
product testing	Provides objective measurements of consumer responses; Allows to capture implicit and unconscious reactions to products; Can detect preferences and reactions at an early stage; Allows for the assessment of emotional engagement with products; Can be applied to assess the usability of products; Analyses how users interact with interfaces at a neurocognitive level; Can assess the impact of different packaging designs on consumer responses; Can be applied in cross-cultural studies.

Source: authors' own development

Ethical considerations and threats of applying neuromarketing techniques in brand management

During the survey we found that neuromarketing raises certain ethical considerations and potential threats that we need to address to enhance brand management. Obviously, establishing clear ethical guidelines, promoting transparency, and fostering responsible practices will help outline potential threats and ensure that neuromarketing techniques contribute positively to both scientific understanding and consumers' engagement. Table 7 explains ethical considerations and threats faced when using neuromarketing techniques in brand management.

Table 7

Ethical considerations and threats of using of neuromarketing techniques

Neuromarketing technique	Ethical considerations and threats
Neuroimaging	
fMRI	Participants should be fully informed about the fMRI procedure, potential risks, and the nature of the research; fMRI data may reveal sensitive information about consumers' cognitive and emotional responses; fMRI involves exposure to strong magnetic fields, and there may be potential risks; Participants must not be forced to take part in the experiment. There is a risk of application of fMRI for non-marketing purposes; There is a risk of overinterpreting fMRI results; The use of fMRI may raise concerns about the potential influence on consumer autonomy and decision-making; Insufficient ethical oversight may lead to the misuse of fMRI technology in neuromarketing.
PET	Participants should be fully informed about the PET procedure, the use of radioactive tracers, and potential risks; PET involves exposure to ionizing radiation; PET data may reveal detailed information about consumers' brain activity; Certain populations, such as pregnant women, may be more vulnerable to the effects of radiation; The use of PET may raise concerns about the potential influence on consumer autonomy and decision-making; Participants may find it challenging to fully comprehend the technical aspects of PET; PET technology may be expensive and less accessible.
MEG	Participants should be fully informed about the MEG procedure; MEG data may reveal detailed information about consumers' brain activity; Certain populations, such as children, elderly individuals, or individuals with cognitive impairments, may be more vulnerable; MEG technology has dual-use potentials; There is a risk of overinterpreting MEG results; Application of MEG may lead to conflicts of interest; The use of MEG may impact consumers' trust if not communicated transparently.
EEG	Participants should be fully informed about the EEG procedure; EEG data may reveal information about consumers' brain activity; Children, elderly individuals, or individuals with cognitive impairments may be more vulnerable;

	The use of EEG may raise concerns about the potential influence on consumer autonomy and decision-making; There is a risk of overinterpreting EEG results; Application of EEG requires ongoing dialogue, collaboration between experts in different field.
fNIRS	fNIRS provides limited spatial resolution compared to other neuroimaging techniques; The effectiveness of fNIRS can vary from person to person; Analyzing fNIRS data can be complex; fNIRS is sensitive to motion signals; Integrating fNIRS data with other neuroimaging measures or behavioral data can be challenging; High-quality fNIRS equipment can be expensive.
SST	The use of SST raises ethical considerations related to participant consent, privacy, and the responsible use of neuromarketing; Consumers differ in their neural responses due to genetics, experiences, and personal preferences; Replicating results can be challenging due to variations in methodologies and sample characteristics; SST is typically conducted in controlled laboratory settings.
Physiological techniques	
ECG	Integrating ECG data with other neuroimaging data can be complex; ECG primarily measures physiological responses related to emotional arousal rather than cognitive processes; ECG provides limited spatial information; Physiological responses captured by ECG can vary among consumers due to age and health conditions; External factors such as ambient noise, temperature changes, or participant discomfort can impact ECG signals.
GSR	GSR does not provide specific information about the nature of emotions; Interpreting GSR data is subjective and requires expertise; Individual variations in skin conductivity can be significant depending on age and gender; GSR is sensitive to external factors like temperature, humidity, or participant discomfort; GSR data collection raises ethical considerations related to participant consent, privacy, and responsible use; Deploying GSR measurements in real-world marketing scenarios can be logistically challenging; The use of GSR may be unfamiliar to the general public, leading to potential misunderstandings or concerns.
EMG	EMG causes certain challenges in differentiating between subtle facial expressions; EMG does not directly measure specific emotions; Facial anatomy varies among consumers that may affect the outcomes; Interpretation of EMG data requires expertise; EMG may lack the precision; EMG may lead to misinterpretation.
ET	ET patterns do not always directly correlate with cognitive or emotional responses;

