ANKARA YILDIRIM BEYAZIT UNIVERSITY
AYBU Business Journal

AYBU Business Journal, 3(2), 54-72
https://dergipark.org.tr/tr/pub/abj
https://aybu.edu.tr/isletme/tr/sayfa/5218/AYBU-BUSINESS-JOURNAL

Submitted: 14 September 2023
Accepted: 9 December 2023
Published Online: 12 December 2023
DOI:10.61725/abj.1360469

REVIEW ARTICLE

Empirical Neuromarketing Studies: An Overview of Turkiye

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Abstract

The study aims to compile an overview of the empirical neuromarketing studies conducted in Turkish literature in the extent of neuroscience measurement methods. Within the scope of this study, which examines how measurement methods in the context of neuroscience have developed in the field of marketing between 2015 and 2022 by Turkish authors, solely empirical neuromarketing studies published in Web of Science(WOS), Google Scholar, Research Gate and Dergipark databases have been examined and the current situation in the field is evaluated in terms of neuroscience measurement processes. In this regard, the neuromarketing concept and the measurement tools used within this scope were explained first, and then the use of the measurement tools are examined and discussed on a literature basis.

Keyword

Neuromarketing in Turkiye,
Neuromarketing Tools,
EEG,
GSR,
Eye-Tracking

1.INTRODUCTION

Advanced technologies developed in neuroscience has lead marketing field to combine traditional way of conducting consumer data with neuroscientific methods to boost the attempts of better understanding consumer behavior. The reason behind this is the intense competitive environment and the fact that consumers conveniently access information thanks to the internet sources which has led to increased concerns about understanding how consumers think and decide. The fact that traditional market research and information-gathering techniques do not always produce effective results has led businesses to seek more reliable and accurate methods to gather useful data. This is because current methodologies often focus on informed responses from consumers, in part, to questions posed by researchers. At the same time, most research questions are produced in the consciousness of researchers and in their minds reflecting their personal thoughts (Zaltman, 2000:6).

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To cite this article: Daldıran, K. (2023) Empirical Neuromarketing Studies: An Overview of Turkiye. *AYBU Business Journal,* 3(2), 54-72.

According to Ustaahmetoglu(2015) data collection via traditional research methods is not always a guide to businesses with a survey technique based on verbal expression from respondents. The matter that consumers do not only make rational actions on decision stages has led companies to research methods aimed at accurately predicting consumer behavior. Over the years, with the development of technology and neuroscience, neuromarketing techniques have been added as an alternative to traditional methods. In order for data analysis to be carried out properly in line with the explanations given above, traditional research methods and neuromarketing research methods must be used together. The advantageous and disadvantageous points of both methods can only be minimized in this way. As a result, technical advances in neuroscience have started to be implemented in the field of marketing. The information obtained through neuroscience help to achieve effective decision making and competitive advantage.

Businesses desire to achieve the predetermined organizational goals at a lower cost by designing appropriate product and marketing communication tools. It is examined that neuroscientific techniques are used to achieve the stated strategic objectives.(Arily&Berns,2010) Additionally, Arily and Berns(2010) claim that two main reasons are backed this increase observed in the application of neuroscientific techniques within the marketing field. First, neuroscientific techniques start offering faster and lower cost solutions than traditional market research techniques, and neuroscientific methods provides additional information that traditional market research techniques cannot provide.

In parallel with this, Kesek and Gedik(2017) states that managing consumers with only traditional marketing policies is no longer a valid method. At this point, neuroscience has emerged, an interdisciplinary field of study that enables technology to be easier to measure consumer responses to a marketing stimuli. With neuroscience, the emotions of consumers are analyzed with the measurement tools used in their psychological conditions and used in research development activities. With the research results, studies are carried out for a better marketing service to consumers. (Hatip, 2008)

Measuring the change in activity in different brain regions when measuring the brain's reactions to a product reveals not only why consumers choose that product, but also which brain part is active in this choice. In other words, medical science is revealing the secrets of the nervous system one by one. Although it is possible today to understand the mental structure of the brain's reactions to stimuli, messages and advertisements, it is becoming increasingly easier to make sense of the results thanks to the advancing and rapidly digitalizing medical technology (Müdok, 2013).

Consequently, marketers may study factors that can affect the consumer decision process by means of neuroscience. Every decision is actually a choice, investigation of the reasons behind these choices may be carried out by neuroscience researchers. Consequently, neuromarketing, as a discipline of neurology and marketing, attempts to reveal the relationship between the consumer nervous and decision making system (Hubert and Kenning, 2008). However, neuromarketing is not just brain measurement activities used to reveal the reasons behind consumer preferences (Yücel and Çubuk, 2014). As Ural (2008) stated, it shows which brain regions are active during consumers' product selection and offers the opportunity to develop new products and materials through the findings. Therefore, academics and market practitioners utilize neuromarketing in different areas of marketing including branding, advertising, packaging design, product development and for different purposes.

Neuromarketing is an emerging field that requires meticulous understanding, offers cheaper and faster results than traditional methods and provides marketers with confidential information (Ariely and Berns ,2010). Parallel to global literature, studies conducted in Turkey has gain popularity regarding the number of papers published on databases. However, the number of neuromarketing empirical studies which offers potential

useful insights on consumer behavior is lacking comparing to the world literature. Neuromarketing studies conducted with an empirical approach in Turkey is reviewed in this study on a literature basis. The main motivation of this study is to highlight useful insights from consumers responses to marketing stimuli measured by neuromarketing tools, make contributions to both the academic and business world and to pave the way for future researches. It is crucial to examine findings of neuromarketing studies by utilizing neuroscientific tools for better understanding the local market in Turkey and consumer behavior, learning how to take competitive advantage, analyzing the evolution of consumer behavior and shaping business strategies accordingly.

In this respect, this study which consist of two parts, first focuses on the definitions and development of the concept of neuromarketing, examines the methods and techniques used by neuromarketing. In the second part of the study, academic empirical studies conducted in the field of neuromarketing in Turkey were examined within the scope of the research. This literature review is conducted with the expectation of shedding light on new researches on neuromarketing field.

