Galatasaray University Managerial and Social Sciences Letters,
Vol.2 Issue.1 September/Septembre 2024, pp. 6-24, e-ISSN: 2980-1575

Neuromarketing as a Marketing Research Technique: Past, Present, and Future*

Research Article / Araştırma Makalesi

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ABSTRACT

As of the 20th century, humanity has started to develop itself and create new branches of science. With the technology it has developed in various fields. The journey of marketing and market research, which began with the Industrial Revolution, has led us to neuromarketing today, which combines neuroscience, consumer psychology, and marketing sciences. Researchers working in the marketing and marketing research circle have also managed to understand customer acquisition, brand management and marketing, and communication strategies by using neuromarketing and consumer neuroscience techniques, especially in the last two decades. Researchers in the field are expanding and enlarging the neuromarketing literature with the neuromarketing analyses and research they conduct. In this study, the articles obtained from the SCOPUS and Web of Science databases in the field of neuromarketing after 2000 were analyzed in a bibliometric context. The study aims to inform the researchers about the article studies carried out within the scope of neuromarketing.

Keywords : *Marketing research ; consumer neuroscience ; neuromarketing ; bibliometric analysis*

1. INTRODUCTION

With the Industrial Revolution, the quest for innovation that has been present since the discovery of fire by humanity has taken a significantly different dimension. Many innovations in engineering and medicine following the Industrial Revolution laid the groundwork for today's technologies. Subsequent to these innovations, the wars and economic downturns of the 20th century propelled humanity towards a future where they would explore technology more profoundly.

The quest for innovation and exploration, present since the beginning of humanity but gaining momentum especially since the 18th century, can be observed in the emergence of the concepts of "brand" and marketing during this time. Traditional marketing, particularly with the advancements in mass production and improved printing technologies up to the 19th century, progressed and evolved. However, both the wars that occurred in Europe in the 19th and 20th centuries and the end of the Imperial Age with the emergence of new political players delayed potential innovations in the field of marketing. Additionally, the economic problems resulting from the Great Depression between 1929-1939 and the collapse of the American stock market can be cited as factors that further slowed the development of marketing (Tadajewski, 2010).

Nevertheless, looking at the changed political climate of the post-World War II era, it is evident that the role of the major player shifted from European countries or the United Kingdom to the United States. Particularly in the 1960s, the United States introduced its post-war society to concepts of advertising, public relations, and marketing. From this time onwards, marketing literature benefited from both the events that are global, social and political and the significant technological developments towards the end of the 20th century, including the invention of the internet.

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Received / Reçu : *20.12.2023 ;* ***Revised / Revisé :*** *02.03.2024 ;* ***Accepted / Accepté :*** *07.03.2024*

**This article is issued from the undergraduate final project of the author, submitted to Galatasaray University, under the supervision of Nilşah Cavdar Aksoy, titled "Neuromarketing as a Marketing Research Technique: Past, Present, and Future"*

The successes achieved by humanity in medicine and psychology, combined with traditional marketing approaches, led to the creation of more consumer-centric, personalized, and deeply analyzable, predictable, and improvable marketing strategies and models (Wright and Wagner, 2008). In this context, neuromarketing came into play, offering the opportunity to scientifically and systematically examine consumer behaviors by combining scientific methods that study the brain and nervous system with traditional marketing techniques. Research in this field not only expanded the neuromarketing literature but also revealed findings in stages such as consumer purchasing decisions, brand and product retention, and the decision-making process for effective marketing and communication strategies.

The aim of this study is to provide a summary of the literature specific to neuromarketing using academic articles in English collected from the SCOPUS and Web of Science databases in the fields of business, marketing, and management. In this research, the importance of neuromarketing is discussed by focusing initially on the concepts of neuroscience, consumer neuroscience, neuroeconomics, and neuromarketing, followed by a systematic bibliometric analysis based on the obtained data. The goal is to map out the existence of neuromarketing methods in the literature as a type of marketing research, highlighting gaps in academia and guiding future researchers and practitioners.

2. A BIBLIOMETRIC ANALYSIS ON NEUROMARKETING

2.1. Research problem

The research problem stems from the observation that the number of studies conducted in the field of neuromarketing is comparatively lower than those conducted in other areas of marketing research. Considering the challenges and risks inherent in the field, there is a necessity to better illustrate these circumstances and provide a clearer understanding of the situation. Therefore, it is believed that capturing a comprehensive picture of the field is essential to showcase perspectives in this area. As a response to this need, this study presents a bibliometric analysis to shed light on the current state of the field and provide insights into the challenges and risks associated with it.

