

NEUROMARKETING AND CONSUMER BEHAVIOR

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NEUROMARKETING AND CONSUMER BEHAVIOR

BY

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PLAGIARISM

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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ABSTRACT

In this thesis, the concept of neuromarketing; has been explained in detail, from its relationship with other sciences to the techniques used, from brain physiology to its effect on purchasing behaviors, from its use in advertising to its connection with artificial intelligence. Then, the survey data applied to 409 participants were analyzed using statistical analysis methods in IBM SPSS 22 program to explain the relationship between consumer preferences and behaviors, personality traits, dominant brain region, and demographic features, and their relationships with each other, and the results were analyzed and interpreted. Factor Analysis, Confidence Analysis, Correlation Analysis, T-test, and Chi-Square Analysis were used in the data analysis phase.

Keywords: Neuromarketing, purchasing behaviors, personality traits, rational consumption, hedonic consumption, brain, advertising, artificial intelligence.

ÖZET

Bu tezde nöropazarlama kavramı; diğer bilimlerle ilişkisinden kullanılan tekniklere, beyin fizyolojisinden, satın alma davranışları üzerine etkisine, reklamcılıkta kullanılmasından, yapay zeka ile ilişkisine kadar detaylı bir şekilde açıklanmıştır. Ardından, tüketicinin tercih ve davranışlarının, kişilik özellikleri, baskın olarak kullanılan beyin bölgesi ve demografik özelliklerle ilişkisini ve birbirleriyle olan ilişkilerini açıklayabilmek için 409 katılımcıya uygulanan anket verileri IBM SPSS 22 programında istatistiksel analiz yöntemleri kullanılarak analiz edilmiş ve sonuçlar incelenerek yorumlanmıştır. Veri analizi aşamasında Faktör Analizi, Güvenirlilik Analizi, Korelasyon Analizi, T test ve Ki Kare Analizi kullanılmıştır.

Anahtar Kelimeler: Nöropazarlama, satın alma davranışları, kişilik özellikleri, rasyonel tüketim, hedonik tüketim, beyin, reklam, yapay zeka.

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1. INTRODUCTION

Neuromarketing is a fairly new application approach in marketing. With the recent acceleration of technological developments and developments in brain imaging technologies, there has been an increase in the number of studies exploring the human brain. As the name suggests, Neuromarketing is a common point where neuroscience and marketing meet, a marketing technique. Neuromarketing is a branch that measures the unconscious movements and habits of the consumer and creates a marketing strategy in this direction. In other words, by examining the human brain, he develops a strategy from the results of the purchasing perception of the person. Thanks to Neuromarketing, consumer behaviors and the social and psychological causes of these behaviors can be investigated. The most suitable purchase conditions for the consumer can be discovered. All of the studies carried out to investigate the thought and behavior of the target audience, that is, the consumer, include Neuromarketing. This method, which many important brands use, spreads rapidly worldwide. Giving an opinion on human behavior is an opportunity for brands to attract the attention of the consumer and correct the message they want to give to the consumer. With this technique, which provides both a technical and a practical way, brands reach the target audience more.

This study aims to introduce neuromarketing, a new application in marketing activities, and to measure the relationship between neuromarketing and consumer behavior by determining consumer preferences and behaviors. For this purpose, in the second part of the study, the concept of neuromarketing is discussed in a general framework. In this context, the relationship between neuromarketing and neuroscience

was examined, and general information about brain imaging techniques was given. After the general information is given, brain physiology is discussed in detail to understand neuromarketing better. Then, the relationship between purchasing behaviors and neuromarketing is summarized, and the advertising uses of neuromarketing are mentioned. Finally, neuromarketing and artificial intelligence are mentioned in this section.

In the third chapter, where the research method is explained, the purpose and importance of the research are mentioned, and its sample and data collection methods are explained. Then the limitations are explained.

In the fourth chapter, the findings obtained from the survey study are presented. In this section, firstly, demographic findings are explained, and then the results of factor analysis are examined.

In the fifth section, where the hypotheses are determined, correlation analysis, t-test analysis, and chi-square analysis were applied, and the results were examined.

In the sixth section, the results of the hypotheses and the contribution of the study to the literature are discussed.

In the last chapter, the seventh chapter, the study results are discussed, and what can be done for the future is emphasized.

2. LITERATURE REVIEW

2.1. Neuromarketing Concept

Neuromarketing is a new practice that successfully integrates neuroscience and consumer psychology. Neuromarketing has revolutionized marketing research by measuring consumers' emotional and unconscious responses. It does this by identifying the origins of consumer behavior and using neuroimaging techniques and other biological metrics to persuade consumers toward their purchasing decisions. In this process, trying to understand the factors affecting the consumer constitutes the scope of the application (Kong et al., 2013). Neuromarketing is a new approach to studying consumer behavior that uses findings and techniques from neuroscience, cognitive psychology, and marketing (Ariely & Berns, 2010).

Neuromarketing is based on the neuroscientist Antonio Damasio's claim that individuals make their decisions using the emotional part of the brain, not the rational part. Thus, neuromarketing is the neurological study of consumers' reactions and mental states when faced with marketing or advertising messages. Neuromarketing can be defined as the measurement and analysis of emotional and unconscious responses resulting from people's perceptions and their use in marketing. From a more practical point of view, neuromarketing can be described as an attempt to discover the purchasing region of the human brain. By interpreting the emotional biochemistry of individuals, neuromarketing can guide us to influence consumers' five senses through positive stimuli like smells, music, colors, shelf arrangement, etc. Neuromarketers examine the brain's purchasing decision process based on data sent from the five senses (Yücel & Çubuk, 2014). Neuromarketing is based on the assumption that the brain contains confidential

personal information about personal preferences, and there is a relationship between brain activity and verbal preferences.

According to Calvert (2011), neuromarketing measures unconscious emotional responses. Hubert and Kenning define this as integrating the results of neuroscience and domain physiology into the marketing world, and they prefer the concept of consumer neuroscience (Pop & Iorga, 2012). Butler (2008) argues that neuromarketing seeks to understand the biology of people's behaviors, thoughts, and actions in this context. Professor Ale Smidt explains the concept of neuromarketing as the commercial application of neurobiological techniques such as brain imaging and brain mapping (Belden, 2008). Neuromarketing can be defined as any marketing or market research that uses its methods and techniques or is aware of the findings and insights of neuroscience (Genco et al., 2013). According to Pepe Martinez (2012), neuromarketing is the integration of many different disciplines, such as neurology, which studies the human brain; cognitive psychology, which studies the relationship between thought and behavior; and the mixing of science and art, which is responsible for the development of new products and service concepts to meet consumer needs and thus maximize profits. According to Harrell (2019), neuromarketing studies the brain to predict and control consumer behavior and decision-making. Bercea (2013) defines consumer behavior as an interdisciplinary field that aims to study and understand the brain by examining it. Neuromarketing is cognitive neuroscience applied to marketing and marketing research (Babu & Vidyasagar, 2012).