1.1 The Concept of Neuromarketing

Neuromarketing is defined as a branch of marketing that uses various technologies to determine the subconscious reactions of consumers to products and brands in order to create effective marketing strategies. It brings together marketing, neuroscience and psychology to examine the way the brain works in decision-making stage (Kumar,2015:525).

According to Oliviera and Giraldi(2017) neuromarketing deals with various tools traditionally used in medicine, psychiatry and psychology, together with various sub-fields of different marketing types in neurological, biological and metabolic feedback processes; It is an interdisciplinary science that uses traditional marketing tools to better understand the physiological behavior and thoughts of both conscious and unconscious consumers .

Kumar(2015) states that Gerry Zaltman, who suggested combining brain imaging technologies with marketing in the late 1990s and integrated the fMRI device into marketing studies for the first time, is considered the pioneer of the field of neuromarketing. Although, Zaltman is shown as the founding name of the field, the concept of neuromarketing and the general framework of neuromarketing were first introduced in 2002 by Ale Smidts in his study "The Study Of The Cerebral Mechanism To Understand Consumer Behavior In Order To Improve Marketing Strategies".

Plessis(2005) highlights that the nervous system in human body consists of neurons, that is, nerve cells, and regulates the functioning of organs and systems in the face of internal and external influences by effectively/quickly performing tasks such as stimulation, arousal and evaluation in the body. Neurons, which are the research subject of neuroscience, form neural networks and enable functions including learning, perception, memory, cognition and information processing. Neurophysiological measures in neuromarketing research focus on central nervous system activity. Physical measurements, on the other hand, are based on measurements of various reactions created in our body by the peripheral nervous system, which provides mutual communication between our brain and body (Gedik and Kesek 2017: 52). The measurement of how the human brain, which has a very complex thinking ability, responds to marketing stimuli is performed by neuroimaging techniques. Neuromarketing, which deals with the mental part of the purchasing process, seeks answers to the questions of "why" and "how" in the decision process of consumers (Bayır, 2016:48-49). Accordingly, Yücel and Coşkun(2018) states that the concept of neuromarketing, which provides a clearer understanding of consumer behavior and a place in the subconscious, enables the measurement of emotional commitment, attention and retention parameters in consumers.

2 NEUROMARKETING TOOLS

Neuromarketing commonly utilizes brain imaging technologies and biometric measurement techniques when measuring consumers' brain responses to a stimuli. Apart from these, psychometric measurement techniques are also used (Varan et al., 2015:178).

Thanks to the electricity observed in different parts of the human brain with brain imaging technologies, comments can be made about what consumers react more to. Biometric measurements include computer-controlled systems developed to measure a consumer's physical and behavioral responses. It is possible to list the most used biometric measurement techniques in neuromarketing as measuring eye movements, facial movements, galvanic responses, skin electricity and sweating (Shiv and Yoon, 2012). Accordingly, the three techniques and measurement tools used in neuromarketing measurements are classified below.

2.1 Biometric Measurements

Bodily reactions occurring through the peripheral nervous system can be internal or external. These physiological reactions have a direct connection with our mind, and since physiological reactions occur before our conscious awareness arises, unconscious reactions created by marketing stimuli play a very important role (Erdemir and Yavuz, 2016: 23).

Biometric measurements aim to measure biological and physiological responses. It intends to monitor the reactions of the whole body except the brain: techniques for instance, facial expressions, breathing rate, contraction, voice pitch, eye tracking (Eye-Tracking), galvanic skin response (GSR) can be called biometric measurement.

2.1.1 Galvanic Skin Response-GSR

As an automatic response of the autonomous nervous system, the skin, especially the palms, show typical reactions to cases that are both pleasurable and stressful. By monitoring these reactions, the pleasurable or disturbing parts of images or products are detected (Plassmann et al., 2015). For instance, increased sweating with emotional reactions is an indication that the electrical resistance of the skin increases and this causes excitement.

2.1.2 Eye Tracking

The eye tracking technique, one of the most common methods used in neuromarketing studies, was developed by Mowrer in 1936 (Özdoğan, 2008: 135). It allows us to follow where and how long eye movements focus, and what route the eye follows. Just as we can track the data of a single user, the combination of hardware and software that enables tracking of the data of a group offers the opportunity to make inferences about what the viewer(s) actually sees and what they focus on. It is most common to record pupillary responses, usually by directing infrared rays at the eye. Eye tracking technique, which is easy and cost-effective for neuromarketing research, is used in placing products, designing shelves, website design, and using eye-catching elements in commercials.

2.1.3 Facial Action Coding System -FACS

People react to stimuli from the environment, either voluntarily or involuntarily, with facial expressions. In marketing research, reactions to products, advertisements and shelf layouts are observed using the face coding

technique and improvements are made accordingly. Paul Ekman identified 6 basic facial expressions with the coding method he calls Facial Action Coding System (FACS). These expressions: They are the reflections of anger, fear, sadness, surprise, pleasure and disgust on the face (Giray and Girişken,2013).

2.2 Neurometric Measurements

With neurometric measurement methods, neurological activities of cognitive and emotional reactions in the brain are observed. The frequently used neurometric measurement devices are fMRI (Functional Magnetic Resonance Imaging), EEG (Electroencephalography), PET (Positron Emission Tomography), MEG (Magnetoencephalography) (Yücel, 2016:26).

2.2.1 Functional Magnetic Resonance Imaging-FMRI

fMRI has a working principle that follows the increase in hemoglobin caused by oxygen consumption during neural activity with high-scale magnetic field and radio waves (Kulich et al., 2009). In other words, when any cognitive process is started, the blood flow to the region accelerates due to the energy need that arises in the activated brain regions. For this reason, the level of hemoglobin, which carries oxygen in the blood, also increases in the relevant region. With this method, which has been used frequently recently, it has been tried to reveal how the concepts of learning, perception and emotion are shaped.