	Eye behavior varies among individuals due to factors such as cultural background, personal preferences, and cognitive styles; Integrating of ET data with other neuroimaging or psychophysiological measures for a comprehensive understanding of consumer responses requires careful coordination; Application of techniques requires accurate calibration of equipment; Participants may experience discomfort when wearing eye tracking devices.
Self-report	
surveys	Surveys rely on consumers' self-reported information, which can be subject to biases; The efficiency of using of surveys depends on wording of questions; Participants may interpret survey questions differently; Surveys often rely on consumers ability to recall and accurately report past experiences or behaviors; Surveys may not be culturally or linguistically sensitive; Surveys may not effectively capture emotional responses; Lengthy or complex surveys can impose cognitive load on participants; Online surveys may face technological barriers.
interviews	Expressing emotions verbally might be challenging for some participants; Cognitive biases can influence consumers' responses during interviews; Interviews provide limited access to unconscious processes; The interviewer's presence and behavior can influence consumers' responses; Participants may face difficulties in recalling specific details or experiences; The social context of an interview can impact consumers' responses.
focus groups	The dynamics within a focus group can affect individual responses; Expressing emotions verbally may be challenging for some participants; Focus groups primarily capture conscious opinions and attitudes; The role of the moderator can impact the direction of the discussion; Focus groups often involve a small number of participants; Focus groups are typically conducted post-experience, missing the opportunity to capture real-time emotional or cognitive responses; Cultural and linguistic variations can impact the understanding and interpretation of responses within focus groups.
CBC	CBC assumes that participants make decisions rationally; CBC primarily focuses on explicit, consciously stated preferences; CBC demands that consumers' preferences are stable and can be accurately expressed; CBC studies often involve consumers evaluating numerous product or service profiles; Participants may not always provide consistent responses across different choice scenarios; External factors can impact consumers' responses in CBC; Analyzing CBC data involves complex statistical models.
free-form responses	Analyzing free-form responses is subjective and requires interpretation; Participants vary in their ability to express thoughts and emotions verbally; Free-form responses are usually qualitative, making it challenging to quantify and compare results across participants or groups; Analyzing large sets of free-form responses is time-consuming; Free-form responses lack standardization;

	Interpretation of free-form responses may vary based on cultural and linguistic factors.
rating scales	Participants may interpret rating scale points subjectively; Rating scales often provide a limited number of response options; Participants may struggle to express their emotions accurately using a numerical scale; The context in which rating scales are presented can influence responses; Cultural and linguistic differences can affect the interpretation of rating scale items; The format of the response scale can influence participant responses; Emotional or attitudinal states can vary over time.
Behavioural techniques	
observation	The presence of an observer can influence the behaviour of consumers; It is necessary to obtain ethical approval; The interpretation of observed behaviours can be subjective; Understanding the reasons behind observed behaviours often requires additional research methods; Researchers have limited control over the environment in natural observational studies; Observations made in specific contexts may not be easily generalized; It is essential to train observers to maintain consistency and reliability.
data analysis	The data may be complex and multidimensional; Analyzing data in the context of individual differences requires sophisticated statistical approaches; Data analysis demand proper anonymization and protection of sensitive information.
clickstream analysis	Access to neurophysiological data is limited; Clickstream data alone cannot measure emotional responses; Clickstream data lacks detailed contextual information about the consumers' environment, mindset, or offline experiences; User behaviour in digital environments may be influenced by factors such as website design, user interface, and marketing strategies; Clickstream analysis involves tracking user behavior online, raising privacy concerns.
experience analysis	Integrating and interpreting data from various dimensions can be complex; User experiences are usually subjective; Experience analysis often involves both qualitative and quantitative data that requires advanced analytical methods; Findings from experience analysis may not always generalize to broader populations or different contexts; Consumers' preferences are dynamic and changing over time; Experience analysis often involves processing large volumes of data from diverse sources.
simulation	It is difficult to achieve a high level of realism in simulations; Simulations may lack the complexity of the actual consumers' experience; People vary in their responses to simulations; Combining simulation data with other measurements requires careful synchronization; Findings from simulations may not always generalize to real-world consumer behaviour; The design of simulations may introduce bias; Participants may behave differently in simulations.