Better understanding and predicting consumer behavior is the primary goal of neuromarketing. In other words, neuromarketing aims to understand, interpret, and

predict the market-related behaviors of individuals, groups, and organizations (Lee et al., 2007). The main purpose of neuromarketing is to help consumers better understand their needs and make better choices. With the methods used in neuromarketing, attention, memory, mental effects, and interest can be measured before and after these processes. The aim here is to reach the mysterious unknowns of the mind. When viewed as a science, marketing attempts to accurately predict the products to be produced and deliver them to the right audience at the right time, in the correct quantity, and at the right price (Tüzel, 2010).

In neuromarketing, two different aspects of the mind are targeted. A recall is a memory formation for an advertised product, regardless of product-related stimuli. On the other hand, recognition is familiar with a product when the consumer is exposed to the product or related promotional material. Thanks to neuromarketing, the consumer's memory can be filled, and the consumer can be persuaded to buy the product (Daugherty & Hoffman, 2017).

Neuromarketing aims to measure three essential metrics: consumer attention, emotional engagement, and retention. Examples of these parameters are measuring the attention a consumer pays to the shelves during shopping, what the consumers are afraid of, what they love, how much of an advertisement or a picture is remembered, especially which part of it. Neuromarketing guides marketing by employing these concepts that appear impossible to quantify at first glance. (Lee et al., 2007). Marketing analysts use neuromarketing to better measure and define consumer preferences. Brain research data in neuromarketing helps marketers create more effective brain-focused marketing

campaigns and products. Neuromarketing helps marketers identify what consumers respond to (Özdoğan et al., 2008).

The key to success in neuromarketing is based on the results obtained by statistical interpretation of the data obtained from the most appropriate combination of neurophysiological and motor techniques. Thus, neuromarketing provides clear and concise guidance for future brand development and communication strategies.

Neuromarketing helps marketers build trust factors and develop secure relationships with customers. It helps consumers think about price and ensures correct positioning at the right price. Neuromarketing can also be used in retail. It can also be used to illuminate the store and make arrangements to appeal to customer emotions, such as music and color. Neuromarketers can use the knowledge they have to design better products that meet the basic needs of consumers (Calvert, 2011). Most neuromarketing research is done for practical purposes, such as informing effective marketing strategies and advertising campaigns (Ducu, 2017). We are using neuromarketing to measure advertising effectiveness, determining the effectiveness of celebrities in advertising and the effectiveness of the media, product attractiveness, branding, logo selection, product design, new product development, film industry, politics, and architecture (Fugate, 2007).

2.1.1. The interaction of neuromarketing concept and neuroscience.

Neuromarketing is a term that refers to the use of neurotechnology to understand neurophysiological responses to marketing stimuli in general. With neuromarketing research, changes in the mental state of consumers exposed to any marketing message can be tested neurologically (Özdoğan et al., 2008). To better understand Neuromarketing, it is helpful to understand the concepts of neuroscience and

psychophysiology based on Neuromarketing. The concept of Neuromarketing, the study of the functioning of the human brain and decision-making against marketing messages, comes from the discipline of neuroscience (Çakar, 2010). Neuromarketing is a multidisciplinary science developed in neuroscience to explain better marketing research and consumer behavior (Yorgancılar, 2015). Neuromarketing is the application of consumer neuroscience techniques to understand consumer behavior in the market (Ural, 2008). Before defining Neuromarketing, it is essential to define the concepts of neuroscience and psychophysiology. Neuroscience studies the nervous system's anatomy, physiology, biochemistry, or molecular biology and the relationship between nerves and nervous tissue and behavior and learning (Merriam-Webster, 2022). Neuroscience, studying the biological responses of the human brain, which consists of more than 100 billion cells and 1 million kilometers of fiber connections, reveals the decision-making process. (Renvoise & Morin, 2007). Neuroscience is a discipline that requires the cooperation of many fields. We can classify this area as follows (Nordqvist, 2017).

Table 1

Neuroscience Disciplines

Affective Neuroscience	The field studies the relationship between neurons and emotions, mostly animal laboratories.
Behavioral Neuroscience	These studies reveal the biological basis of behavior. It studies the influence of the brain on behavior.
Cellular Neuroscience	It studies the physiological properties of neurons.
Clinical Neuroscience	It studies nervous system disorders and mental problems.
Cognitive Neuroscience	It studies higher cognitive functions and their neural basis. To understand the nature of cognition, cognitive neuroscientists use behavioral, experimental, or computational modeling methods.
Computational Neuroscience	Programs are used to simulate and model brain functions to understand how the brain works. Mathematics, physics, and other computational field are used.
Cultural Neuroscience	It investigates how beliefs, shared assumptions, and cultural values are formed.

We see the field of cognitive neuroscience and psychophysiology at the forefront of neuromarketing research. Psychophysiology studies the relationship between the human brain and the body (Precourt, 2015). Psychophysiology includes psychological processes, including emotional responses such as fear and anger, and cognitive processes like problem-solving and decision making (Andreassi, 2013). Psychophysiology is used to determine responses to marketing stimuli in the brain and human body. As neuroscience and psychophysiology define, Neuromarketing applies neuroscience and psychophysiology findings to marketing. (Hubert & Kenning, 2008). On the other hand, Neuromarketing aims to reveal insightful information that consumers frequently overlook by relying on their nervous systems' neurophysiological and psychophysiological responses to the causes that guide their behavior (Erdemir & Yavuz, 2016). It uses data obtained from medical techniques for non-medical purposes to develop marketing strategies and activities (Lewis, 2013).

2.2. Techniques Used in Neuromarketing

Neuromarketing uses various techniques used in medicine to understand consumers better and create marketing strategies (Akın & Sütütemiz, 2014). The history of neuromarketing goes back to Plato's chariot story. Neuroscience research emerged after World War II to address how people make decisions through research. The method used to study changes in neurons in the 1970s was to examine individual cells under a microscope. Today, neuroimaging devices that can see inside the brain and observe the evolution of synapses in real-time have been developed (Jensen & Nutt, 2014). Since 1985, neuroscience work has been conducted at military research centers and universities,

including in the United States. However, the most severe research on neuromarketing came in the 1990s when Gerry Zaltman and Stephen Kosslyn of Harvard University announced using functional magnetic resonance imaging in their marketing research (Fisher et al., 2010).