2.2. Objective and importance of the research

The main objective of the study is to provide researchers and practitioners with information about scientific studies conducted in the field of neuromarketing by examining articles obtained from the SCOPUS and Web of Science databases through bibliometric methods.

As a result of the research, information about the current state of the field will be presented to researchers who will conduct studies in the field of neuromarketing and practitioners of future in this area. Moreover, due to its comprehensive depiction of the field of neuromarketing, the research is considered important for all parties aiming to undertake theoretical or applied studies in this domain.

2.3. Scope and limitations of the research

This study aims to provide information about research conducted in the field of neuromarketing by analyzing articles obtained through bibliometric methods on the SCOPUS and Web of Science platforms. Due to the cost and time constraints, our research focuses solely on articles on the SCOPUS and Web of Science platforms. To maintain the relevance and appropriateness of the research, articles written in the fields of business, marketing, and management published after the year 2000 have been considered. Similarly, due to constraints in time, translation, and scope, only research articles conducted in English have been included in the study.

2.4. Research type and methodology

This study utilized bibliometric analysis as a method. The bibliometric analysis method was applied to 71 data obtained from the Web of Science and SCOPUS databases. These data were analyzed through bibliometric analysis, considering publication dates, the journals in which they were published, access status, research areas, topics and contexts, types of research, citation counts, institutions affiliated with the research, and the neuromarketing, neuroscience, and neuro-imaging techniques and technologies used during the studies.

2.5. Sampling process and data collection

In this research, 71 articles written in English on business, marketing, and management, containing the term 'neuromarketing' in their abstracts and titles, were examined using the SCOPUS and Web of Science databases, and these articles were published after the year 2000.

The obtained valid data were analyzed through the bibliometric method concerning publication years, journals of publication, topics, contexts, research types, and sampling. Microsoft Excel application was utilized for data collection and analysis at this stage.

Table 1. Distribution of Research Articles According to Databases

	SCOPUS	Web of Science	TOTAL
Number of Research Papers	36	35	71

2.6. Research findings

In this research, articles in the field of neuromarketing were obtained through SCOPUS and Web of Science platforms. After scanning on these platforms, 71 valid data were obtained. Within the scope of our study, 71 articles registered on SCOPUS and Web of Science platforms were examined in the context of publication year, published journal, access type, research type, subject and scope, number of citations, institutions they are affiliated with and the neuroscientific devices and techniques they used.

2.6.1. Neuromarketing studies by years

The articles we obtained as a result of the searches we carried out in SCOPUS and Web of Science databases are examined in terms of publication year, 1 in 2007, 3 in 2011, 3 in 2012, 3 in 2013, 4 in 2014, 3 in 2015, 4 in 2016, 7 in 2017. It was determined that 4 articles were published in 2019, 7 in 2019, 3 in 2020, 11 in 2021, 7 in 2022 and 11 in 2023. It has been determined that the number of academic articles in the field of neuromarketing has increased in the last 4 years, except for 2020. The reasons for this situation can be attributed to the increasing interest in neuromarketing and consumer neuroscience, technological developments in neuroimaging and analysis tools, and the increasing importance that companies give to systematic neuromarketing research in marketing research. However, the fact that there was a large decrease in 2020, unlike the increasing data of 2019 and 2021, can be explained as an effect of the Covid-19 pandemic felt worldwide in 2020.

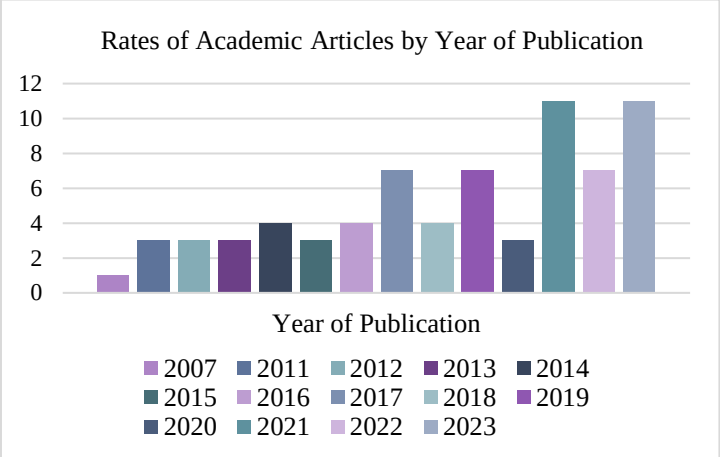

Figure 1. Years in which academic articles were published

2.6.2. Neuromarketing studies according to the journals in which they are published

When we examined our articles obtained from SCOPUS and Web of Science databases in the context of the journals in which they were published, Table-2 data was obtained. According to our analysis, Journal of Consumer Marketing, Journal of Consumer Behaviour, Journal of Business Research, 3C Empressa and Revista Brasileira de Marketing stand out as the platforms where neuromarketing-related articles are most published.

