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Optimizing Digital Marketing Efforts Through Neuromarketing: Systematic Review

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ABSTRACT

Neuromarketing, as a neuroscientific approach to understanding human behavior and decision-making in marketing, holds significant promise for optimizing digital marketing strategies. This systematic review addresses the gap in research regarding the impact of neuromarketing on digital platforms like social media, websites, and e-commerce. By synthesizing existing literature, the review aims to bridge consumer behavior analysis with neuromarketing applications in digital marketing. Key themes identified include a deeper understanding of consumer behavior, improved targeting and personalization, optimized user experience (UX), enhanced ad effectiveness, and data-driven decision-making. These themes highlight the practical benefits of integrating neuromarketing insights into digital marketing strategies, allowing businesses to connect with their target audience more effectively. Compared to traditional methodologies, neuromarketing techniques offer a more accurate understanding of consumer responses and preferences, facilitated by advanced neuroscience tools like EEG, fMRI, eye tracking, and facial coding. Leveraging these tools enables marketers to align digital efforts with consumer preferences, leading to a more efficient and cost-effective marketing approach.

Introduction

The field of marketing has undergone significant transformations over the years, driven by advancements in technology and a deeper understanding of consumer behavior. One such transformative approach that has gained momentum in recent years is the neuroscientific approach to marketing. (Micu et al., 2021) This innovative discipline aims to explore the cerebral mechanisms that underlie various aspects of human behavior, including decision-making, preferences, attention, and the impact of intense emotions triggered by advertisements (Levallois et al., 2019). In the realm of neuroscience, several techniques have been developed to probe the intricacies of human brain activity and emotional responses. Among the most widely used and successful tools in neuromarketing are Electroencephalogram (EEG), Functional magnetic resonance imaging (fMRI), Eye tracking, Facial coding, Magnetoencephalography (MEG), Galvanic Skin Response (GSR), and Electrocardiogram (ECG). These cutting-edge tools enable researchers to delve into the subconscious mind of consumers, unravelling the neural processes involved in decision-making, emotional reactions, and cognitive preferences. (Micu et al., 2021). By delving into the neural processes behind consumer responses, neuromarketing seeks to provide marketers with valuable insights to create more effective and profitable marketing campaigns, leading businesses towards greater success in the competitive market landscape. (Kakaria et al., 2023; Mashrur et al., 2022). As the competition intensifies and consumer expectations continue to evolve, it becomes increasingly vital for marketers to employ strategies that resonate deeply with their target audience. Neuromarketing offers a promising avenue to achieve this goal. By

deciphering the neural underpinnings of consumer behavior, businesses gain access to a wealth of information that traditional marketing research methods may not fully capture. This knowledge can be leveraged to craft more compelling and tailored marketing efforts, enhancing the overall effectiveness of digital marketing campaigns (Kislov et al., 2021; Riley & Randolph, 2021; Jing Zhang & Lee, 2022).

There is limited research in the field of neuromarketing that explores its overall impact on various aspects of digital marketing, including social media, websites, e-commerce, and other platforms (Pasaribu et al., 2023). This study seeks to contribute to the existing body of knowledge by addressing the gap between consumer behavior analysis and the application of neuromarketing techniques, specifically within the context of digital marketing. Therefore, this paper aims to explore the potential of neuromarketing insights in optimizing digital marketing efforts. The practical implication of this paper is to provide valuable insights to marketers and business owners, guiding them on how to optimize their digital marketing endeavors in a more effective and cost-efficient manner, supported by evidence from neuromarketing research. This approach is considered more accurate compared to the traditional self-reported methodologies like surveys and interviews commonly employed in marketing research.

In the subsequent sections, this systematic review will delve into five main themes that have emerged from the analysis of existing research: enhanced understanding of consumer behavior, improved targeting and personalization, optimized user experience (UX), enhanced ad effectiveness, and data-driven decision-making. By addressing each theme in-depth, this review seeks to offer valuable guidance for businesses and marketers seeking to harness the potential of neuromarketing insights to gain a competitive advantage in the digital landscape.