To better explain the concept of neuromarketing, it helps to understand how brain scanning is used in neuromarketing. The emergence of neuromarketing and the idea that human physiology can be used outside of verbal expressions to understand consumer preferences has led many researchers, advertisers, and marketing researchers to use neuromarketing techniques. The formation of emotions and thoughts is due to the communication of neurons with each other by electrical messages. Observing these electrical signals with imaging devices is essential for understanding human behavior (Jensen & Nutt, 2014). Thanks to the electrochemistry observed in different parts of the human brain with brain-scanning technology, and it is possible to comment on what consumers react to the most. While brain imaging measures attention, memory, mental influences, and preferences, behaviors before and after these processes are also measured. Brain scanning tests used in neuromarketing reveal subconscious thoughts, feelings, and desires that push consumers to make purchasing decisions. Researchers have advertisements, images, logos, etc., related to the subject they are researching that they can use. After showing it to the subjects, they monitored the activity in their brains and measured how they responded to it (Hart, 2009).

The development and widespread use of brain imaging methods have enabled interdisciplinary studies by applying them to the social sciences (Özüpek & Özer, 2018). Neuroscience methods involve using tools and techniques to measure, map, and record

brain and neural activity in behavior. These techniques allow neuroscientists to observe neural processes occurring in behavior; they can be classified as neuroscience tools and techniques that record neural activity or techniques used to manipulate it (Lim, 2018). According to Oliveira and Giraldi (2017), marketing research cannot be classified as neuromarketing without neuroscientific measures. To determine the specific meaning of emotional data, neurometry should be supplemented by biometric measurement. Neuromarketing typically uses brain scanning and biometric techniques to measure consumer responses to stimuli. In addition to these, it was determined that psychometric techniques were also used (Varan et al., 2015). Techniques used in neuromarketing research are classified in three ways: neurometric, biometric, and psychometric (Yücel, 2017).

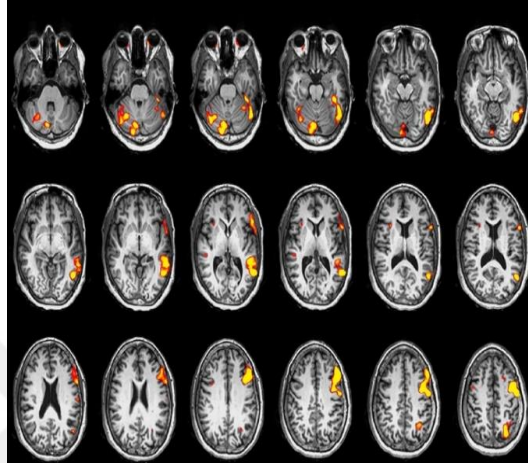
2.2.1. Neurometric measurements.

Neurometric measurements aim to measure brain and nerve responses. Neuroscience has begun to be used to determine what drives consumers to shop. Leading neuroscientists are trying to understand people's decision-making process using fMRI and are studying what part of the brain is telling them. This is achieved by measuring blood flow to different brain parts associated with emotions such as desire and hesitation. Techniques used in neuromarketing, fMRI, EEG, etc., help us understand how our brain responds to advertisements, brands, and products, especially unconsciously (Miller, 2006).

2.2.1.1. Functional magnetic resonance imaging (fMRI).

Figure 1

Functional Magnetic Resonance Imaging



Note. Birler, B. (2020). EEG / fMRI hangisini ne zaman kullanmalı? Retrieved from <https://www.noropazarlama.net/2020/05/23/eeg-fmri-hangisini-ne-zaman-kullanmali/>

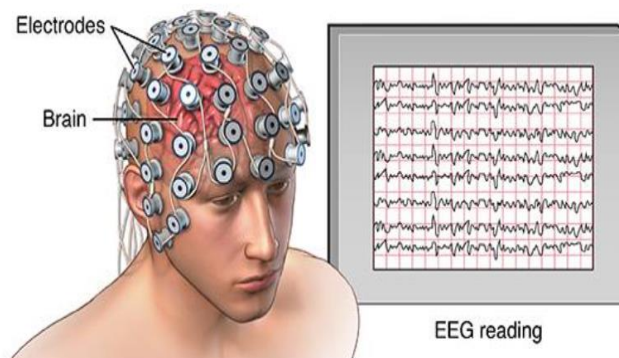
Functional magnetic resonance imaging, or fMRI, is used in neuromarketing to determine consumers' reactions when examining their behavior. This technique is most commonly used in neuromarketing. With this device, different stimuli are presented in the experiment, and it is determined which parts of the brain become active over time, and brain scans are performed with maps showing their degrees (Ural, 2008). The fMRI method is an imaging technique in which data is obtained by measuring blood oxygen levels in the brain (Ustaahmetoğlu, 2015). Functional Magnetic Resonance Imaging allows us to perceive the images, videos, and music shown to the patient or subject with fMRI or observe the activities in the relevant parts of the brain while performing a physical data task (Ayata & Aşkın, 2008). Agarwal and Xavier (2015) noted that fMRI had gained popularity in neuromarketing research over the past decade due to its high spatial resolution, i.e., its ability to look deeply into the consumer's brain.

With fMRI, researchers can monitor neural activity and examine researchers' cognitive and advertising responses to print ads (Wilson et al., 2008). Electrical movements in the brain can determine preferences. With fMRI measurement, it is possible to measure consumers' tastes, favorite music genres, and willingness to buy. The cost-benefit of neuromarketing techniques is higher than traditional techniques (Ariely & Berns, 2010). fMRI is an imaging technique used to measure blood oxygen levels in the brain and metabolic changes in brain activity. Some subjects were afraid to stay inside, and some allergic reactions were the weak side of this technique. Another disadvantage is the high cost. The fMRI machine examined the brain regions responsible for emotions such as reward, pleasure, and anxiety. The emotions created by the stimulus provided to the consumer were determined. The fMRI technique provides ten times more detailed data than an EEG device.

2.2.1.2. Electroencephalography (EEG).

Figure 2

Electroencephalography



Note. Electroencephalography. (n.d.). Home [Facebook page]. Facebook. Retrieved May 17, 2022, from <https://www.facebook.com/gazikenttipmerkezi/photos/eeg-nedir-elektroensefalografi-eeg-ya-da-beyin-%C3%A7izgesi-y%C3%B6ntemi-beyin-dalgalar%C4%B1-a/2094108127345567/>

Electroencephalography, or EEG, the most common and best-known neuroscience measurement technique, is measured with an electrode placed on the scalp. As the applied electrode charge increases, the degree of density increases, and the accuracy of the measurement increases (Ariely & Berns, 2010). EEG, which has a long history in neurology, is accepted to measure brain activity. When our neural circuitry, made up of more than 100 billion neurons and trillions of synaptic connections that form the basis of our cognitive response, is awakened by a specific stimulus as advertised, the neurons are activated, producing a small amplifiable electrical current (Morin, 2011). EEGs measure these currents. When brain cells, and neurons, are activated, electrical currents are created in the area. EEG measures the outputs during synaptic stimulation of many dendrites of pyramidal neurons located mainly in the cerebral cortex. It has been determined that various studies have been conducted in which EEG (Indira et al., 2012), which is widely used to control Bevin's functions and neurological diseases, is used to express the emotional states of individuals. The fact that human emotions can be understood with brain signals has attracted the attention of marketers, the use of EEG has become widespread in this field, and studies have begun on its properties. It raises doubts about the determination of ease of use instead of verbal expression.