Table 2. Journals where research articles are published

Published Journal	Number of Research Paper
3C Empressa	4
Journal of Consumer Behaviour	4
Journal of Consumer Marketing	3
Revista Brasileira de Marketing	3
Journal of Business Research	3
IBIMA Business Review	2
Journal of Advertising Research	2
Journal of Marketing Management	2
Journal of Marketing and Entrepreneurship	2
Management Theory and Studies for Rural Business and Infrastructure	2
Indian Journal of Marketing	2
ABAC Journal	2
Journal of Media Business Studies	1
Journal of Brand Management	1
Journal of Legal, Ethical and Regulatory Issues	1
Journal of Advanced Manufacturing Technology	1
Journal of Destination Marketing and Management	1
Journal of Business Ethics	1
Journal of Consumer Policy	1
Applied Marketing Analytics	1
European Journal of Marketing	1
International Business Management	1
International Journal of Internet Marketing and Advertising	1
International Journal of Services Operations and Informatics	1
International Journal of Business and Globalisation	1

International Journal of Business Innovation and Research	1
International Journal of Fashion Design Technology and Education	1
International Journal of Economic Research	1
International Review on Public and Nonprofit Marketing	1
International Journal of Recent Technology and Engineering	1
International Journal of Technology Marketing	1
Polish Journal of Management Studies	1
Pacific Business Review International	1
Communication Today	1
British Food Journal	1
Psychology & Marketing	1
Consumption Markets and Culture	1
Corporate Governance and Organizational Behavior Review	1
Amfiteatru Economic	1
Casopis Ekonomiju I Trzisne Komunikacije	1
Revista Perspectiva Empresarial	1
Business History	1
Science and Engineering Ethics	1
Tourism and Management Studies	1
Tourism Management Perspectives	1
Scientific Annals of Economics and Business	1
Tourism Review International	1
Organizational Research Methods	1
TEM Journal	1
Rivista di Studi sulla Sosteni	1
Gestao e Producao	1

2.6.3. Neuromarketing studies in terms of access

When we analyzed the 71 neuromarketing articles we obtained from SCOPUS and Web of Science databases in terms of their accessibility, we obtained 25 fully accessible articles, 46 closed access articles, 10 gold accessible articles, 3 hybrid gold accessible articles, 8 green accessible articles, and 4 bronze accessible articles. We have reached the conclusion that we have.

Gold and hybrid gold open access means that the research is accessible from the moment it is published by the publisher. This usually occurs when the article in question is published in an open access journal or Hybrid Open Access journal (Bailey, 2006).

Green open access means that access to research becomes free when the author digitizes the article by transferring it to his own archive after publishing the research. Bronze open access is the access type of research that can be read free of charge from the publisher's page, but does not have the necessary licenses for use (Bailey, 2006).

Table 3. Access types of research articles

Type of Accessibility	**Number of Research Paper**
Closed for Access	46
Open for Access	25
Gold	10
Hybrid Gold	3
Green	8
Bronze	4

2.6.4. Neuromarketing studies by research type

Qualitative, quantitative and mixed research methods specified in Leedy and Ormond's (2001) work were used to determine and classify research types. Accordingly, research types are descriptive research, exploratory research and causal comparative research under quantitative research types; Under qualitative research types, case study, ethnography study, phenomenological study, theory building study and content analysis methods are discussed. Within the scope of mixed research methods, articles using both qualitative and quantitative methods were examined.

When we analyze the data we gathered in the context of author and article research type, Descriptive Research with a rate of 32%, Exploratory Research with a rate of 33% and Causal Comparative Research methods with a rate of 18% stand out. With this data, Content Analysis was used at 12%, while Case Study method was used at 3% and Theory Formation methods were used at 2%.

The descriptive research approach is a basic research method that examines a particular situation according to its current position (Leedy et Ormond, 2001). It involves defining the characteristics of a particular phenomenon on an observational basis and investigates the relationship between it and other phenomena.