The purpose of this research is to investigate the potential impact of neuromarketing on digital marketing strategies. Specifically, the study aims to explore how insights from neuromarketing can be utilized to optimize digital marketing efforts across various platforms such as social media, websites, and e-commerce. By delving into the neural processes behind consumer responses, the research seeks to provide valuable guidance to marketers and business owners in crafting more effective and tailored marketing campaigns. The gap analysis in the literature reveals a lack of comprehensive studies addressing the integration of neuromarketing techniques with digital marketing practices, including social media marketing, website optimization, e-commerce strategies, and other digital platforms. This study aims to contribute to filling this gap by bridging the divide between consumer behavior analysis and the application of neuromarketing techniques in the context of digital marketing, providing empirical evidence and actionable insights for marketers and businesses looking to optimize their digital marketing endeavors using neuromarketing principles.

Method

Search Strategy

This systematic review is conducted to answer how neuromarketing insights help optimize digital marketing efforts. The search strategy commenced by identifying two key concepts, namely "neuromarketing" and "digital marketing." Subsequently, a comprehensive list of relevant search terms and synonyms was compiled for each concept. Employing Boolean operators (AND/OR), these search terms were combined to construct search queries, resulting in the following query:

(neuromarketing) AND (digital marketing OR online marketing OR digital advertising OR social media OR social media marketing).

To ensure a thorough exploration of the literature, four prominent databases, namely Business Source Ultimate, Science Direct, Scopus, and Web of Science, were selected to conduct the search. Specific filters were applied during the search process, including constraints on the publication date (limited to 2021-2023) and language (restricted to English). By employing this comprehensive and structured search strategy, this study aims to gather and evaluate the most pertinent and up-to-date literature on the subject matter, ultimately contributing valuable insights into the potential benefits and implications of integrating neuromarketing principles into digital marketing practices.

Initial Assessment

The initial assessment process involved multiple steps to systematically screen and identify relevant literature from the retrieved results. Upon conducting the query in each database, the obtained records were downloaded and uploaded to the reference management software, Mendeley. Subsequently, duplicates were automatically removed after cross-referencing the results from the target databases. Once the elimination of duplicates was completed, the researcher conducted an initial review of the title and abstract of each retrieved document. This preliminary evaluation aimed to identify articles that potentially met the inclusion criteria. In the subsequent stage, full-text versions of the identified articles were retrieved, and a thorough examination of their content was carried out by the researcher.

The inclusion criteria employed in this study were as follows: 1) The selected studies must have utilized a neuroscience tool in their research. 2) The articles had to be published in the English language. 3) The eligible document types encompassed research papers, conference papers, reviews, reports, and commentaries. 4) Articles that were thematically focused on exploring the role of neuromarketing in digital marketing were considered relevant. 5) The publication date of the articles should fall within the timeframe from 2021 to June 2023.

Conversely, the exclusion criteria were defined as follows: 1) Articles published in languages other than English were excluded from consideration. 2) Documents classified as "letters to the editors" and "editorial articles" were not included in the study. 3) Articles that were deemed unrelated to the research question and purpose were excluded. 4) Articles that primarily focused on computational methods for simulation were also excluded from the analysis.