2.2.2 Electroencephalography- EEG

EEG is a brain imaging method, measures the electrical activities occurring in the brain. With this method, the electrical activity fluctuations of the neuron group in the cerebral cortex are recorded, and after the recorded data is converted into numerical data and formulated, it provides feedback on activities such as motivation, attention, and sensory interest (Kesek and Gedik, 2017:77).

2.2.3 Positron Emission Tomography-PET

PET, which is a technologically very important imaging device among nuclear medicine imaging techniques, "involves intravenous injection of a radioactive marker that binds to glucose in the brain and emits special signals by breaking down through positron heating" (Kesek and Gedik, 2017:86). This method clarifies in which parts of the brain the activities take place.

2.2.4 Magnetoencephalography- MEG

It is a remarkable technique for measuring and imaging magnetic regions in the brain. The magnetic field created by electrochemical signals and neural activities is observed with MEG technique (Yücel, 2016:33). Although it is a useful technique for examining deeper details in the brain, its high cost limits its use.

2.2.5 Functional Near-Infrared Spectroscopy -fNIRS

fNIRS is an emerging low-cost, noninvasive neuroimaging technique and may be viewed as a viable alternative to fMRI (Fishburn, Norr, Medvedev, & Vaidya, 2014). fNIRS is a method of monitoring brain oxygenation. This technique investigates hemodynamic changes in the cerebral cortex. fNIRS is widely used in clinical and scientific research. Based on existing neuroimaging studies, functional near-infrared spectroscopy appears to be a reliable neuroimaging measure for analyzing emotional states by examining changes in hemodynamic response in the prefrontal cortex (PFC) (Chong, Lu, and Tang, 2019).

2.3 Psychometric Measurements

Marketing and management research conducted with traditional survey methods is tested for reliability using psychometric measurement methods. The answers people give to some issues may require timidity and they may not answer the questions correctly. For example, a person who smokes a lot may say that his consumption is less. For this purpose, attitudes and behaviors can be analyzed with implicit association tests, which are the basis of psychometric tests (Yücel, 2016:39).

3. Neuromarketing Studies in Turkey

Neuromarketing has begun to be researched, implemented and widespread in developed and developing countries. In fact, with the increasing interest and curiosity in neuromarketing in Turkey, it has been opened as a master's degree program in several universities and awareness has begun to increase. In Turkey, branding, packaging and advertising activities are carried out with neuromarketing techniques. The number of articles, theses, and books published in the field of neuromarketing in Turkey is relatively low when compared to the world literature. Research companies serving in Turkey are Think Neuro, Neuromar Aectspots, Ipsos Turkey and Millward Brown. They are large-scale companies that invest in brand value and customer loyalty. (Bayır, 2016: 89).

METHODOLOGY

This study aims to examine empirical researches with neuroscience measurement tools conducted in Turkey within the scope of neuromarketing between 2015 and 2022 since the early empirical studies were started to be conducted and the number of academic papers has gradual increase in 2015. For this purpose, Web of Science, Google Scholar, Research Gate and Dergipark databases were examined using the keyword 'neuromarketing in Turkey', and in creating the basic data pool, the relevant keyword was included in the title, keywords, abstract or content section or the Turkish version of the relevant study was included. Attention was paid to the fact that it was conducted by the researchers in Turkey. Two acceptance criteria were determined during the examination process of the obtained studies. These acceptance criteria were determined as (1) the research being an empirical study, (2) neurometric or biometric measurement tools being used. The reason for this is to understand the level of use of neuromarketing techniques in Turkey beyond theoretical studies.

While filtering the studies, care was taken to ensure that they met all the criteria at the same time. During the review process, books, thesis and conference papers were not included in the scope of the research. 26 studies were deemed appropriate for evaluation.

FINDINGS

The 26 neuromarketing studies included in the review were classified according to the methods used, the year of publication, the title of the study, their findings were stated and presented as suggestions for future studies.

As a result of the analysis of experimental academic studies (articles) published in Turkey, it is seen that the first studies in the field appeared in 2015 and continue to increase thereafter. Although studies are generally carried out in the fields of business, advertising and communication, there is also interest in the field from other different disciplines.

The keywords mainly used to describe the studies varies and repeatedly used ones are demonstrated below in the figure 1.1. Furthermore, the most common 7 keywords are listed below in figure 1.2

Figure 1.1

Figure 1.2

Empirical Neuromarketing Studies Using EEG Method

	Tittle	Authors	Year	Method	Findings
1	A research on neuromarketing and perception management in terms of new trends in marketing	Alyar, P., Pirtini, S., and Yücel, N.	2021	EEG	According to the findings obtained by EEG method; It was observed that the reactions to the images used for the research were different between those with prices and those without prices. Due to this difference, the images are divided into two groups. It has been determined that the parietal region of the brain, which plays a role in combining stimuli from various sensory organs, is not active when images without prices are watched silently, but this region is activated when the same images are watched with sound. Reactions are received to images shown with or without sound, but it has been observed that the intensity of the reaction changes in visuals with sound. The visuals with price and campaign date in the advertisement were examined. It was observed that certain regions of the participants' brains reacted to the visuals. It has been determined that when the price is voiced, activity increases in the frontal region of the brain, which is responsible for conscious thinking, and the response disappears in the temporal region, which has many functions including speech, memory and hearing. When visuals with sound, silence and price were shown to the participants, a decrease in the reaction of the participants to the advertisements shown with the sound element was observed.
2	An experimental study on consumers' perceptions of electronic commerce sites with EEG method,	Coşkun, P. & Yücel, A.	2021	EEG	It has been determined how elements such as menus, simple appearance, readable texts, background of the webpage, text color, webpage map and accessibility on the websites prepared by the companies are perceived by the customers and what they pay attention to. The parts that must be included in an effective e-commerce site design for consumers are social approval, reference point, feeling of missing out, colors and check-out mechanism. The study demonstrated that the reference point, colors and the feeling of missing the opportunity are important for consumers.
3	The effect of restaurant lighting on food selection from the menu,	Şahin, E. & Yazıcıoğlu, İ.	2020	EEG	Evaluations were made according to liking, attention, memory and cognitive load parameters. Accordingly, in bright light, participants examine the menu more carefully, like it more and remember it more. However, they have a hard time choosing. In dim light, the level of appreciation and attention decreases, the menu is less memorable, but participants do not have difficulty in making a choice. Orders placed in both conditions were examined, an increase in order items was observed in dim light, but this did not affect the turnover. There was an increase in dessert orders in the dim light environment. While turnover in other categories was observed to decrease in dim light, turnover in the dessert category increased.
4	Measuring consumer brand perceptions in terms of neuromarketing by using the EEG method: An experimental study on the automotive industry	Yücel, A.& Şimşek, A., İ	2019	EEG	It is aimed to determine the automobile brand perceptions of consumers according to the variables of comfort, security, fuel economy, quality service, prestige, performance, stylish design, durability and quality. It has been revealed that that consumers have moved away from rationality in a sense, focusing on abstract concepts such as stylish design, quality service and prestige.