The exploratory research method measures the results of the researcher investigating a systematic intervention in the participant group (Williams, 2007). (Leedy & Ormond) catagorizes exploratory research in three types. These being pre-experimental, true experimental and quasi-experimental studies. His approach includes an independent variable that does not change in pre-experimental research and a control group that is not randomly selected (Williams, 2007). Contrary to his pre-experimental catagory, true experimental design provides a high degree of control and realism in the experiment (Campbell et Stanley, 1963). These design methods create a systematic approach as the result of quantitative data collection. Quasi-experimental design, on the other hand, examines non-random selection of participants and provides limited control to the researcher. For these reasons, it is not considered a real experiment and its validity can be questioned due to the inability to control the variables (Campbell et Stanley, 1963).

Furthermore, mixed research methods began to emerge in the early 1900s (Tashakkori et Teddlie, 2003). These methods are seen as an extension of qualitative and quantitative research methods by synthesizing them. The aim of researchers using mixed research methods are to minimize the weaknesses of quantitative and qualitative approaches by taking advantage of their strengths (Johnson & Onwuegbuzie, 2004). By combining data collection and data analysis methods of qualitative and quantitative approaches, researchers are able to systematically construct and test their studies and theories (Williams, 2007).

The content analysis method, which falls under qualitative research methods, is defined by Leedy and Ormrod (2001) as "a detailed and systematic examination of the content of a particular material in order to identify patterns, themes or biases." This method examines all forms of communication and other sources, including but not limited to books, newspapers, and movies, with the aim of identifying specific patterns, definitions, and themes. As a result, the researcher can interprete and analyze verbal, visual and behavioral patterns; thus allowing the examination of themes and issues (Williams, 2007).

According to Creswell (2003), the case study method is "an inquiry strategy in which the researcher investigates a program, event, activity, process, or one or more people in depth." In using this research method, the research is limited in time, activity and collects data with the help of various data collection procedures (Stake, 1995). The case study method is shown among the qualitative research methods according to Leedy and Ormond (2001).

Additionally, theory building research method, which is shown as part of the qualitative research types (Leedy et Ormond, 2001), is a research method in which the researcher produces an abstract and objective theory of process, action or interaction based on the opinions of the participants (Creswell, 2003). The main features of this method are the constant comparison of data with emerging categories and the theoretical sampling of different groups to maximize the similarities and differences of information (Creswell, 2003).

Finally, the causal comparative process, the researcher examines the cause-effect relationship between variables by examining to what extent independent variables are affected by the dependent variables. Causal comparative research design, which is a type of quantitative research, provides researchers with the opportunity to analyze the interaction between independent variables and their effects on dependent variables (Williams, 2007).

When the research articles were obtained through SCOPUS and Web of Science platforms; they were categorized as qualitative, quantitative and mixed research types according to the work of Lee and Ormond (2001) mentioned above. After further analysis, it was gathered that 63% of the data taken was qualitative, with 46 articles using qualitative research methods. Likewise, 14 articles with a rate of 19% used quantitative data, and 11 articles with a rate of 18% used mixed research methods.

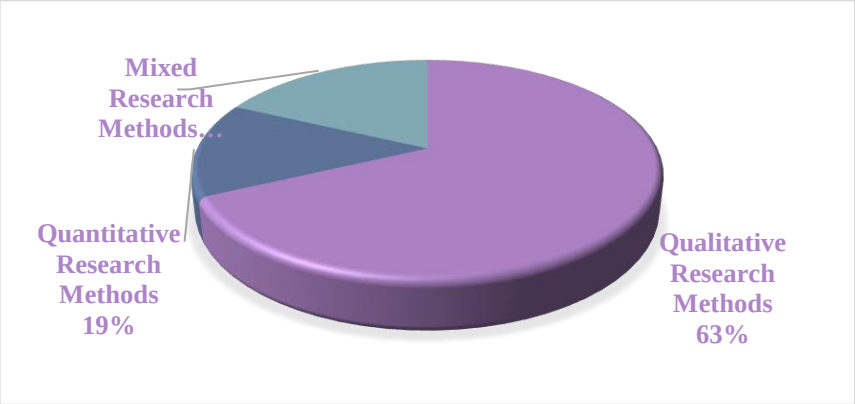

Figure 2. Research types of research articles

2.6.5. Neuromarketing studies by research areas

When we examined the data on studies in the field of neuromarketing according to research areas, we found 46 different research areas. These research areas were compiled through subject tags and keywords in SCOPUS and Web of Science databases. Among these fields, consumer behavior is at the forefront with 17 articles written about it, while marketing and marketing research with 15 articles, neuroethics with 14 articles, neuroscience with 13 articles, purchasing decisions with 7 articles, EEG and Eye-tracking with 6 articles; 4 articles on emotions, decision-making mechanisms, fMRI, consumer neuroscience, and advertising; Internet, technology, neural activity, neuroeconomics and food with 3 articles; With 2 articles, the areas of preferences, target marketing, psychology, strategy, neuro-imaging, attention, branding, perception, pricing, wine tasting and selection and marketing communications come to the fore.