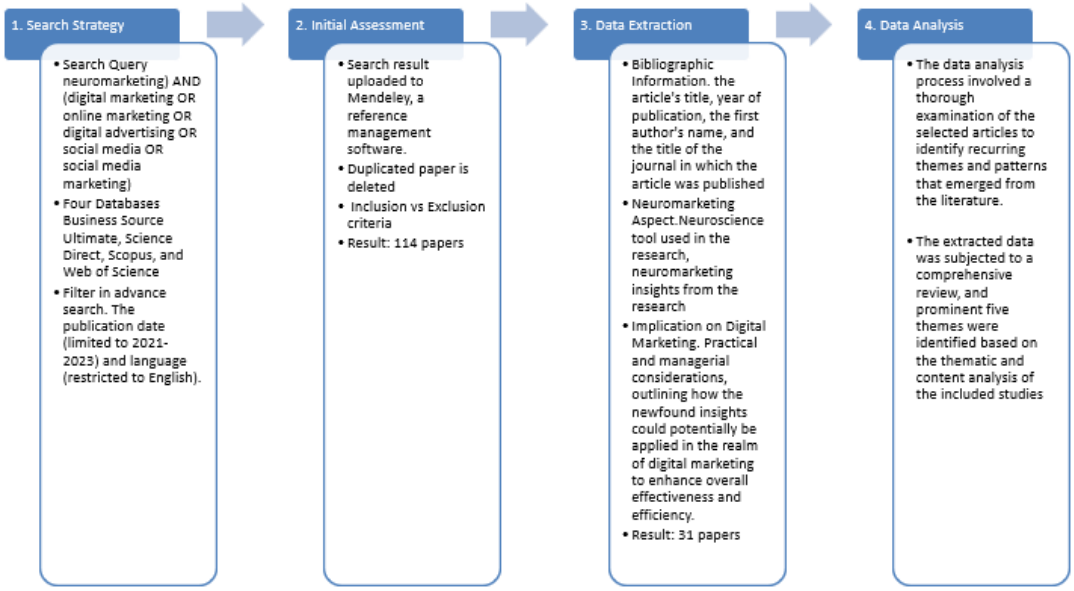

Figure 1. SLR in Optimizing Digital Marketing Efforts through Neuromarketing

Data Extraction

Upon the finalization of the article selection process, pertinent information was meticulously extracted from the full-text articles in a structured manner. The data extraction encompassed four distinct sections, each serving to capture specific aspects of the selected literature. In the initial section, essential bibliographic information pertaining to the articles was recorded, comprising the article's title, year of publication, the first author's name, and the title of the journal in which the article was published. The second section of the data extraction involved the comprehensive retrieval of the research objective and methodology employed in each study. This step aimed to provide a clear understanding of the primary focus and investigative approach undertaken by the researchers. The third section was dedicated to the documentation of information related to neuromarketing aspects within the selected articles. Specifically, this segment entailed the

identification of the specific neuroscience tools utilized in the respective studies. Additionally, the extraction process encompassed the elucidation of the neuromarketing insights derived from the research findings or any pertinent observations resulting from the study. Finally, the fourth section focused on outlining the implications of the identified neuromarketing insights for digital marketing practices. Particularly, the data extraction process aimed to discern how the investigated neuromarketing principles were posited to contribute to the optimization of digital marketing efforts. These implications encompassed practical and managerial considerations, outlining how the newfound insights could potentially be applied in the realm of digital marketing to enhance overall effectiveness and efficiency.

Data Analysis

The data analysis process involved a thorough examination of the selected articles to identify recurring themes and patterns that emerged from the literature. The extracted data was subjected to a comprehensive review, and prominent themes were identified based on the thematic and content analysis of the included studies.

Results

The systematic search yielded a total of 144 studies relevant to the research question. Subsequent to the identification of potential duplicates, 68 studies were eliminated from the dataset, resulting in a refined collection of 76 unique articles. Following the application of the predefined inclusion and exclusion criteria, a total of 31 full-text papers were subjected to thematic analysis in the final phase of the study (Table 1). The Systematic Literature Review (SLR) phases can be seen in Figure 1.

Table 1. List of Selected Literature

Study Number	Title	Author	Publication Date	Neuroscience Tool Used
1	Cognitive load during planned and unplanned virtual shopping: Evidence from a neurophysiological perspective	Kakaria et al.	2023	Electroencephalogram (EEG)
2	Neuromarketing Actions for the Digital Promotion of Tourism in Cuba	Lazo et al.	2023	Eye-tracking
3	Neuromarketing as a scale validation tool: Understanding individual differences based on the style of processing scale in affective judgements.	Lin et al.	2023	EEG
4	The influence of negative emotions on brand trust and intention to share cause-related posts: A neuroscientific study	Bigné et al.	2023	Eye-tracking; Facial Coding
5	The neurophysiological mechanisms underlying brand personality consumer attraction: EEG and GSR evidence	Xu et al.	2023	EEG; Galvanic Skin Response (GSR)
6	An intelligent neuromarketing system for predicting consumers' future choice from	Mashrur et al.	2022	EEG