	Tittle	Authors	Year	Method	Findings
5	Determining the Effect of Anti-Smoking Public Advertisements on Individuals Using Neuroimaging Method	Özer, D. & Özüpek, M. N	2018	EEG	It was concluded that women are more sensitive than men to the sounds and music used in anti-smoking public spots, and their general perception is more positive. In addition, the reactions to the public service announcement were measured by separating smokers and non-smokers in the subject group. Accordingly, it has been observed that women react more and men react less.
6	Do Our Brains and Tongues Speak the Same? Comparison of Survey and EEG Methods: A Research in Terms of Brand Personality Measurement	Öztürk, S., A., Yücel, N., and Bayır, T.	2018	EEG	It has been observed that the Turkcell brand operator is associated with more brand personality attributes than the Vodafone brand operator. In the research, operator brands were identified with an adjective attributed to brand personality that emerged after the survey analysis. In the second stage of the research, the identified brand was subjected to EEG analysis as a personality. In other words, the EEG method was used as a filter of the survey method. Thus, clearer and deeper information was obtained. As a result of these analyses, it was seen that the statements of the consumers and what was in their minds were not identical.
7	Measurement of Effect of the Smell on the Decision Process of Informed Users in Terms of Neuromarketing,	Dermirtürk & Yücel	2017	EEG	It has been revealed that smell has a significant effect on emotion and decision-making mechanism. It has a positive impact on the decision-making process by creating positively charged emotions and feelings towards the brand; It has been confirmed to be an effective sensory stimulant in establishing an emotional bond with the brand. Moreover, it has been verified that smell is an effective sensory stimulant that creates an emotional connection with the brand and recalls the brand by evoking the memories and experiences of informed users through emotions and feelings, creating awareness and difference and take a place in the minds of informed users.

Empirical Neuromarketing Studies Using Eye-Tracking Method

	Tittle	Authors	Year	Method	Findings
1	Packaging in marketing communication strategies: a neuromarketing research	Taşçı, M. A. & Baygül Özpınar, Ş	2022	Eye-Tracking	The findings reveal that highlighting the brand name on the packaging by writing it in capital letters has a positive effect on attention, and giving more space to visuals reflecting the content of the product attracts the consumer's attention.
2	Reflections of Self-Discrepancy Theory on Consumers' Online Purchasing Behavior	Tomris Küçün, N. , Duman Alptekin, H. , Çetin, C. & Eroğlu, S.	2021	Eye-Tracking	According to the temperature maps obtained from the eye tracking device, it has been observed that as the current body perception exceeds the ideal weight, attention to the relevant visual decreases. According to self-discrepancy theory; The existence of a difference between the real self and the ideal self-causes tension. As the difference increases, the tension will also increase. It will result in anger, aggression and fear. Although the results obtained support this acceptance of the theory, it has been observed that this tension state is not high in individuals with ideal body size and those with below ideal body size, while the tension state increases in individuals with above ideal body size. In general, it was concluded that overweight increases avoidance behavior along with self-discrepancy. Additionally, it was concluded that the determining factor in consumer behavior is individual differences and self-perceptions rather than gender differences.
3	Examination of Hedonic Consumption Themed Advertising Images Using Eye Tracking ,	Emül,S.& Yücel A.	2021	Eye-Tracking	It was concluded that both male and female participants did not focus on the images in which the ice cream object was in a single form. However, the concentration on the ice cream image in broken form was almost the same for men and women. The only image where the focus is intense on the ice cream image in its entire form is the image in which it is placed together with the image of the car. In this image, the car logo did not attract as much attention as the text on the image; That is, the focus on the texts and the ice cream logo is higher for male and female participants.
4	The Evaluation of the Perception of Advertising Attractiveness and Advertising Strategies in Different Genders over Disinfectant Ads	Sucu, A., Baruönü, Ö. and Yücel, N.	2021	Eye-Tracking	Differences were detected between the attention and focus levels of male and female participants to the verbal and visual messages in disinfectant advertisements. Accordingly, it has been determined that women focus more on visual and written messages than men, think more about the focused object and carry out a detailed analysis. In the survey conducted after eye tracking, male and female participants were asked whether they remembered the brand names in the advertisements they watched. While 6 of the women and 4 of the men remembered the brand name, 9 of the women and 11 of the men stated that they did not remember the brand names.