EEG stands for electroencephalogram. When the rhythmic potentials that occur in the functional processes of the brain are awakened, changes in the electrical potential occur. These potentials are measured and recorded using an EEG (Yücel & Çubuk, 2014). With this method, electrical signals from certain brain parts can be transmitted with various formulas through mathematical values, and we can gain attention, motivation, emotional excitement, cognitive load, and meditation. The collection of path

data in an EEG is done by placing small electrodes on the scalp. The average frequency of human cognitive processes is between 50 and 60 Hertz. The leading frequency bands that the human brain receives from the EEG are delta (0–4 Hz), theta (3–7), alpha (8–12), beta (13–30), and gamma (30–40). Observing these forbidden bands allows the consumer's cognitive or emotional reaction to pre-prepared marketing stimuli (Batı & Erdem, 2015). Delta, alpha, beta, and gamma waves correspond to emotions such as excitement, attention, fear, and disgust, with electrical waves emanating from the brain lobes via an electroencephalogram. The changes in the brain waves obtained in the face of any stimulus are recorded on the computer. The experts then drew inferences about the subjects' emotional responses to the marketing stimulus. For example, a decrease in alpha waves means increased left frontal lobe activity and means the subject likes it (Akin, 2014).

EEG is cheaper and easier to apply than many neuroimaging techniques has enabled EEG devices to be used more frequently in neuromarketing research (Batı & Erdem, 2015). Many different techniques can be used in neuromarketing research. These techniques often differ in their measurement methods. This leads to performance differences over time and space. For example, fMRI (functional magnetic resonance imaging) can obtain sensitive data with a spatial resolution (Daugherty & Hoffman, 2017), while mental activities can be measured in near real-time with EEG (Morey, 2018). Furthermore, unlike EEG, which measures electrical activity (Yücel & Çubuk, 2014), fMRI measures blood oxygen levels (Ustaahmetoğlu, 2015).

2.2.1.3. Magnetoencephalography (MEG).

Figure 3

Magnetoencephalography



Note. Delhipages. (2020). Magnetoencefalografia tecnica di imaging. Retrieved from <https://delhipages.live/it/salute-e-medicina/medicinale/magnetoencephalography>

Magnetoencephalography, or MEG, is a technique used to study the activity of the human brain. It measures continuous brain activity in milliseconds and shows where the brain activity is. A Magnetic Brain X-ray creates a snapshot of the brain that shows which brain parts are active in response to a stimulus. It works with a slighter delay than devices with the same functionality (Sutherland, 2007). The MEG device is three-dimensional and has a very high resolution over time. That is why it is one of the best imaging methods. However, it is not often used in neuromarketing research due to its high cost. Small electrical currents occurring between brain cells can be read using MEG technology. The MEG device is superior in features and more convenient. However, due to the high cost of the study, the EEG method is more preferred in neuromarketing research as it is less costly than the MEG method (Behremen, 2015).

2.2.1.4. Positron emission tomography (PET).

Figure 4

Positron Emission Tomography



Note. Reyap Hastanesi. (n.d.). PET/CT. Retrieved May 6, 2022, from <https://reyaphastanesi.com.tr/tibbi-bolumler/pet-ct/>

Positron emission tomography, or PET, is a high-level imaging technique that uses radioactive material and a special camera (Akin, 2014). Positron emission tomography is a nuclear imaging method used for imaging tumors and metastases in the type area. In this method, sugar water mixed with ^{18}F , a weakly radioactive substance, is given intravenously to the patient to detect hidden tumor tissues in the body. Tumor cells absorb this substance, an analog of glucose, and begin to give signals, which are detected by a special camera called a PET scanner and converted into maps showing the whole body (Lang et al., 2002). Nuclear medicine specialists use PET scans to identify cancer cells. With PET measurements, a large part of our body system can be scanned, and detailed information about the presence of tumors can be obtained (Şimşek, 2016). Although positron emission tomography is a nuclear medicine method, the patient must use radioactive drugs. Data is obtained by measuring the flux of the radioactive deposition zone. (Klineková, 2016). Neuromarketing uses biometric methods and other

neuroimaging and brain activity measurement techniques to understand consumer responses to stimuli (Brenninkmeijer et al., 2020).

2.2.2. Biometric measurements.

Biometric measurements aim to measure biological and physiological responses. It aims to measure the reactions of the whole body, except the brain. Physiological responses are complex for participants to monitor because physiological responses are synthesized when the participant performs the behavior. In addition, physiological responses convey the data exactly because the researcher does not say what he wants to hear and does not try to hide the truth (Özdoğan et al., 2008). Biometric measurements include computer-controlled systems developed to measure consumers' physical and behavioral responses. The most commonly used biometric measurement techniques in neuromarketing can be pupil movements, facial movements, electrochemical responses, electrification, and measurement of transepidermal sweating (Shiv & Yoon, 2012). In addition, biometric measurements can include heart rate, facial expressions, respiratory rate, seizures, pitch, eye tracking, and galvanic skin response. Biometric measurements can be made with PET, which is the most advanced nuclear medicine imaging technique. Face coding, electrocardiogram, FMG, facial mimicry, electromyography, and speech pitch analysis also measure the subject's emotional response.

2.2.2.1. Eye-tracking.

Figure 5

Eye-tracking



Note. Institute for Neuromarketing. (n.d.). Home. Retrieved May 17, 2022, from <https://neuromarketinginstitut.com/eng/>

The eye-tracking technique, one of the most frequently used methods in neuromarketing studies, was developed by Mowrer in 1936 (Özdoğan et al., 2008). Eye-tracking is data obtained by tracking the position of the eyes to understand where the person is looking (Bergstrom & Schall, 2014). One of the most frequently used techniques in neuromarketing research is eye-tracking. Eye-tracking is a device that detects where the consumer's eye is focused on a target object or stimulus. Pupil movements, dilation, and contraction were recorded with an eye tracker. During this recording, the student is exposed to an infrared beam at a rate of 60 Hz. Our eyes are constantly in motion. Although some are conscious movements, they are unconscious and uncontrolled movements. For example, students make quick movements, stop at each word, skip, and move on to the next. Unless there is a conscious focus, the eyes can stay fixed on one spot. It can stay fixed for up to 250,300 milliseconds. Scientific studies show that this increase in fixed points also increases cognitive work. It has been shown that increasing the load of the brain means an increase in the resolution and inference

level of the brain (Girişken, 2015). The eye is at a certain point. The number of focal points and focal length of jump data represent the transition of the eye from one point to another, jump and another point, follower and focus trajectories, and eye-tracking routes with a combination of jump data (Erdemir & Yavuz, 2016).