	electroencephalography signals			
7	Analysis of the purchasing decision-making process in e-commerce using SED Method from Neuromarketing	Córdova et al.	2022	EEG
8	Customer behavior in e-commerce purchase from learning style	Córdova et al.	2022	EEG
9	Emotional responses in online social interactions: the mediating role of flow	Herrando et al.	2022	Heart Rate Variability (HRV)
10	Exploring the Relationships Between Perception of Product Quality, Product Ratings, and Consumers' Personality Traits: An Eye-Tracking Study	Pascucci et al.	2022	Eye-tracking
11	Neuromarketing in the Digital Age: The Direct Relation between Facial Expressions and Website Design	González-Mena et al.	2022	Eye-Tracking
12	Neuromarketing Solutions based on EEG Signal Analysis using Machine Learning	Ullah et al.	2022	EEG
13	Study of the Relationship Between Sensory Marketing and Consumer Satisfaction	Teixeira et al.	2022	GSR
14	The Development of Electroencephalogram (EEG) in Neuromarketing Using Hedonic and Utilitarian Motivation	Nizam et al.	2022	EEG
15	The heart, brain, and body of marketing: Complementary roles of neurophysiological measures in tracking emotions, memory, and ad effectiveness.	Baldo et al.	2022	EEG
16	Tracking unconscious response to visual stimuli to better understand a pattern of human behavior on a Facebook page	Šola et al.	2022	Eye-Tracking
17	"Two Rivers" brain map for social media marketing: Reward and information value drivers of SNS consumer engagement	Zhang et al.	2022	Functional magnetic resonance imaging (fMRI)
18	A Study of Advertising	Kislov et	2021	Eye-Tracking

	Content in Digital Communications: the Experience of Applying Neuromarketing and Traditional Techniques	al.		
19	Applying Implicit Association Test Techniques and Facial Expression Analyses in the Comparative Evaluation of Website User Experience	Mauri et al.	2021	Implicit Association Test (IAT); Facial Expression Analysis
20	Brain buzz for Facebook? Neural indicators of SNS content engagement	Zhang et al.	2021	EEG
21	Customer emotions when making an online purchase decision: Results of neuromarketing experiments	Yarosh et al.	2021	Eye-Tracking; Facial Coding
22	Destination website management: A social constructionist approach	Kanazawa et al.	2021	Eye-Tracking
23	Examining the effect of online advertisement cues on human responses using eye-tracking, EEG, and MRI	Yen & Chiang	2021	Eye-Tracking; EEG; Magnetic Resonance Imaging (MRI)
24	How Moment-to-Moment EEG Measures Enhance Ad Effectiveness Evaluation: Peak Emotions during Branding Moments As Key Indicators.	Kolar et al.	2021	EEG
25	How online advertising competes with user-generated content in TripAdvisor. A neuroscientific approach	Bigne et al.	2021	Eye-Tracking; EEG
26	Impact of Celebrity Endorsement and Breaking News Effect on the Attention of Consumers	Lazar et al.	2021	Eye-Tracking
27	Leveraging NeuroIS Tools to Understand Consumer Interactions with Social Media Content	Riley & Randolph	2021	EEG
28	Observing viewers' self-reported and neurophysiological responses to message appeal in social media advertisements	Wajid et al.	2021	EEG
29	Seeing It Is Like Touching It: Unraveling the Effective Product Presentations on Online Apparel Purchase Decisions and Brain	Jai et al.	2021	fMRI

	Activity (An fMRI Study)			
30	The visual-digital identity of corporate brands: A study of neuromarketing in young people from Spain and Portugal	Mañas-Viniegra et al.	2021	Eye-tracking; GSR
31	Understanding the Emotional Impact of GIFs on Instagram through Consumer Neuroscience	Mandal et al.	2021	Eye-tracking; Facial Coding; GSR