With this data, different topics have been accessed such as celebrity representative, fashion, sustainability, advertising, target marketing, social media, health, tourism, mobile phone industry and neurogastronomy. The data obtained as a result of this analysis confirms the claim that the field of neuromarketing is a dynamic research subject used in many different sectors and research fields.

As can be seen in the research fields data obtained, EEG, Eye tracking, fMRI, neural activity, neuroscience and neuroimaging research fields were frequently revealed as a result of the scans carried out on SCOPUS and Web of Science databases. Based on

these data, it is concluded that neuromarketing has an interdisciplinary relationship with the disciplines of neuroscience and consumer neuroscience, and that the research and application techniques and theories of the fields of neuroscience and consumer neuroscience are used in neuromarketing research; practice and theory.

Table 4. Subject of research articles

Research Areas	Number of Research Paper
Consumer behavior	19
Marketing and Marketing Research	16
neuroethics	14
neuroscience	14
Purchasing Decisions	7
EEG	6
eye tracking	6
Advert	6
Feelings	5
Technology	4
Decision Making Mechanism	4
fMRI	4
Consumer Neuroscience	4
Food and Beverage Industry	4
Internet	3
Neural Activity	3
neuroeconomics	3
Packaging	3
Preferences	2
Target Marketing	2
Psychology	2
Strategy	2
Neuroimaging	2
Attention	2
Branding	2
User interface	2
Perception	2
Pricing	2
Wine Tasting and Selection	2
Marketing Communications	2
Media Contact	1
Sensory Marketing	1
Hormones	1
Famous Representative	1
Fashion	1
Education	1
Social media	1
Nonprofit Marketing	1
Neurogastronomy	1
Neuroergonomics	1
Aesthetic Laser	1
Health	1
Mobile Phone Industry	1
Sustainability	1
Tourism	1
Gender	1
Competitive Advantage	1
E-Commerce	1
Crypto	1
Programmatic Advertising	1
Brand Marketing	1

Industrial Security	1
Customer Experience	1

2.6.6. Neuromarketing studies by citation count

Science databases were examined according to their citation numbers, the highest number of citations was 142. It is thought that this number of citations, which belongs to an article published in 2007, is due to the fact that the research has existed in academia for a long time. Although this number of citations is followed by 2 articles with 93 and 63 citations, it is noteworthy that there are no citations in the 30 articles we obtained. The fact that these articles have been published since 2017 explains why they have never been cited.

Table 5. Citation numbers of research articles

Citation Count	Number of Research Paper
142	1
93	1
63	1
60	1
47	2
46	1
44	1
41	1
35	1
33	1
20	2
22	1
18	1
17	1
15	1
14	1
13	2
11	1
10	1
9	1
8	1
7	3
6	1
4	3
3	3
2	1
1	6
0	30

2.6.7. Neuromarketing studies according to the affiliated institutions

As a result of scanning the 71 research articles we obtained as a result of our database scans according to the institutions they are affiliated with, 95 different institutions were reached. When we analyze these institutions, it turns out that Vytautas Magnus University and Universidade de Sao Paulo are the institutions that have published the most studies in the field of neuromarketing, with 3 articles. These institutions are followed by Universitat Politecnica de Valencia, University of Valencia, Presov University, Azman Hashim International Business School, University of Warwick, Aston University and Universidade Federal de Minas Gerais with 2 articles published in the field of neuromarketing.

Vytautas Magnus University, Universidade de Sao Paulo, Universitat Politecnica de Valencia, University of Valencia, Presov University, Azman Hashim

International Business School, University of Warwick, Aston University and Universidade Federal de Minas Gerais institutions include scientific and scientific studies in higher education and doctoral fields that include laboratories. They are institutions that focus on application research; In addition, the fact that Universidade de Sao Paulo and the University of Valencia institutions are included in the list of the most influential universities in the world according to the Times Higher Education (THE) classification also explains the high number of research articles on the field of neuromarketing published in these institutions.