The path followed by the eye was used to analyze visual perception, cognitive purpose, and preference (Santos et al., 2015). This allows us to keep track of where and for how long eye movements focus and which path the eyes follow. When we can monitor a user's data, the team's data monitoring can infer, see, and focus on what the viewers are looking at, thanks to the combination of hardware and software (Baş & Tüzün, 2014). With the eye-tracking method, it is possible to quickly analyze shopping mall shelf design, website usability, and product packaging, which parts of the consumer focus on visual stimuli in packaging design (Özdoğan et al., 2008). Eye-tracking is frequently preferred in marketing studies due to its low cost and ease of use. For example, it determines where they focus on a product's packaging or advertisement, what parts they look at when browsing a marketplace, and where consumers look when navigating a website. With it, businesses can change their packaging designs, logos, and icons on the packaging and design their websites and optimize their layouts. According to an Eye-Tracking Study, a brand increased its sales from 28% to 44% simply by changing the location of the logo on the packaging (Girişken, 2015).

2.2.2.2. Galvanic skin response (GSR).

Figure 6

Galvanic Skin Response



Note. Martinez-Levy, A. C., Moneta, E., Rossi, D., Trettel, A., Peparaio, M., Saggia Civitelli, E., & Sinesio, F. (2021). Taste Responses to Chocolate Pudding with Different Sucrose Concentrations through Physiological and Explicit Self-Reported Measures. *Foods*, 10(7), 1527.

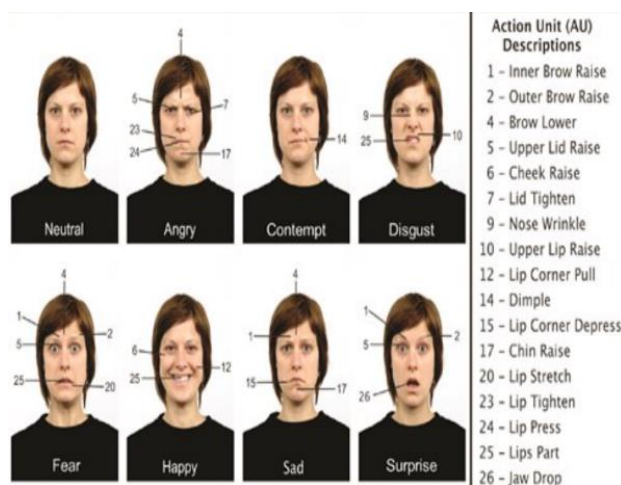
Our skin covers our entire body and is our largest organ due to the surface area it covers. There are 3 million sweat glands in our body, mainly on our cheeks, palms, hands, and feet. Sweat secreted to moisturize the skin helps tighten the pores, facilitate grasping, and eliminate heat. Sweating is a response of our brain through the autonomic nervous system. Due to our anatomical structure, sweat gland activity cannot be achieved voluntarily with our conscious choice. Sweat facilitates the diffusion of electrical activity, and conductivity is transmitted to the skin at small voltages. Transdermal delivery technology displays the intensity of the emotional stimulus based on the magnitude of this electrical emission. Skin conductivity technology shows the intensity of the emotional stimulus in us based on the magnitude of this electrical emission. This sensitive measurement is called the Galvanic Skin Response (Erdemir & Yavuz, 2016). The galvanic response, or GSR, an automatic response of the autonomic nervous system, indicates specific responses of the skin, particularly the palms, to both pleasure and stress.

By monitoring these reactions, parts of the image or product that please or disturb them are determined (Plassmann et al., 2015). For example, increased sweating that accompanies emotional responses is a sign of increased skin's electrical resistance, which causes excitement (LaBarbera & Tucciarone, 1995). Skin conductivity is a technique in which the skin's electrical conductivity measures the body's physiological response to sweating due to excitement. This method is mainly used in marketing research to measure the response to advertisements and websites. In addition, with the advantage of being inexpensive, easy, and portable, electrical skin conductivity is sometimes used to aid neuromarketing research techniques. After this device is attached, it can move, sit, and stand as it wishes during the test, and data can be recorded during the test (Valiyeva, 2015).

2.2.2.3. Facial coding system (FACS).

Figure 7

Facial Coding System



Note. Brand and Marketing. (2016). Técnicas de neuromarketing (VI): emotional facial coding. Retrieved from <http://brainandmarketing.blogspot.com/2016/03/tecnicas-de-neuromarketing-vi-emotional.html>

Faces are a significant source of information. By looking at a face, we can tell if it belongs to someone we know. Despite minor differences in facial features, a person's gender, race, or emotional state can also be defined (Pearce & Arnold, 2013). Face coding is data acquisition due to measuring the changes created by emotions in facial expressions (Renvoise & Morin, 2007). Face coding can examine unconscious reactions through 43 facial muscles and 23 movement units and six basic emotions; anger, dislike, jealousy, fear, sadness, surprise, and laughter that are social or natural. Facial reactions contain much information about a person's response to a stimulus. In recent years, face coding has become popular market research and media measurement tool. Facial behaviors provide complementary and additional information for other techniques. The coding of sign and message decisions based on facial behavior can make quantitative, instantaneous measurements to gauge the audience's response. Facial responses are used to predict and quantitatively evaluate content performance and to diagnose the content qualitatively (McDuff & Kaliouby, 2017). The information obtained from measuring the facial responses was limited due to the insufficient scalability of the observational methods. Recent advances have enabled these answers to be given with the assistance of computers to obtain more reliable results (McDuff & Kaliouby, 2017). As a result, researchers have developed techniques that identify people by their faces and reveal what is on their minds (Hutson, 2018). The Facial Movement Coding System, or FACS, is the most widely used and comprehensive objective coding system for facial behaviors.

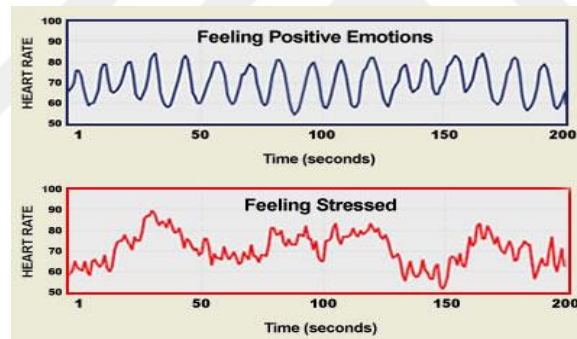
Nearly all sign decisions and responses to the media use FACS. Communicating and interpreting the results would be extremely difficult without such a universal coding system. (McDuff & Kaliouby, 2017). FACS evaluates facial movement's duration,

frequency, and intensity (Kassam, 2010). Moreover, The Facial Coding System was created by Ekman-Friesen-Davidson. Thanks to this system, people's emotions can be detected by analyzing their facial expressions in different videos. The system they developed is based on the position and location of 43 different facial muscles, which can produce thousands of different facial expressions due to their combined movements. In most cases, it is crucial for this test that emotion or emotion flows so quickly that it is invisible to the naked eye.