Thematic Analysis

Several common themes emerged from the analyzed articles, demonstrating the multifaceted impact of neuromarketing insights on digital marketing efforts. Factors that classified the studies to each theme are identified. A study can have more than one theme. First and foremost, a recurrent theme highlighted in the selected literature was the "Enhanced Understanding of Consumer Behavior." By employing neuroscience tools and methodologies, researchers were able to gain deeper insights into the cognitive and emotional processes underlying consumer decision-making, shedding light on the drivers of consumer preferences, motivations, and responses to marketing stimuli.

Table 2: Thematic Analysis

Theme	Factor	Study number
Enhanced Understanding of Consumer Behavior	Gain insights into consumer behavior, emotions, attention, and/or decision-making processes.	1, 3, 4, 6, 7, 9, 10, 12, 13, 14, 15, 16, 17, 18, 20, 21, 23, 26, 27, 29, 30, 31
Improved Targeting and Personalization	Enable marketers to better target their digital marketing campaigns, to resonate with specific segments of their target audience, increasing relevance and engagement.	3, 5, 8, 17, 20, 27, 28, 31
Optimized User Experience (UX)	Incorporating neuromarketing insights in UX design helps create websites, applications, and digital interfaces that align with users' cognitive capabilities and preferences.	1, 2, 9, 10, 11,16, 19, 22, 29
Enhanced Ad Effectiveness	Help optimize digital advertising effectiveness, including ad content and placement for maximum impact.	3, 6, 15, 17, 18, 20, 23, 24, 25, 27, 28
Data-Driven Decision Making	Data-driven approach minimizes guesswork and cost, and allows marketers to make informed decisions based on objective insights.	1, 5, 6, 8, 11, 12, 15, 16, 17, 22, 24

Another notable theme that recurred in the literature was "Improved Targeting and Personalization." The integration of neuromarketing insights into digital marketing practices enabled marketers to tailor their strategies more effectively to individual consumers, leveraging

personalized content and messaging to enhance engagement and conversion rates. Furthermore, the data analysis revealed a prevalent focus on "Optimized User Experience (UX)." The application of neuromarketing principles in the digital realm allowed for the refinement of user interfaces, website design, and overall user experience, leading to heightened satisfaction and prolonged engagement with digital marketing assets. The "Enhanced Ad Effectiveness" was another discernible theme among the selected articles. By leveraging neuromarketing insights, marketers were able to design and deliver advertisements that resonated more profoundly with consumers, resulting in higher attention, recall, and favorable brand perceptions. Finally, the data analysis highlighted the significance of "Data-Driven Decision Making" in the context of digital marketing. The utilization of neuroscience tools and techniques empowered marketers to collect and interpret valuable data, facilitating data-driven decision-making processes that were rooted in empirical evidence and neuroscientific findings, which ultimately is cost-effective and more accurate.

Discussion

This paper revealed that neuromarketing "enhanced understanding of consumer behavior". The utilization of neuromarketing techniques, such as EEG, fMRI, eye-tracking, and GSR, has allowed researchers to delve deeper into the subconscious processes underlying consumer choices, preferences, and emotional responses to marketing stimuli (Baldo et al., 2022; Bigné et al., 2023; Jai et al., 2021; Kislov et al., 2021; Nizam et al., 2022; Riley & Randolph, 2021; Rua-Hidalgo et al., 2021; Sola, Mikac, Koncevic, et al., 2022; Teixeira et al., 2022; Yarosh et al., 2021; Yen & Chiang, 2021; Jing Zhang & Lee, 2022). Emotions play a significant role in shaping consumer behavior, influencing purchase decisions, and fostering brand loyalty (Baldo et al., 2022; Bigné et al., 2023; Kakaria et al., 2023; Lin et al., 2023; Mañas-Viniegra et al., 2021; Rua-Hidalgo et al., 2021; J Zhang et al., 2021). Neuromarketing research has shown that emotional valence and arousal levels impact trust perceptions, sharing intentions, and brand engagement on social media platforms (Baldo et al., 2022; Kakaria et al., 2023; Nizam et al., 2022). Furthermore, sensory experiences and emotional valence are intertwined, as demonstrated by studies exploring the relationship between sensory stimuli, customer satisfaction, and preferences in online shopping environments (Baldo et al., 2022; Bigné et al., 2023; Kakaria et al., 2023; Mañas-Viniegra et al., 2021; Rua-Hidalgo et al., 2021; J Zhang et al., 2021).