Empirical Neuromarketing Studies Using Eye-Tracking Method

	Tittle	Authors	Year	Method	Findings
5	Analysis of the effectiveness of different types of commercials using eye tracking and survey methods	Toker, A. & Sulak, H	2021	Eye-Tracking	It has been shown that different advertising appeals attract the attention of the consumer and this increases product/brand recall. It has been determined that positioning brands and logos in the middle of the screen in commercials is more eye-catching, and although it varies depending on the social structure, the use of humor and emotionality is more appreciated by the consumer.
6	Digital marketing in the tourism sector: analysis of the web sites of Elazığ hotels by eye-tracking	Yücel,N.& İnan, M	2020	Eye-Tracking	It has been observed that on the websites of 4-star and above hotels operating in Elazığ, the section with the hotel name and logo generally attracts more attention. On the other hand, It was determined that the links did not attract much attention on the web pages including Home Page, About Us, Our Rooms, Facilities, Gallery, Restaurants, Meeting Rooms, SPA, Reservation, Contact (Contact Us).
7	How consumers browse dishwashing detergent shelves in stores? An eye-tracking research	Akgül, D. & Güneş , V.	2019	Eye-Tracking	It was concluded that gender and income level do not have a significant effect on the choice of dishwashing detergent, marital status and having children have an effect on brand and product selection, and shopping frequency affects the time spent in front of the shelf.
8	Contextual effect and measurement of attention to advertisements via eye tracking method	Yaman, C. , Tomris Küçün, N. , Güngör, S. & Eroğlu, S.	2018	Eye-Tracking	Data on context and recall revealed remarkable results. It has been revealed that the recall rates of advertisements used with text and visuals in context are high, while the recall rates of advertisements that are not positioned in context are low. It has been observed that advertisements associated with news texts attract more attention than advertisements that are not associated with news texts. It has also been observed that the focus on remembered brands is high. This confirms the relationship between focusing and remembering. In addition, according to the findings, it has been revealed that brands with high awareness attract attention at a level that can compete with brands with relatively low awareness, even if they do not use visuals or emphasize them.
9	A Research on Green Marketing Application in Terms of Consumer Perception with Neuromarketing Technique	Tayfun, N., &Öçlü, B	2015	Eye-Tracking	It can be understood from surveys results that the participants have not yet established a greener understanding and state that they do not regularly pay attention to whether the products are environmentally friendly or not in every purchase. Participants pay more attention to the words cooling and freshness in the advertising frame shown to them. The term energy efficiency almost does not attract attention. Survey results and heat map results do not support each other.

Empirical Neuromarketing Studies Using GSR Method

	Tittle	Authors	Year	Method	Findings
1	Biometric analysis of stress levels of digital natives and digital immigrants within online shopping processes	Küçün, N., et al.	2018	GSR	Slowing down internet speed increases the stress levels of digital immigrants compared to digital natives. There was no significant difference in internet addiction levels between the two groups. Additionally, it was concluded that the determining factor in consumer behavior is individual differences and self-perceptions rather than gender differences.
2	Determining the level of confidence use of different tractor models using galvanic skin response sensor	Beyaz, A. , Beyaz, R. & Gerdan, D.	2015	GSR	When the data of the tractor operator was examined, it was observed that the tractor brand with a high level of safety equipment and a stable structure had a low feeling of trust due to its late response, while the tractor brand with a low level of safety equipment, contrary to expectations, was more agile and created a feeling of trust due to its sudden response to operator reactions.

Empirical Neuromarketing Studies Using fMRI Method

	Tittle	Authors	Year	Method	Findings
1	Testing the Level of Liking of a Product by fMRI Technique within Neuromarketing: Example of Truck as a Product	Çimen, S., &Candan, F. B.	2020	fMRI	According to the data obtained from the behavioral test results, the most liked truck group was clustered as B1 and the least liked truck group was grouped as B2. These results are compatible with the data obtained from the fMRI device. fMRI test results were compared with similar study results in the literature and it was observed that the findings overlapped with each other. While preparing the images, brand logos and data that may remind you of the brand were cleaned. However, it was emphasized that the truck drivers' familiarity with the brands from the general outline of the trucks should be taken into consideration.

Empirical Neuromarketing Studies Using fNRS Method

	Tittle	Authors	Year	Method	Findings
1	Detecting the effect of voice-over in tv ads via optic brain imaging (fNRS) and in-depth interview methods	Girişken, Y. & Çakar, T.	2016	fNRS	The results show that the use of voice-overs during TV commercials likely caused a decrease in participants' attention and emotional engagement levels.
2	An investigation of the neural correlates of purchase behavior through fNIRS.	Cakir, M. P., Çakar, T., Girisken, Y. and Yurdakul, D.	2018	fNRS	It has been shown that neural activations can be used to decipher purchase or non-purchase decisions with 85 percent accuracy, provided sensitivity to the budget constraint is provided as an additional factor.

Empirical Neuromarketing Studies Using FACS Method

	Tittle	Authors	Year	Method	Findings
1	Neuroscience in Marketing: Assessment of Advertisement Memory by means of Facial Action Coding Analysis	Bozoklu, Ç., P. & Alkibay, S.	2016	FACS	The scenes of the ads that trigger the highest emotional responses consist of brand-specific and ad-specific information. It was concluded that melancholic, Turkish classical music placed in advertisements with negative emotional content was an effective stimulus.

Empirical Neuromarketing Studies Using Multiple Methods

	Tittle	Authors	Year	Method	Findings
1	A neuromarketing research about the effect of colors on discount perception	Devrimsel, M. Y.	2020	GSR & Eye-Tracking	The effect of colors on discount perception was measured in the study. It was determined that the colors on discount labels have a close relationship with consumers' discount perceptions. Accordingly, it was observed that red labels have a strong effect on consumers' discount perceptions in male and female subjects, while white discount labels promote a weak effect on discount perceptions for both genders.
2	Analyzing Brand Mascots In TV Commercials Using Neuromarketing Galvanic Skin Response and Facial Coding Analysis Techniques	Daglı,O.& Uluç,T.,	2021	GSR &FACS	Facial muscle movements in Brand Mascots, skin conductivity and questions asked in face-to-face interviews; In the Fish Cracker group, when the high level of positive stimulation and stimulus were taken into account with the stimulus taken in seconds and the answers given to the questions, it could be interpreted as having a strong determinant on the purchasing tendency on the participants. Attributing the ability to speak to the Fish Cracker character, the humorous approach of the Brand Mascot, his sympathetic attitudes and being a permanent brand mascot contribute to the character's recognizability and preference.
3	A Zero-Sum Game: Customers' Switching Behavior in The Turkish GSM Market-A Neuromarketing Analysis	Boz, H., & Koç, E.	2019	FACS, Eye Tracking	It is revealed that existing customers are affected by the promotions prepared by GSM operators. It has been observed that even if existing customers are satisfied with their GSM operator, they may change their operator if they see an attractive offer from a different operator.
4	Determination of user experience on food business websites using neuromarketing techniques	Babaç,E. & Yüncü, H.	2022	EEG, Eye Tracking	The findings reveals that the website's structured visual contents were more effective at capturing users' attention and maintaining their focus throughout. The research found that the individuals' anxiety levels were higher on the experiment 2 webpage because it contained unplanned visual information. In light of the study's findings, experts can produce the visual information they utilize on websites for the food industry considerably more effectively.