2.2.2.4. *Measuring heart rate.*

Figure 8

Measuring Heart Rate



Note. Willow Cottage Clinic. (n.d.). Heart Rate Variability. Retrieved May 17, 2022, from <http://www.thenhs.co.uk/HRV.htm>

The emotional changes people experience also cause changes in their heart rate. We can also observe changes in heart rate due to emotions such as fear and excitement. Studies have shown that the heart rate increases in response to unpleasant stimuli. The heart rate slows in response to pleasant stimuli (Watson & Gatchel, 1979), and attention is directed more toward external stimuli (Bolls et al., 2003). The electrocardiogram allows us to monitor the heart rate by recording the electrical discharges associated with the heart muscle contraction (Wiles & Comwell, 1991). When excited, the heart rate increases (Sayan & Uçan, 2013). Data on this change can be obtained by measuring heart

rate. However, since changes in heart rate may occur for different reasons, it should be used in conjunction with other techniques.

2.2.3. Psychometric measurements.

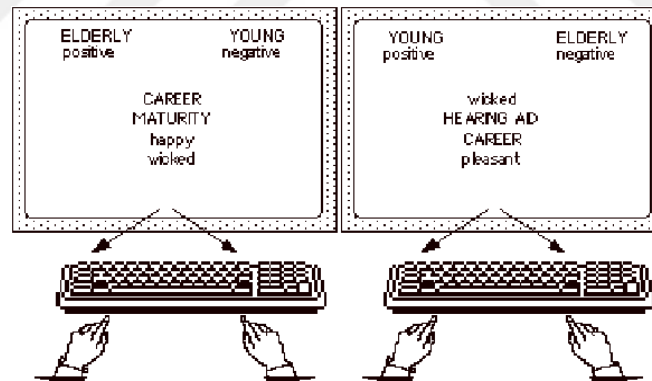
Psychometric measurements aim to measure psychological and implicit responses related to the indirect measurement of brain activities (Varan et al., 2015).

Neurophysiological responses are examined according to the rule that if two nerve cells are triggered one after the other, their connection becomes stronger if one affects the other (Hebb, 2005).

2.2.3.1. The implicit association test.

Figure 9

The Implicit Association Test



Note. Jelenec, P., & Steffens, M. C. (2002). Implicit attitudes toward elderly women and men. *Current Research in Social Psychology*, 7(16), 275-293.

The Implicit Association Test requires us to match two concepts. For example, young and good, or old and good. The closer we see these concepts to each other, the easier it will be for us to answer them by pressing the same button. Namely, if we want to associate with young and good, we have to press the same button for both. If the association between old and good is not strong, responding by pressing the same key will be more challenging. This gives us a measure of the extent to which the concepts are

interrelated. The more similar the concepts are, the faster our answers will be. The Implicit Association Test, created by Greenwald et al. (2001), was created to measure individuals' implicit attitudes towards any concept. The scale is one of the most commonly used tests to measure implicit attitudes in studies in social psychology. This test assumes that the concepts in the same category in people's minds automatically evoke each other.

2.3. Neuromarketing and Brain

Neuromarketing, one of the techniques used by marketing science to reach consumers, directs us to our brains. Brain research has gained importance today; scientists have begun to uncover the mysteries of the brain. The physiological structure of the brain and the role of logic and emotions in our decisions are trying to be clarified. The human brain, which is also responsible for consumer behavior and manages most of the functions of the day, is also trying to be understood by neuro marketers (Morin, 2011). One person's liver is almost the same as another person's liver. However, individual consciousness, compassion, intelligence, curiosity, honesty, and many other mysterious qualities (Ataç & Uçar, 2006). Thanks to functional neuroimaging techniques, significant progress has been made in finding brain equivalents of behaviors, emotions, attitudes, and beliefs. In addition to basic human emotions such as fear, joy, sadness, and surprise, it is increasingly understood which brain regions are activated and which are predominantly involved in more complex and developed emotions such as guilt, revenge, pride, and love. The brain is the manager of bodily and emotional events. In other words, since the brain is an organ that manages the perception of the entire internal and external

environment and acquires and processes information, it creates many unique features of human behavior and personality (Cansel et al., 2008).

Thoughts and questions about the origins of human behavior and efforts to find answers to these questions go back a long way; it is known to go as far as Hippocrates. Hippocrates, who associated all behaviors, emotions, thoughts, and perceptions with the brain, laid the first foundations for the neurobiological origins of behavior. One of the first to focus on the idea that the brain controls behavior in the 19th century was the neuroanatomist F.J. Gall. Gall developed a theory that connects specific structures in individuals' brains with their psychic nature. Fritsch and Hetsch, who later became military doctors in 1870, determined that the right hemisphere of the brain controls the left body, and the left hemisphere controls the right body. Since the 1980s, neurocognitive theory, physiology, cognitive psychology, and brain science have tried to fully understand human behavior and reveal its theoretical basis (Korkmaz & Mahiroğlu, 2007). In other words, it is thought that it is impossible to fully understand the personality and personality dimensions and the factors affecting the formation of personality without fully understanding the working systematics of the human brain. In this direction, determining the physiological and chemical changes in the human brain and which brain regions play an active role in shaping behaviors allows for a more holistic and healthy approach to the concept of personality.

2.3.1. The nervous system.

Figure 10

The Nervous System



Note. Medicoplus. (n.d.). ELA (Esclerosis Lateral Amiotrófica): causas, síntomas y tratamiento. Retrieved May 17, 2022, from <https://medicoplus.com/neurologia/ela>

As can be understood from the methods used in neuromarketing, our biological responses, such as eyes, pulse, sweat, and hormones, also provide us with data, just like our brain. All these changes in our body occur not only through our brain but also through the nervous system, of which our brain is a part. The nervous system, which we can define as a network, perceives the information coming from the internal and external environment, processes the information, gives it meaning, and transmits signals to different regions through a network, regulating the activities of cells, organs, muscles, and hormones (Başev, 2017).