The integration of neuroscience into marketing research has facilitated a deeper understanding of consumer perception, attention, and memory processes, particularly in the context of visual content and social media marketing (Baldo et al., 2022; Jai et al., 2021; Lazar & Pop, 2021; Nizam et al., 2022; Ullah et al., 2022; Jing Zhang & Lee, 2022). Visual aesthetics, simplicity, and sensory engagement in social media content have been found to enhance consumer attention and emotional responses, thereby influencing brand trust and sharing intentions (Baldo et al., 2022; Jai et al., 2021; Ullah et al., 2022; Jing Zhang & Lee, 2022). These findings highlight the importance of optimizing visual presentation strategies to capture consumers' interest and create emotionally rewarding experiences, especially in the context of social media marketing. Moreover, the cognitive processing of consumer value and decision-making has been investigated using neuromarketing techniques, shedding light on how consumers perceive product attributes, ratings, and online advertisements (Kakaria et al., 2023; Mañas-Viniegra et al., 2021; Nizam et al., 2022; Riley & Randolph, 2021; Ullah et al., 2022; Jing Zhang & Lee, 2022). The results indicate that consumers' neural responses to different marketing stimuli can vary based on their individual characteristics, such as personality traits, emotional valence, and attention patterns (Kakaria et al., 2023; Mañas-Viniegra et al., 2021; Riley & Randolph, 2021; Ullah et al., 2022).

The second theme "Improved Targeting and Personalization" highlights that the application of neuroscientific research methodologies such as ERP, EEG, and biometric analysis, provide unique and valuable information that goes beyond traditional self-reported measures, enabling marketers to better target and personalize their strategies to enhance engagement and customer satisfaction. (Riley & Randolph, 2021; Wajid et al., 2021; Xu et al., 2023; J Zhang et al., 2021; Jing Zhang & Lee, 2022). One key aspect explored in these studies is the emotional appeal of marketing content. The use of automated biometric analysis (facial coding, GSR, and eye tracking) alongside self-

reported responses (Rua-Hidalgo et al., 2021) demonstrates that neurophysiological measures offer a more accurate representation of emotional valence in social media marketing. By understanding how specific visual and informational elements trigger different emotional responses in consumers, marketers can craft content that elicits the desired emotions and fosters positive brand experiences (Rúa-Hidalgo et al., 2021; Wajid et al., 2021).

Another area of focus in this theme is the examination of brand personality perception using neuroscientific techniques (Xu et al., 2023; Jing Zhang & Lee, 2022). By analysing neural pathways related to reward and information value perception, researchers have identified the brain regions responsible for consumer engagement, recommendation, and sharing behaviour. Understanding how consumers perceive and connect with brand personalities allows marketers to align brand messaging with target audience preferences, thereby fostering stronger brand-consumer relationships (Xu et al., 2023; Jing Zhang & Lee, 2022). Furthermore, the utilization of neuroscience in measuring customer value perception in social media marketing has enabled the creation of an integrative brain map (Jing Zhang & Lee, 2022). This dual processing model sheds light on the underlying mechanisms of consumer value in the social media context. By identifying the unique needs and preferences of consumers based on reward and information value perception, marketers can customize their offerings to enhance consumer satisfaction and loyalty.