Table 6. Institutions to which research articles are affiliated

Affiliated Institutions	Number of Research Paper
Vytautas Magnus University	3
Universidade de Sao Paulo	3
Universitat Politecnica de Valencia	2
University of Valencia	2
Presov University	2
Azman Hashim International Business School	2
University of Warwick	2
Aston University	2
Universidade Federal de Minas Gerais	2
Indian Institute of Management (IIM System)	2
Swinburne University of Technology	1
Swinburne University of Technology Sarawak	1
Trade and Commercial School	1
V.I. Vernadsky Crimean Federal University	1
Universidad Panamericana – Ciudad de Mexico	1
Universidad Privada del Norte	1
Universidad Continental	1
Punjabi University	1
Lovely Professional University	1
Aligarh Muslim University	1
Ahsanullah University of Science & Technology (AUST)	1
University of Gottingen	1
United International University	1
Central Michigan University	1
University of Rochester	1
Middle Tennessee State University	1
Allegheny College	1
Catholic University of the Sacred Heart	1
Erasmus University Rotterdam	1
Leiden University	1
Leiden University – Excl LUMC	1
EMLYON Business School	1
Texas A&M University System	1
Texas A&M University San Antonio	1
Poznan University of Economics & Business	1
Luiss Guido Carli University	1
Sapienza University Rome	1
University of Francisco de Vitoria	1
Indian Institute of Management Sambalpur	1
Management Development Institute (MDI)	1
Western Kentucky University	1

University of Alba Iulia	1
University of Miami	1
University of Louisiana, Lafayette	1
Oklahoma City University	1
Sacred Heart University	1
University of Texas	1
University of Birmingham	1
University of London	1
Acibadem University School of Medicine	1
Middle East Technical University	1
Bogazici University	1
Baskent University	1
INAGE Business School	1
Babes Bolyai University from Cluj	1
Sao Paulo State University at Bauru	1
Duke University	1
Oakland University	1
Advertising Research Foundation (ARF)	1
Islamic Azad University	1
Universidade de Passo Fundo	1
Monash University	1
Uşak University	1
İzmir Katip Çelebi University	1
Bandırma Onyedi Eylül University	1
Vels University	1
Manonmanium Sundaranar University	1
A.M Jain College	1
NHTV Breda University of Applied Sciences	1
Tilburg University	1
Chinese Academy of Science	1
Chevalier.T.Thomas.Elizabeth College for Women	1
Timpac Healthcare Pvt. Limited	1
Oxford University	1
Universiti Teknologi Malaysia	1
Universitas Gadjah Mada	1
Krupanidhi School of Management	1
National Kaohsiung University of Hospitality and Tourism	1
University of Naples Parthenope	1
Aristotle University of Thessaloniki	1
Associazione Italiana di Neuromarketing	1
University of Naples “Parthenope”	1
Kyiv National Economic University named after Vadym Hetman	1
Simone Cesaretti Foundation	1
University of Salento	1
Pontificia Universidade Catolica de Minas Gerais	1
Haldia Institute of Management	1
University of Prešov in Prešov	1
Anadolu University	1
Afyon Kocatepe University	1
Vytautas Magnus University	1
Sukkur IBA University	1
Complutense University of Madrid	1
AAB College	1
V.I. Vernadsky Crimean Federal University	1

As a result of these data, it was found that among the 81 institutions we received, 3% of the institutions published 3 articles in the field of neuromarketing, 8% of the institutions published 2 articles, and 89% of the institutions published 1 article in the field. The reason for this data can be given that the field of neuromarketing is still growing and is a dynamic research field that benefits from technological developments.

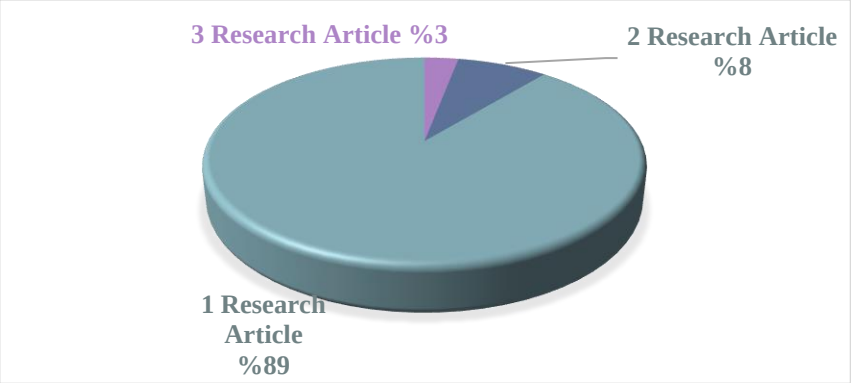

Figure 2. Ratio of research articles publications by institutions

2.6.8. Neuromarketing studies according to the neuroimaging devices they use

As a result of research conducted on SCOPUS and Web of Science databases, it was found that 5 different neuroimaging devices were used. These devices have emerged as EEG (Electroencephalography), fMRI (Functional Magnetic Resonance Imaging), eye tracking, MEG (Magnetoencephalography) and fNRIS (Functional Near Infrared Imaging Method).