in-store experiments	Conducting in-store experiments involves logistical challenges; Different stores may have varying layouts, atmospheres, and product displays; It is challenging to recruit participants within the store environment; Using neuroscientific tools in the store may be challenging; In-store experiments involve collecting data within a commercial setting, raising privacy concerns; Experimentation may disrupt the natural flow of customers in the store; In-store experiments may not capture the long-term effects of marketing interventions.
product testing	Consumers' responses to products are influenced by various factors; Individuals have diverse preferences; Product testing in the controlled laboratory environment may not fully represent the real-world context; Product testing often focuses on short-term responses; Ethical considerations related to participants' consent, privacy, and the impact of product testing on consumers' well-being must be carefully addressed; Responses can be complex and multifaceted; The logistics of accommodating a larger sample size require careful planning.

Source: authors' own development

The study results enable us to proceed to the explanation of practical steps to implement neuromarketing techniques in brand management.

Discussion

The research allowed us to outline the practical steps for further effective implementation of various neuromarketing techniques that may resulted in enhancement of brand management oriented towards providing valuable analysis of consumers' perceptions, preferences, and behaviours. These steps include the following:

Defining of clear objectives for implementation of neuromarketing techniques. Clear objectives guide the research process and help select appropriate methods (Crespo-Pereira et al., 2019). At the same time, defining of clear objectives demands understanding the broader business goals and challenges the company is facing. It helps increase brand awareness, improve product perception, or optimize marketing strategies (Alsharif et al., 2023). Some findings show that conducting a preliminary analysis of consumers' data identifies the areas where neuromarketing techniques must be applied and outlines the specific challenges within the company's marketing efforts (Birknerová et al., 2022). Some researchers state that description of the target audience through demographics, psychographics, and behavioural characteristics helps interpret the results more effectively (Gill & Singh, 2022) and, therefore, enhance brand management during future campaigns. We agree with some findings showing that defining clear objectives require establishing a timeline, considering the campaign budget (Bočková et al., 2021), analysis of stakeholders' expectations (Crespo-Pereira et al., 2020), and considering ethical implications (Antoniak, 2020; Clark, 2020; Shahriari et al., 2020).

Establishment of interdisciplinary collaboration. Fostering collaboration between marketing professionals, neuroscientists, psychologists, and data analysts may contribute to brand management significantly since a multidisciplinary approach ensures that the outcomes gained

through neuromarketing techniques are effectively interpreted and may be incorporated into actionable strategies (Singh et al., 2023). A number of scientific works insists that establishment of interdisciplinary collaboration is crucial when incorporating neuromarketing techniques into brand management because such collaboration brings together professionals to leverage their expertise and create a comprehensive understanding of consumers' behaviour (Rawnaque et al., 2020). We found that implementation of neuromarketing techniques effectively requires integration of relevant disciplines including marketing, neuroscience, psychology, data science, design, and business strategy (Robaina-Calderín & Martín-Santana, 2021). And a cross-functional team ensures diversity in skills, perspectives, and backgrounds to enrich the collaborative process. Some findings demonstrate that building open communication within the integrated team through regular team meetings, brainstorming sessions, and workshops provide opportunities for sharing ideas, addressing challenges, and achievement of project goals that resulted in promotion of learning culture (Elouadifi & Essakalli, 2022). Coordination of brand management project requires a shared understanding and facilitates more effective collaboration between team members, data integration, and recognizing diversity of perspectives (Brenninkmeijer et al., 2020). Fostering a collaborative environment to implement neuromarketing projects in brand management maximizes the strengths of each discipline and leads to a more holistic understanding of consumers' behaviour or marketing strategies.