The third theme explore how neuromarketing insights can help "Optimize User Experience (UX)". Firstly, the application of neuromarketing techniques, such as Implicit Association Tests (IAT), emotional facial expressions analyses, and neurophysiological experiments, proved instrumental in understanding user behavior and emotions. These techniques provided objective measurements and deeper insights into users' reactions to different stimuli, aiding in identifying areas for improvement and enhancing user engagement. (Herrando et al., 2022; Kakaria et al., 2023; Kislov et al., 2021; Sola, Mikac, Koncevic, et al., 2022). Secondly, personalization emerged as a critical factor for optimizing user experience. Tailoring content and interfaces to elicit positive emotions and engage users can significantly impact users' satisfaction and foster stronger connections with brands (Jai et al., 2021; Mauri et al., 2021). Thirdly, efficiency and usability were emphasized in Lazo et al. (2023) and Sola, Mikac, & Koncevic (2022) researches. Improving website attractiveness, usability, and overall web quality can streamline the user journey, reducing friction and enhancing satisfaction. The concept of flow experience played a prominent role in optimizing user experience (Jai et al., 2021; Kakaria et al., 2023). By creating a state of flow during website navigation, users were more likely to perceive higher quality and exhibit increased engagement, positively impacting purchase intentions. Lastly, customer feedback and evaluation were crucial in assessing the effectiveness of neuromarketing techniques and design improvements. Incorporating user feedback and expert validation ensures iterative enhancements that continually optimize user experience. (Kanazawa et al., 2021; Lazo et al., 2023; Mauri et al., 2021). Neuroscience tools such as eye-tracking helps marketer better understand how to optimize their customer’s user experience. (Pascucci et al., 2022)

The fourth theme “enhance ad effectiveness” refers to how neuromarketing insights help optimize digital advertising effectiveness. By analyzing consumers' neural responses using neurophysiological tools such as EEG, fMRI, and event-related potentials to different ad elements, such as visuals, headlines, and calls-to-action, marketers can refine ad content and placement for maximum impact. This can result in higher click-through rates, improved brand recall, and increased ad effectiveness (Baldo et al., 2022; Bigne et al., 2021; Kislov et al., 2021; KOLAR et al., 2021; Lin et al., 2023; Mashrur et al., 2022; Wajid et al., 2021; J Zhang et al., 2021; Jing Zhang & Lee, 2022).

The analysis reveals the integration of digital technologies, machine learning and artificial intelligence in refining advertising content and placement. The utilization of neural networks enables precise targeting, personalized advertising, and analyzing vast amounts of consumer data to optimize ad placements across various digital channels. (Bigne et al., 2021; Kislov et al., 2021; Mashrur et al., 2022; Yen & Chiang, 2021; J Zhang et al., 2021). The application of moment-to-moment EEG indicators further contributes to this theme. Understanding consumers' real-time emotional responses and engagement during different stages of an ad allows marketers to refine

content and strategically place advertisements for maximum impact. By incorporating such insights, marketers can tailor ads to specific microsegments of target groups, leading to higher click-through rates and improved brand recall. (Bigne et al., 2021; Kislov et al., 2021; Mashrur et al., 2022). Furthermore, the validation of consumer scales through neuromarketing methods provides a more robust foundation for measuring consumer behavior and preferences. Utilizing neurophysiological measures alongside self-reported data enhances the accuracy and reliability of these scales, enabling marketers to make more informed decisions about advertising strategies. (Lin et al., 2023; Wajid et al., 2021). Neuromarketing researches focusing on social media marketing provide essential insights into understanding consumer behavior and value perception in this context. By identifying distinct neural pathways associated with reward value, emotional appeal, and information value, marketers can strategically design social media advertisements to engage users, elicit sharing behavior, and influence purchase decisions. This aligns well with the research question, as these abstracts explore how neuromarketing insights specifically impact advertising in the social media context. (Baldo et al., 2022; Riley & Randolph, 2021; Jing Zhang & Lee, 2022)