Table 7. Neuro-imaging devices used in research articles

Neuroimaging Devices	Number of Research Paper
EEG	7
Eye Tracking	7
fMRI	4
MEG	1
fNRIS	1

Neuromarketing captures stimulus responses at the time of purchase. Therefore, it represents the true state of mind. Researchers in the field of neuromarketing use various neuroscience techniques to measure brain and neuronal activities. EEG (Electroencephalography) measures the changes and effects in the consumer's brain in response to any product or service (Panda et al. 2023). Electroencephalography, which can be combined with other marketing research techniques such as heart rate, eye tracking and facial expression tracking, is used both in laboratory research and within the scope of marketing research of companies because it is low-cost and portable and can be connected to the phone or any mobile device (Panda et al. 2023).

Eye tracking is a technique of continuously recording gaze position while participants perform a task such as reading a text, navigating a website, or interacting with a device (Meng, 2023). The obtained gaze position data is then used to interprete and analyze the fixation and twitch points of the eye. Based on these fixation and twitch points, the consumer's area of interest is determined (Meng, 2023). Interest point measurement is used for the purpose of comparing different variables from the same viewpoint (Paveleková et al., 2021).

fMRI is a neuroimaging technique preferred by neuromarketing and consumer neuroscience literature researchers with its superior spatial resolution, ability to fully capture the active brain areas of the participant, and being a non-invasive approach. However, it analyzes consumer decision-making and behavioral strategies by measuring

the change of blood flow and oxygenation in the blood during scanning (Dimoka, 2012). When neurons activate, they must use high-speed energy. In this respect, the main element that a neuromarketing researcher using fMRI must understand is the contrast of the Blood Oxygen Level Dependant (BOLD) signal. When the participant's brain is exposed to a certain stimulation, brain regions use more oxygenated blood flow than when they are at rest. This change causes disruptions in the magnetic field emitted by the protons in the water molecules in the participant's blood. Accordingly, the main purpose of fMRI studies is to support that the electrochemical signals produced by neurons coincide with the change in Blood Oxygen Level Dependant (BOLD) signals and that these electrochemical signal changes are the correct measure of neuronal activity (Morin, 2011).

MEG (Magnetoencephalography) is based on measuring changes in the magnetic field caused by neural activity. Magnetoencephalography is a non-invasive neuroscience technique that offers much better clear bit resolution than Electroencephalography due to less influence of magnetic fields by the skull and retains the same advantages of temporal resolution. The MEG method, on the other hand, requires sensitive instruments and the placement of a large magnetometer around the participant's head and a magnetically isolated room. However, the fact that the participant contributes to the experiment in an isolated environment and is separated from his or her natural environment is also stated as a factor affecting the measurement results (Bočková et al. 2021).

fNRIS (Functional Near Infrared Imaging Method) is a newer, non-invasive neuroimaging method than other neuroscientific techniques used in traditional neuromarketing research. The technique involves the use of near-infrared light sources that can penetrate human skin and tissue (Ferrari & Quaresima, 2012). The Mobile Functional Near-Infrared Imaging Method uses specific wavelengths of light (760 and 850 nm) to provide a measurement of cerebral oxygenated and deoxygenated hemoglobin, the main absorbers of near-infrared light (Kopton & Kenning, 2014).

3. DISCUSSION AND IMPLICATIONS

Neuromarketing research has become an interesting field in recent years, both in marketing research literature and in practice in terms of business and company management (Morin, 2011). The invention of new technological neuroscience techniques and devices in the field of academia and their contribution to the literature (Mileti et al. 2016), as well as the fact that neuromarketing tools measure participant physiological and neural responses in an unbiased and systematic way, also increase the importance of neuromarketing in the literature. In this respect, research on neuromarketing strengthens the place of the subject in academia (Morin, 2011). It can be argued that this research on neuromarketing provides researchers who will work in the field with knowledge about the literature.

In this study, articles obtained as a result of scanning in the field of neuromarketing in SCOPUS and Web of Science databases; They were discussed in the context of their publication years, journals they were published in, access status, research types, topics they were published in, number of citations, institutions they were affiliated with, and the neuroscientific and neuroimaging techniques and tools they used in their research.