A nerve cell with all its extensions is called a neuron. Neurons can sense environmental changes, transmit them to other neurons, and mediate cognitively based bodily responses (Wolfe, 2001). All the nervous system activities are provided by the electrical current coming from the neurons. That is, information moves between neurons

in the form of electrical currents. This particular electrical phenomenon, similar to the electric current in a metal conductor, is called nerve current (Korkmaz & Mahiroğlu, 2007). The connections between the extensions of neurons are called synapses (Katerji, 2009). Nerve cells in the brain communicate with each other through synapses. The transmission of biochemical messengers activates synapses. This communication system of our brain enables human behavior to occur.

When we exhibit a behavior, it is transmitted to the senses through electrical and mechanical signals. Signals reaching the senses are converted into electrochemical signals in the nervous system and transmitted to the brain. New behaviors emerge after this communication. Most of these behaviors occur automatically, below the level of conscious awareness (Cozolino, 2014). The nervous system is an organ system that causes living things to perceive their internal and external environments, obtain and process information, maintain communication between various systems in the body, and regulate the activities of organs and muscles. The nervous system receives messages from the body and the external environment and analyzes, compares, groups, coordinates, interprets, and ultimately transmits its orders to tissues and organs. All structures in the body are in direct contact with the nervous system.

The nervous system is also responsible for higher-order functions such as memory and interpretation, motivation, and cognitive processes. As can be understood from these expressions, the nervous system regulates many processes of "human behavior." Therefore, the nervous system is the essential component of the psychological system in advanced organisms (Korkmaz & Mahiroğlu, 2007).

The nervous system consists of the central and peripheral nervous systems. The peripheral nervous system is composed of nerve cables that transmit the order to withdraw our hands from the surface and secrete liquid in sour apples in our mouths (Başev, 2017). All the stimuli in our environment and our body are perceived by the relevant receptors and transmitted to the brain through nerve impulses.

The brain examines this information that comes to it, evaluates it, and interprets it as a sense in its cortex. The different types and intensities of the impulses coming to the brain form the basis of learning. The brain creates attention, consciousness, emotional behavior, and sleep. Although it is not yet fully understood how it happens, it is accepted that memory, dreaming, thinking, and creating are complex brain activities. Since environmental stimuli cause neurons to fire, these stimuli and experiences shape how a person thinks (McFadden, 2001), and in this respect, each brain is unique.

The central nervous system comprises all the parts and organs that perceive and process the data obtained with the help of the peripheral nervous system, perform all mental functions and make decisions. It is a complex set of structures that include regions where decisions are made, data from the environment is interpreted, perception and other mental functions are performed. The central nervous system, constituting the largest part of the nervous system, has a fundamental role in controlling behavior and the peripheral nervous system. The central nervous system is the part that evaluates and decides what kind of response to the changes in the internal and external environment to have. The central nervous system consists of the whole brain and the spinal cord.

2.3.2. The physiological structure of the brain.

Figure 11

Brain



Note. eLife. (2019). How humans evolved bigger brains. Retrieved from <https://elifesciences.org/digests/41250/how-humans-evolved-bigger-brains> &

Taylor, T. (2020). Brain. Retrieved from <https://www.innerbody.com/image/nerv02.html>

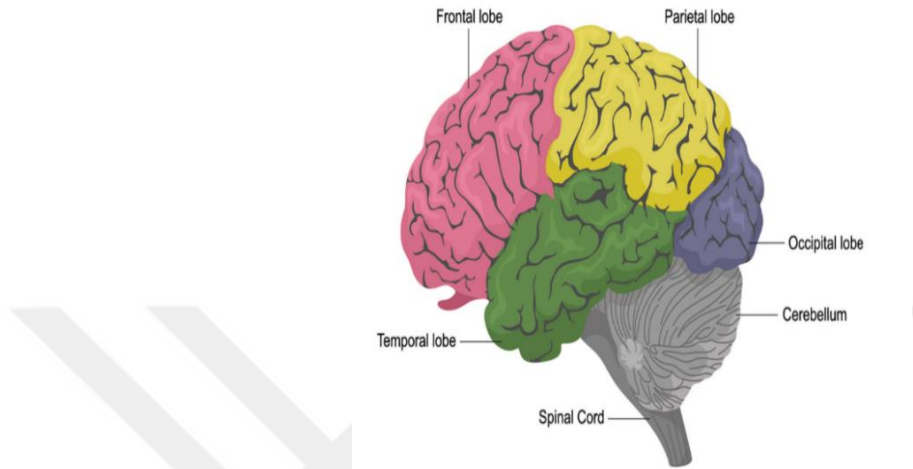
The human brain accounts for about 2% of our body weight, with approximately one and a half kilograms. The brain is the most complex and unexplored organ globally, with more than a hundred million nerve cells and trillions of synaptic connections in the human brain. It can use approximately 20% of the human brain (Morin, 2011). The brain is a slightly more than 1200 gram, sticky, jelly-like substance that smells like moldy cheese, fills the intracranial cavity, is covered by three layers of the cerebral cortex, and is a white-colored or gray-colored organ consisting of two hemispheres with a protruding gyrus.

Sousa (2001) states that the right hemisphere governs the left side of the body, and the left hemisphere governs the right side. The brain provides the control of many systems in the body. In short, the brain is the central command center of the body. When the brain is examined in detail, it is seen that it consists of a deep cleft from front to back and two separate hemispheres on the right and left (Ziylan & Murshid, 2000). The right and left hemispheres are connected and kept in communication by a nerve network called

the corpus callosum. In other words, the corpus callosum bundle, which consists of a dense neural network, acts as a bridge that ensures the continuous exchange of information between the right and left lobes of the brain. When the corpus callosum is cut, the communication between these two parts is also interrupted, and therefore, information exchange between them is not possible in any direction (Kocabıyık et al., 2006).

The left brain mainly performs cognitive functions, such as perception, thinking, expressing one's thoughts, understanding, mathematical abilities, being logical, and speaking; on the other hand, it has been understood that the right brain is mainly related to affect, expressing the effect, recognizing faces, tracking non-verbal communication, and creative, intuitive, and artistic abilities. Since these different brain parts are also related to different types of intelligence, it has been revealed that different parts of the brains of people who use different types of intelligence are also active at different levels (Uzunoğlu, 2004).

These two hemispheres are divided into four main parts; Frontal Lobe, Parietal Lobe, Occipital Lobe, and Temporal Lobe with deep clefts (Kolb & Whishaw, 2009). Each separated piece is called a lobe. Namely, the brain consists of the frontal lobe, temporal lobe, parietal lobe, occipital lobe, cerebellum, and brain stem. At the same time, there is the limbic system, which is associated with emotions in the operational structure of the brain. These lobes work together, but each has specific functions.

Figure 12*Brain Lobes*

Note. Johns Hopkins Medicine. (n.d.). Brain Anatomy and How the Brain Works.