The last theme "data-driven decision making" classified researches that reveal how neuromarketing insights provide data-driven guidance for digital marketing decision-making. These studies employ advanced neurophysiological methods, such as EEG, fMRI, eye-tracking, GSR, and facial expression analysis, to identify patterns, preferences, and trends within their target audience, informing strategic decisions related to messaging, design, channel selection, and campaign optimization. This data-driven approach minimizes guesswork and allows marketers to make informed decisions based on objective insights that is productive and cost-efficient. (Kakaria et al., 2023; KOLAR et al., 2021; Mashrur et al., 2022; Sola, Mikac, Koncevic, et al., 2022)
Kakaria et al. (2023) and Mashrur et al. (2022) studies demonstrate how neuromarketing insights derived from EEG and eye-tracking data provide data-driven guidance for marketers in making informed decisions related to messaging, design, and campaign optimization. Similarly, González-Mena et al. (2022) explores user experience on websites using eye-tracking, offering recommendations for content optimization to increase user attention and engagement. These findings reduce guesswork and provide marketers with objective information for effective digital marketing strategies, that would get highest return on investment (ROI).

Moreover, the application of neuromarketing techniques in social media marketing is evident in Baldo et al. (2022) and Jing Zhang & Lee (2022) studies. The use of fMRI and other neurophysiological measures helps identify distinct neural pathways responsible for reward and information value perceptions in consumers' brains during social media engagement. Marketers can leverage this understanding to tailor content to specific user needs and preferences, resulting in enhanced engagement, recommendation, and sharing behavior.
Additionally, Xu et al. (2023) uses EEG and GSR to explore the discrepancy between self-reported brand personality preferences and physiological responses. This study highlights the significance of neuromarketing insights in understanding consumer behavior beyond traditional survey methods. Such insights can inform marketers about brand personality design and target consumer groups. Several studies focus on using neuromarketing insights to predict consumer preferences and future behavior, aiding in the creation of marketing strategies and optimized digital marketing efforts (González-Mena et al., 2022; Kakaria et al., 2023; Mashrur et al., 2022; Xu et al., 2023).

Conclusion

Neuromarketing is a powerful tool that offers valuable insights into consumer behavior, providing a deeper understanding of subconscious processes and emotional responses that traditional marketing research methods may not capture. This systematic review has shed light on the significant impact of integrating neuromarketing insights into digital marketing efforts.
The five themes identified in this analysis demonstrate the diverse range of benefits that neuromarketing can bring to digital marketing strategies. Firstly, the enhanced understanding of consumer behavior empowers marketers to craft personalized and emotionally resonant

campaigns, leading to stronger connections with their target audience. Secondly, improved targeting and personalization enable marketers to deliver tailored content, messages, and offers, boosting relevance and engagement among specific segments of their audience. Moreover, incorporating neuromarketing insights into UX design leads to optimized user experiences, ensuring that digital interfaces align with consumers' cognitive capabilities and preferences. This, in turn, enhances user satisfaction and conversions. Additionally, the application of neuromarketing insights in digital advertising significantly improves ad effectiveness, as marketers can refine ad content and placement based on consumers' neural responses, resulting in increased click-through rates and better brand recall. Lastly, the review highlights the importance of data-driven decision-making, where marketers can leverage neurophysiological data to identify patterns, preferences, and trends within their target audience. This approach minimizes guesswork and guides strategic decisions related to messaging, design, channel selection, and campaign optimization.

Overall, the implications of these findings are highly valuable for digital marketers. By adopting neuromarketing insights, marketers can gain a competitive advantage in the dynamic digital landscape. Crafting personalized and emotionally resonant campaigns leads to stronger brand-consumer relationships and increased loyalty. Moreover, optimizing user experiences and digital advertising effectiveness drives higher engagement, conversion rates, and brand impact. The practical and managerial implications of this systematic review suggest that businesses and marketers should consider incorporating neuromarketing techniques into their digital marketing strategies. Utilizing neuroscientific methods to understand consumer behavior and preferences will lead to more effective campaigns, better customer experiences, and ultimately, improved business performance. As technology and data analytics continue to evolve, embracing neuromarketing insights will be crucial for marketers seeking to stay ahead of the curve and connect with their audience on a deeper level. However, it is essential to acknowledge that ethical considerations should always guide the use of neuromarketing techniques to ensure consumer privacy and consent.

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