DISCUSSION

In the research, neuromarketing and the tools used in the context , which is still a relatively new field of study, are tried to be discovered, and the ways of using neuroscience techniques in the field of social sciences were aimed to be revealed. In 26 experimental neuromarketing studies that fit the research constraints, it is found the conducted research are related with marketing field on advertising, promotion, consumer behavior. In light of this overview empirical studies conducted on neuromarketing field in Turkey demonstrates that Eye-Tracking and EEG methods are the ones utilized most commonly. GSR, FACS, FMRI, fNRS are the other measurement methods derived in consumer researches. PET and MEG are shown to have quite limited usage within predetermined constraints of overview.

The relatively higher use of EEG and Eye-tracking among the neurometric methods discussed highlights to an important point. It demonstrates that there is an increasing trend on the use of single method on empirical studies. However, incorporating neurometric measurement tools such as fMRI and fNIRS used in neuromarketing studies into integrated measurement processes can provide more comprehensive information about the consumer brain.

In parallel to this, the insufficient number of studies conducted with multiple methods is relatively small. The combination of neurometric (EEG) and biometric (GSR, Eye-Tracking, FACS) tools provides much more meaningful results by combining the stimulation process based on brain nerves and the physical reactions of consumers. (Juarez et al., 2020) The main reasons for the low number of studies conducted with integrated measurement are the cost of the tools used and the prejudiced attitudes of the people who will be subjected to the study towards neuroscience measurement tools. In addition, since neuromarketing requires interdisciplinary work, is high in cost, and is a relatively new field of study, the number of experimental studies conducted in Turkey is not high.

When the current studies are examined, it is possible to make suggestions for future research on certain topics.Studies in the literature emphasize the relationship between perception management and marketing strategies. Perception management plays a critical role in influencing consumers' decision-making processes. However, in order to manage consumer perception correctly, marketing messages must be conveyed effectively. At this point, more research can be done on the difficulties in the communication process and successful perception management strategies. Neuromarketing research provides a more in-depth understanding of creating and managing consumer perception.

Research indicates that the combined use of visual and auditory stimuli enables consumers to perceive messages better. However, in cases where numerical values are included, the negative effect of a second sensory stimulus is emphasized. This finding emphasizes the importance of marketers using visual and auditory stimuli in a balanced manner. Investigating this issue from different aspects provides an idea for future studies.

A study on the effectiveness of electronic commerce sites and how they are perceived by consumers was conducted using the EEG analysis method. This type of research is important for understanding the consumer experience on online platforms. Data obtained through the use of EEG makes a valuable contribution to understanding the effects of design elements on websites on consumers. In order to gain more information in the field of neuromarketing in Turkey, an expanded research can be conducted to include neuromarketing strategies of social media campaigns. This study can provide a broader perspective including digital marketing and consumer interaction and contribute to the development of new strategies that will provide competitive advantage in Turkey's dynamic marketing environment.

Moreover, a study on the effect of lighting, one of the restaurant ambiance factors, on food selection from the menu was conducted using neuromarketing tools. Such studies are important in understanding consumers'

sensitivity to visual and emotional elements in the service sector. In addition, the hotel and tourism industry can optimize their ambience using findings from neuromarketing research.

In a study where automobile brand perception was examined using the EEG analysis method, it was tried to determine how consumers perceive automobile brands. Such research is important for understanding how brand perception affects consumers' emotional and cognitive responses. Brand managers can strengthen their brand strategies by using insights from neuromarketing research.

Furthermore, a study examining the effects of anti-smoking public service announcements and the music and sounds used on individuals using EEG analysis offers an important perspective on the effectiveness of public service announcements. Such studies are important for understanding the relationship between emotion and brain activity in the design of social awareness campaigns.

In several studies, data collected through traditional scales were compared with data collected through EEG. This comparison is important to evaluate whether the neuromarketing approach provides a more in-depth and direct understanding than traditional research methods.

The basis of the neuromarketing approach emphasizes the importance of consumers' sensory and unconscious reactions. This is critical to understanding the role of emotional interactions and subconscious factors in the consumer decision-making process. As a result, experimental neuromarketing studies conducted in Turkey reveal important findings in terms of consumer behavior, brand perception and marketing strategies. Evaluating these studies allows us to understand the developments in the field of marketing and evaluate this information from a local perspective. These contexts should be adapted to rapidly developing and changing customer needs and emerging technologies.

The limitations of experimental neuromarketing studies in Turkey should also be taken into consideration. The difficulty of generalizing these studies, which are limited to a specific brand or sector, may encourage the use of more diverse and comprehensive sample groups in prospective studies. Additionally, how neuromarketing will affect marketing strategies in Turkey with technological developments should also be evaluated

CONCLUSION

To conclude, the concept of neuromarketing which can be named as a relatively novel consumer research field is discussed and neuroscientific measurement methods are presented followingly in this overview. The empirical studies in Turkey related to marketing are highlighted and demonstrated the extent of developments in use of neuroscientific tools for identifying consumer decision stages. This study aims to be the pioneer for presenting only the studies which utilize neuromarketing methods and the studies based solely on theory instead of practice is kept out the scope of this overview. Although, the overview has several limitations in terms of surveilled databases and methodologies, it offers a systematic list of studies conducted earlier and may inspire future researchers about the topics covered earlier in the marketing field in Turkey. The conference papers, master and PHD thesis are not included in this study however, they may provide further insights to understand the situation of the field.