3.1. Theoretical implications

Within the scope of our study, 71 valid data were accessed, 36 from the SCOPUS platform and 35 from the Web of Science platform. When we examined the articles we have in terms of publication years, it was found that the most articles on neuromarketing were published in 2021 and 2023. Following this, the research was published in 51 different journals and publications, including 4 publications: 4C Empressa and Journal of Consumer Behaviour; It was seen that Journal of Consumer Marketing, Journal of Business Research and Revista Brasileira de Marketing stood out with 3 publications. Within the scope of our research, 65% of the articles were closed and 40% of the

accessible articles were gold, 12% hybrid gold, 32% green and 4% bronze. In terms of research methods and methods, it was observed that 63% used qualitative research, 19% used quantitative research and 18% used mixed research types.

When the 71 valid data obtained in our research were examined in the context of subject headings, 53 different research areas were reached. These research areas include consumer behavior with 19 articles, marketing and marketing research with 16 articles, neuroethics with 14 articles, neuroscience with 14 articles, purchasing decisions with 7 articles, EEG, advertising and Eye-tracking with 6 articles, emotions with 5 articles. ; 4 articles on decision-making mechanisms, technology, fMRI, food and beverage industry and consumer neuroscience; Internet, neural activity, neuroeconomics and packaging with 3 articles; With 2 articles, various topics emerged such as preferences, psychology, target marketing, strategy, neuroimaging, attention, branding, perception, pricing, wine tasting and selection and marketing communication.

The findings obtained in this research draw a current picture of marketing research and the use of neuroscience and neuroneural techniques in the marketing research literature. In addition, it is hoped that the research will provide theoretical and practical guidance for future neuromarketing comprehensive marketing research studies, and it is expected that it will help to categorize the studies in the literature and expand the scope of the neuromarketing field with the current and comprehensive scanning of the neuromarketing literature.

3.2. Managerial implications

In practice, neuromarketing is noted as a promising field for providing information about the consumer in order to increase the effectiveness of marketing strategies such as advertising, pricing and discounting. The neural responses underlying consumers' behavior towards the marketing mix are increasingly being investigated through various research foci in this field, including advertising research, and are being incorporated into marketing strategy decisions in practice (Alsharif et al. 2023). In this respect, what can be stated is that neuromarketing research and techniques are used in theoretical and applied research in today's marketing strategy and research fields. However, it can be said that the theoretical information collected and analyzed by this study provides data to researchers who are in practitioner and strategy development positions in the field of neuromarketing and consumer neuroscience. In this respect, the practical and theoretical value of the research is the presentation of data on the field of neuromarketing, which will form the basis for both theoretical studies in the field and applications to be carried out on a company and market basis, as a result of academic article searches in the field of neuromarketing carried out on SCOPUS and Web of Science platforms.

In the light of this information, it is supported that neuromarketing is subject to many different sectors and research areas such as FMCG, tourism, sustainability, marketing, marketing research, fashion, wine tasting and target marketing. In addition, the fact that neuroscience and neuromarketing techniques and methods such as neuroimaging, neuroscience, consumer neuroscience, EEG, fMRI and Eye-tracking come to the fore as subject headings indicates that neuromarketing consists of the interdisciplinary combination of psychology, neuroscience and marketing sciences and that these fields are based on methods, techniques and theories, and supports the idea that its devices are used in marketing and neuromarketing research.

4. LIMITATIONS AND RECOMMENDATIONS

Within the scope of the research, as stated in the methodology section, only article studies on SCOPUS and Web of Science platforms were included due to cost and time constraints. However, in order to maintain the currentness and relevance of the research, articles written in the fields of business, marketing and management from 2000 onwards were included in the review. Likewise, because of the constraints related to time, translation and scope, the research data to be obtained was restricted to articles written only in English.

Based on the findings obtained from the research, it is seen that neuromarketing as a marketing research method will develop in today's marketing research literature and will be the subject of more academic articles. At the same time, it is believed that marketing practitioners will pay more attention to this area and include it in their research processes. It is recommended that companies use neuromarketing techniques and tools, which are becoming easier day by day in the light of technological and scientific developments, due to their features that make it easier for companies to understand the target audience more accurately and segment their strategies according to the target audience at the stage of marketing strategies and applications within the marketing research processes.

Information on Plagiarism
This article was scanned with plagiarism detection software. No plagiarism was detected.

Ethics Committee Approval Information
Ethics committee approval was not required.

Author Contribution Statement
This research was conducted by a single author.

Funding Statement and other Acknowledgments
This study has not received any type of funding or support.

Competing Interests Statement
There is no conflict of interest to declare with any institution or person within the framework of the study.

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