Selection of an appropriate neuromarketing technique. Choosing neuromarketing techniques should be based on the specific aspects of consumers' behaviour that is aimed to investigate (Alsharif et al., 2023). As different techniques have unique strengths and limitations, the choice should coincide with the campaign objectives. Some findings show that selection of an appropriate neuromarketing techniques in brand management requires deep understanding of the strength and limitations, consider factors such as spatial and temporal resolution, invasiveness, cost, and suitability for different experimental conditions (Crespo-Pereira et al., 2020). In addition, it is proved that selection of neuromarketing techniques depends on assessment of practical considerations, including the availability of equipment, expertise, and budget (Bhardwaj et al., 2023). Some techniques, such as EEG, may be more cost-effective and easier to implement, while others, like fMRI, may require specialized facilities and higher costs. According to Antoniak (2020) and Garczarek-Bąk et al. (2021), combining multiple techniques for a more comprehensive understanding is very important and contributes to enhancement of brand management significantly.

Conducting pilot studies. Pilot studies are found to validate the selected neuromarketing techniques (Hsu & Chen, 2020) and contribute to enhancement of brand management. Obviously, this helps ensure the reliability and validity of the data and allows to adjust effective techniques before they are implemented fully during large-scale campaigns (Traymbak et al., 2023). Special attention must be paid towards assessment the quality of the data collected (Zhu et al., 2022). The findings show that checking for any technical issues or anomalies in the data is essential (Rawnaque et al., 2020). Hakim et al. (2020) and Sánchez-Fernández et al. (2021) state that feedback from participants regarding their experience in the pilot study may provide suggestions for further improvements and refine the campaign design. The outcomes of the pilot study may be used for development of a comprehensive plan where relevant neuromarketing techniques will be implemented.

Prioritizing of ethical considerations when using of neuromarketing techniques. Implementation of neuromarketing techniques effectively involves collecting data from participants, often measuring physiological and neurological responses. This requires considering ethical principles to ensure participants' well-being, rights, and privacy (Antoniak, 2020; Bilgin Turna &

Babus, 2021; Clark, 2020; Mohd Isa et al., 2019). Prioritizing of ethical considerations when using of neuromarketing techniques in brand management includes obtaining informed consent from participants before they are involved in the study (Clark, 2020); explanation about the purpose and objectives of the neuromarketing study transparently (Shahriari et al., 2020); describing how data will be anonymized and aggregated to protect participants' identities (Fernández-Rovira et al., 2021); implementation of data security measures to protect participants' sensitive information (Antoniak, 2020); and ensure voluntarily participation in the neuromarketing study (Garczarek-Bąk et al., 2021).

Combining of neuroscientific and traditional techniques. Integration of neuroscientific measures with traditional metrics provides a more comprehensive understanding of consumers' responses and allows to create cross-validation (Lin et al., 2023). Findings show that neuroscientific and traditional techniques can be integrated through study design, data, or correlation analysis (Meyerding & Mehlhose, 2020). At the same time, special attention is drawn towards combining qualitative data from traditional methods with quantitative data from neuroscientific techniques (Taherdoost, 2022). According to Garczarek-Bąk et al. (2021), Hakim et al. (2020), and Sánchez-Fernández et al. (2021), combining neural data with survey responses, demographic information, and behavioural metrics creates a comprehensive background for in-depth analysis. We found that including of direct behavioural observations as part of the traditional methods provide a relevant context to further neural investigations (Yadete & Kant, 2023; Mariani et al., 2022) and encourages development of integrated models incorporating both neuroscientific and traditional techniques (Gill & Singh, 2022). In addition, the outcomes obtained through neuroscientific and traditional methods ensure cross-validation and enhance the study generalization. By combining these techniques, researchers we can reveal the strengths of each method and create a more nuanced and holistic understanding of consumers' behaviour.

Conclusions and Implications

Neuromarketing is an interdisciplinary concept that comprises neuroscience, marketing, and psychology. It has become a promising phenomenon that provides valuable information about unconscious behaviour to increase the effectiveness of marketing strategies and measures physiological and neural signals to study customers' motivations, preferences, and decisions resulting in creative advertising, product development, pricing, etc. Neuromarketing relies on the scientific methods including neuroimaging, biometric measurements, and psychological tests to measure neural responses related to consumer behaviour. Beyond emotions, neuromarketing studies human cognitive processes such as attention, perception, memory, and problem-solving. Neuromarketing involves certain fundamental concepts that help marketers understand consumer behaviour, make data-driven decisions, and create more effective marketing strategies. They include the concept of emotional engagement, the concept of cognitive simplification, the concept of alternative, the neuroethical concept, and the concept of implicit associations. Neuromarketing concepts are implemented through different techniques. We found that they can be classified into four groups such as neuroimaging techniques, physiological techniques, self-report, and behavioural techniques.