Neuromarketing studies, which have been used effectively in marketing in the world since the early 2000s, were later reflected in marketing research in Turkey. The number of articles, papers, theses and books published in the field of neuromarketing in Turkey is quite lower comparing to the world literature. Additionally, there are relatively fewer companies with a commercial research purpose. Despite all this, it is possible to say that a lot of progress has been made in this regard, thanks to the brain-related research carried out in the last 10-15 years. Of course, these studies do not mean that all the mysteries of the brain have been

solved. In other words, it is a fact that there is still a long way to go and it will take years for humanity to achieve this in this complex structure of the market.

It can be concluded that neuromarketing studies in Turkey are not as intense as in the world, however it is thought that neuromarketing studies will increase in the near future. Several universities include courses related to neuromarketing field in their curricula and even offer Master programs that provide neuromarketing training. This will increase the number of academics working in this field. As the benefits of neuromarketing are seen concretely, businesses' interest in this field will increase.

REFERENCES

Alyar, P., Pirtini, S., ve Yücel, N. (2021, Ocak). Pazarlamada Yeni Eğilimler Açısından Nöropazarlama ve Algı Yönetimi Üzerine Bir Araştırma. Marmara Üniversitesi Öneri Dergisi, 16(55), s. 311-341.

Akgül, D. & Güneş, V. (2019), Tüketiciler Market İçinde Bulaşık Deterjanı Raflarını Nasıl İnceler? Göz Takip Araştırması, BMIJ, (2019), 7(5): 2723-2741 doi: http://dx.doi.org/10.15295/bmij.v7i5.1335

Ariely, D., ve Berns, G.S. (2010). Neuromarketing: The hope and hype of neuroimaging in business. Nature Reviews Neuroscience, 11(4), 284-292.

Babaç,E.&Yüncü, H. (2022) Determination of user experience on food business websites using neuromarketing techniques Tourism & Management Studies 18(3):49-64 DOI:10.18089/tms.2022.180304

Bayır T. (2016), ‘’Marka Kişiliği Algısının Ölçümünde Anket ve Nöropazarlama Yöntemlerinin Karşılaştırılması’’,Anadolu Üniversitesi Sosyal Bilimler Enstitüsü.

Beyaz, A. , Beyaz, R. & Gerdan, D. (2015). Farklı model traktör kullanımının verdiği güven düzeyinin galvanik deri tepkisi sensörü kullanılarak belirlenmesi . Mühendislik Bilimleri ve Tasarım Dergisi , 3 (3) , 133-139. Retrieved from https://dergipark.org.tr/tr/pub/jesd/issue/20874/224009

Boz, H. & Koç, E. (2019). A ZERO-SUM GAME: CUSTOMERS’ SWITCHING BEHAVIOR IN THE TURKISH GSM MARKET - A NEUROMARKETING ANALYSIS . Journal of Management and Economics Research , 17 (3) , 251-270 . DOI: 10.11611/yead.601742

Bozoklu, Ç., P., ve Alkibay, S., (2016). Neuroscience in Marketing: Assessment of Advertisement Memory by means of Facial Muscles Movement Analysis.

Çakir, M. P., Çakar, T., Girisken, Y. ve Yurdakul, D. (2018). An investigation of the neural correlates of purchase behavior through fNIRS. European Journal of Marketing. doi:10.1108/EJM-12-2016-0864

Çimen, S., ve Candan, F. B. (2020). Bir Ürünün Beğeni Düzeyinin Nöropazarlama Kapsamında fMRI Tekniği ile Test Edilmesi: Kamyon Ürünü Örneği. International Congress of Management, Economy and Policy (s. 57-76). Istanbul: ICOMEP.

Chong, J. S., Lu, C. K. ve Tang, T. B. (2019, September). Study of emotional state effect on decision making by using fNIRS. In 2019 IEEE International Circuits and Systems Symposium (ICSyS) (ss. 1-4). IEEE.

Coşkun, P., ve Yücel, A. (2021). EEG Yöntemi ile Tüketicilerin Elektronik Ticaret Sitelerine Yönelik Algıları Üzerine Deneysel Bir Çalışma. Süleyman Demirel Üniversitesi Vizyoner Dergisi, 12(29), s. 286-298.

Dağlı, Ö. & Akboz Uluç, T. (2021). Televizyon Reklamlarındaki Marka Maskotların Nöropazarlama Yöntemlerinden Galvanik Deri İletkenliği ve Yüz (İfade) Kodlama Analizi Aracılığıyla İncelenmesi.

Intermedia International E-journal, 8(14), 58-78. Retrieved from https://dergipark.org.tr/en/pub/intermedia/issue/63250/903621

Devrimsel, M. Y. (2020). Renklerin indirim algısına etkisi üzerine bir nöropazarlama araştırması. Etkileşim, 6, 50-81. doi: 10.32739/etkilesim.2020.6.75

Emül,S.& Yücel A.(2021)Examination of Hedonic Consumption Themed Advertising Images Using Researches on Multidisiplinary Approaches 1(1)

Erdemir, K. O. ve Yavuz, Ö. (2016). Nöropazarlama'ya giriş, İstanbul: Bilnet Matbaacılık ve Ambalaj San. A.Ş.

Fishburn, F. A., Norr, M. E., Medvedev, A. V. ve Vaidya, C. J. (2014). Sensitivity of fNIRS to cognitive state and load. Frontiers in human neuroscience, 8, 76. doi:10.3389/fnhum.2014.00076

Girişken, y., Giray, c., & Ocak, e. (2014). Neural correlates of behavioral reactions to gsm operator's web sites for smart phones. Pazarlama ve pazarlama araştırmaları dergisi, 7(14), 1-20.

Girişken, Y. ve Çakar, T. (2016). Detecting the effect of voice-over in tv ads via optic brain imaging (fNRS) and in-depth interview methods. İstanbul Üniversitesi Siyasal Bilgiler Fakültesi Dergisi, (55), 43-53.

Hatip, Murat (2008). "Neuro Marketing". https://marketrend.wordpress.com/2008/11/16/neuro-marketing/.

Hubert, M., ve Kenning, P. (2008). A current overview of consumer neuroscience. Journal of Consumer Behaviour, 7(4-5), 272-292.