We found that today market participants are highly interested in application of neuromarketing techniques for two reasons. Firstly, neuromarketing techniques may add more value to marketing plans. Secondly, advanced techniques such as neuroimaging may demonstrate better results and make a positive impact in the market. Also, the findings show that neuromarketing has a number of

advantages oriented towards enhancement of brand management. Other findings demonstrate that marketers when apply neuromarketing techniques, face certain threats and challenges that can lead to potential manipulation, poor reliability and validity of data, high expenses, or absence of standardization guidelines. Some researchers state that the effectiveness of neuromarketing in practice depends on several factors. They include the availability and advancement of neuromarketing technologies like neuroimaging or data processing tools; the use of research protocols and methodology, public perception of neuromarketing and its ethical implications, the interdisciplinary implementations, and establishment of industry-specific standards. Addressing these factors may contribute to the successful implementation of neuromarketing strategies, foster ethical and responsible use, and, therefore, enhance brand management significantly.

During the research we outlined the practical steps for further effective implementation of various neuromarketing techniques that may resulted in enhancement of brand management oriented towards providing valuable analysis of consumers' perceptions, preferences, and behaviours. These steps include the following: defining of clear objectives for implementation of neuromarketing techniques; establishment of interdisciplinary collaboration; selection of an appropriate neuromarketing technique; conducting pilot studies; prioritizing of ethical considerations when using of neuromarketing techniques; and combining of neuroscientific and traditional techniques.

The findings may be implied by marketing departments in different companies while planning brand campaigns to enhance brand management. Also, the findings are important for marketing consultants who help companies understand their customers and, therefore, identify effective marketing campaigns.

Also, the study concerns some limitations that are related to integration of neuroscientific and traditional techniques. We found that combining different techniques provides more comprehensive analysis of consumers' behaviour and, therefore, effective integrated techniques, accordingly, may enhance brand management significantly. In addition, special attention must be paid towards building of integrated models that are able to incorporate both neuroscientific and traditional techniques. We are convinced that introduction of integrated approach in neuromarketing will help to understand its boundaries better and avoid the challenges and threats that may happen when applying neuromarketing techniques in brand management.

Suggestions for Future Research

While this study provides valuable insights into the current landscape of neuromarketing techniques and their impact on brand management, several avenues for future research can be explored to deepen our understanding and refine practical applications.

As technology evolves, new tools and methodologies within neuromarketing are likely to emerge. Future research could delve into the effectiveness and ethical implications of these emerging technologies, such as advancements in neuroimaging or biometric measurements, to ascertain their potential contributions to brand engagement.

To comprehend the long-term effects of neuromarketing interventions, longitudinal studies could be conducted. Tracking consumer responses over extended periods would provide insights into the sustainability and lasting impact of neuromarketing strategies on brand perception and consumer loyalty.

Given the global nature of markets, an exploration of how neuromarketing techniques vary across different cultural contexts could be beneficial. Understanding cultural nuances in consumer behavior and response to neuromarketing interventions would enhance the adaptability and effectiveness of such strategies on a global scale.

Building on the ethical considerations raised in this study, future research could focus on developing comprehensive ethical frameworks for the application of neuromarketing techniques. This would contribute to the establishment of industry guidelines and standards, ensuring responsible and transparent use of these powerful tools.

Combining neuromarketing insights with traditional marketing metrics could provide a more comprehensive understanding of consumer behavior. Future studies could explore effective methodologies for integrating neuromarketing data with conventional marketing analytics to optimize decision-making processes.

These suggested research directions aim to contribute to the ongoing evolution of neuromarketing, fostering a deeper understanding of its potential benefits, ethical considerations, and practical applications in the dynamic landscape of brand management.

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Conflict of Interest

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