Juarez, D., Tur-Vi es, V. ve Mengual, A. (2020). Neuromarketing Applied to Educational Toy Packaging. *Frontiers in Psycholo*gy, 11, 2077.

Kesek, H. ve Gedik, H. (2017). Nöropazarlama: Pazarlamada Yeni Bir Yaklaşım.

Kumar S (2015) Neuromarketing: The New Science of Advertising, Universal Journal of Management, 3(12), 524-531.

Kulich, R., Maciewicz, R. ve Scrivani, S. J. (2009). Functional magnetic resonance imaging (fMRI) and expert testimony. American Academy of Pain Medicine. 10, 373-380.

Müdok, Tangül (2013). Nöronal Pazarlama: Nöromarketing. http://www.sdplatform.com/Dergi/747/ Noronal-pazarlama-Noromarketing.asp

Olivirea ,C. & Giraldi, J. E. (2017) What is Neuromarketing? A Proposal For a Broader and More Accurate Definition, Global Business and Management Research: An International Journal, 9(2), 19-29.

Özdoğan, F. B. (2008). Göz izleme ve pazarlamada kullanılması üzerine kavramsal bir çalışma, Gazi Üniversitesi Ticaret ve Turizm Eğitim Fakültesi Dergisi, (2), 134-147.

Özer, D., & Özüpek, M. N. (2018). Sigara Karşıtı Kamu Spotlarının Bireyler üzerindeki etkisinin Nörogörüntüleme Yöntemiyle Tespit edilmesi. OPUS Uluslararası Toplum Araştırmaları Dergisi. doi:10.26466/opus.412027

Plassmann, H., Venkatraman, V., Huettel, S., ve Yoon, C. (2015). Consumer neuroscience: applications, challenges, and possible solutions. Journal of Marketing Research. 52(4), 427-435.

Shiv, B., ve Yoon, C. (2012). Integrating neurophysiological and psychological approaches: Towards an advancement of brand insights. Journal of Consumer Psychology, 22(1), 3-6.

Solmaz I. (2014), ‘’Nöropazarlama Faaliyetlerinde Bilinçaltı Reklamcılık ve Tüketici Algısı Üzerindeki Etkisi’’ Gediz Üniversitesi Sosyal Bilimler Dergisi.

Sucu, A., Baruönü, Ö., ve Yücel, N. (2021). Reklam Çekiciliğinin ve Reklam Stratejilerinin Farklı Cinsiyetlerde Yarattığı Algının Dezenfektan Reklamları Üzerinden Değerlendirilmesi. Uluslararası Toplum Araştırmaları Dergisi, 17(34), s. 1275- 1305.

Şahin, E. & Yazıcıoğlu, İ. (2020). Restoran aydınlatmasının menüden yemek seçimine etkisi . International Journal of Social Sciences and Education Research , 6 (1) , 54-66. DOI: 10.24289/ijsser.679048

Tayfun, N., ve Öçlü, B.,(2015) Yeşil Pazarlama Uygulamasının Tüketiciler Açısından Algılanmasının Nöropazarlama Tekniği ile Araştırılması, Uludağ Journal of Economy and Society. 34(2), 95-113

Tomris Küçün, N. , Duman Alptekin, H. , Çetin, C. & Eroğlu, S. (2021). Benlik Uyuşmazlığı Teorisinin Tüketicilerin Online Satın Alma Davranışına Yansımaları . Pazarlama ve Pazarlama Araştırmaları Dergisi , 14 (3) , 579-604. Retrieved from https://dergipark.org.tr/en/pub/ppad/issue/65124/1002299

Tomris Küçün, N. , Yaman, C. , Güngör, S. & Eroğlu, S. (2018). Online alışveriş süreçlerinde dijital yerlilerin ve dijital göçmenlerin stres düzeylerinin biyometrik analizi . Journal of Life Economics , 5 (4) , 177-190. DOI: 10.15637/jlecon.268

Toker, A. & Sulak, H. (2021). Farklı türde reklam filmlerinin etkinliğinin göz izleme ve anket yöntemi ile analizi . Pamukkale Üniversitesi Sosyal Bilimler Enstitüsü Dergisi , (43) , 61-91 . DOI: 10.30794/pausbed.762837

Ural T. 2008. Pazarlamada Yeni Bir Yaklaşım; Nöropazarlama Üzerine Kuramsal Bir Değerlendirme. Ç.Ü. Sosyal Bil Enst Derg, 17(2), 421-432.

Ustaahmetoglu, Erol (2015). Nöropazarlama üzerine bir değerlendirme, Business & Management Studies: An International Journal, 3(2), 154-168.

Varan, D., Lang, A., Barwise, P., Weber, R. ve Bellman, S. (2015). How reliable are neuromarketers' measures of advertising effectiveness?. Journal of Advertising Research. 55(2), 176-191.

Yaman, C., Tomris Küçün, N. , Güngör, S. & Eroğlu, S. (2018). Reklamlara yönelik dikkatin göz izleme tekniği ile ölçülmesi ve bağlam etkisi . Journal of Life Economics , 5 (4) , 221-232. DOI: 10.15637/jlecon.271

Yücel, A., ve Şimşek, A., İ. (2019). Measuring Consumer Brand Perceptions in Terms of Neuromarketing by Using the EEG Method: An Experiment Al Study on The Automotive Industry

Yücel, N. (2016). Pazarlamada Yeni Bir Trend: Nöropazarlama ve Örnek Uygulamaları. İstanbul: Paradigma Akademi.

Yücel, A., Çubuk F. (2014) Bir Nöropazarlama Araştırmasının Deneysel Yolculuğu ve Araştırmanın İlk İpuçları. FÜ Sosyal Bil Derg, 24(2), 133-149.

Yücel,N.& İnan, M.(2020)Digital marketing in the tourism sector: analysis of the web sites of Elazığ hotels by eye-tracking. Uluslararası Anadolu Sosyal Bilimler Dergisi, 4(4), 43-64.

Zaltman, G. (2000). Consumer researchers: take a hike!. *Journal of Consumer Research, 26*(4), 423-428.