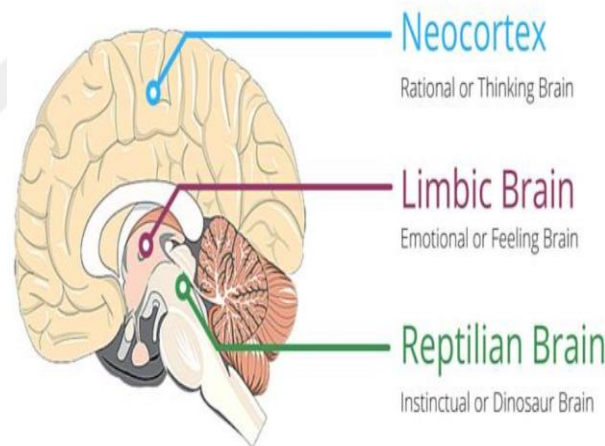
Retrieved May 17,2022, from <https://www.hopkinsmedicine.org/health/conditions-and-diseases/anatomy-of-the-brain>

Anatomical differences in parts of the human brain also correspond to different functions. The brain exhibits perfect unity and integrity in structure and function in this respect. The human brain and mental activities are predominantly concentrated in different brain parts (Ayata & Aşkın, 2008). For example, the outer shell, in which brain cells are concentrated, is called the "cortex". The cortex contains different layers according to the lobe it is in and the function of that lobe. This cortex regulates abstract mental processes, controlling voluntary movements, combining and directing the senses, and high-level mental and emotional functions. Emotions and related processes in the limbic system, also called the inner brain, in the hindbrain system, physical and biological processes like eating and drinking movement are more dominant and dominant.

The brain is divided into three parts for practical purposes, such as understanding it. These parts of the brain, which are also considered the consumer's brain, are the reptilian brain, the limbic brain, and the rational brain (Valencia, 2017). In addition, in the 1950s, neuroscientist Paul MacLean proposed that the brain consists of three layers, representing three successive stages of evolutionary development. The first is the reptilian brain. The reptilian brain is all about survival behavior. The other stage, the limbic system, is about emotions. The third stage, the neocortex, is related to higher-order thinking (Eagleman, 2014).

Figure 13

Three Parts of The Brain



Note. Clinical-Partners. (2016). Your Child has Three Brains. Retrieved from <https://www.clinical-partners.co.uk/insights-and-news/family-issues/item/your-child-has-three-brains>

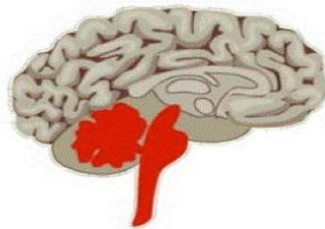
According to Rapaille & Roemer (2015), the effect of these three different structures should be known as an ideal marketing technique. Renvoisé & Morin (2011) state that the new brain that thinks about the neocortex functions analytical data senses the limbic system, the senses, and the innermost like the sixth sense in their book "Pushing the Purchase Button in Your Neuromarketing Customer's Brain." The midbrain

that functions with the senses, the R-Cortex, is the old brain that makes the major decision by considering the data from the other two brains.

2.3.2.1. Reptile brain/Old brain/R-cortex.

Figure 14

Reptile Brain



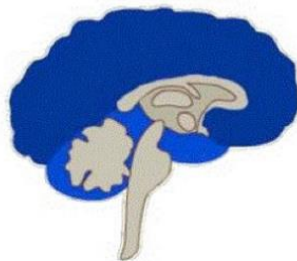
Note. Bilimfili. (2016). Beynimizi Özel Yapan Nedir? Retrieved from <https://bilimfili.com/beynimizi-ozel-yapan-nedir>

The reptilian brain is located in the brain stem and midbrain. It is responsible for unconscious behavior such as breathing, heartbeat, and animal impulses. It is thought that the desire to survive and pass on to the next generation is related to this region.

2.3.2.2. Rational brain/ New brain/ Neocortex.

Figure 15

Rational Brain



Note. Bilimfili. (2016). Beynimizi Özel Yapan Nedir? Retrieved from <https://bilimfili.com/beynimizi-ozel-yapan-nedir>

The rational brain is in charge of coordinating activities in the brain's outer regions. Sharing information between cells and making informed decisions is the remaining area. In addition, it has functions such as getting the most out of all incoming information. On the contrary, thinking is slower in this part of the brain. It is the center where high-level cognitive activities are managed, distinguishing human beings from other living things. It is the part where decisions are made, experiences are kept, the conversation takes place, and the feeling of having fun occurs. The senses are stored in the lobes of the neocortex, and speech, hearing, sight, and touch are recorded in separate sections (Özden, 2005). Both of our brain hemispheres have four lobes; frontal lobe, parietal lobe, occipital lobe, and temporal lobe.

2.3.2.2.1. Frontal lobe.

Figure 16

Frontal Lobe



Note. Noroblog. (2020). Beyin Lobları: Beynimizde kaç lob var, beyin lobları ne işe yarar? Retrieved from <https://noroblog.net/2020/02/01/beyin-loblari-beynimizde-kac-lob-var-beyin-loblari-ne-ise-yarar/>

The frontal lobes are located in the anterior region of the head and cover approximately one-third of the cerebral hemispheres. There are two functional centers in

the frontal lobe, also known as the motor lobe. The first controls voluntary movements, including speech-related movements, while the second center is unorganized and concerned with emotional expressions and moral and ethical behavior.

The frontal lobe is also related to systematic, high-level consciousness, such as setting a goal, creating a behavior style, and processing feedback (Korkmaz & Mahiroglu, 2007). In the frontal lobes, they are responsible for cognitive functions such as creativity, problem-solving, decision making, planning, execution, cascading thinking, sequencing, judgment, strategy changing, behavioral flexibility, will, insight, visualization, predicting the likely distant outcome of events, and working memory (Plotnik et al., 2009). In addition, the frontal lobe is the thinking center of moral judgments and provides the regulation of behaviors related to goal-oriented action and leadership characteristics that require social responsibility. In other words, the frontal lobe is the brain region responsible for most of the features that make us human (Yener, 2002). The frontal lobe is the brain region responsible for executive functions that allow behavior to be developed purposefully. Administrative functions include making people plan, acting according to the plan, making analogies, and enabling them to obey rules, solve problems, and adapt to changing conditions. In the literature, frontal lobe functions and executive functions are interchangeable (Göka et al., 2009).

The frontal lobes also play a vital role in memory functions. The control and direction of the information stored in the memory are carried out through the frontal lobes. In other words, processes related to strategic control and orientation of memory functions such as proper coding of information, production of necessary clues for

retrieval, checking of the appropriateness of responses, suppression of inappropriate responses, and temporal and spatial ordering of information are carried out by frontal regions (Gündoğar & Demirci, 2007).

In summary, it can be said that the frontal lobe is the brain region responsible for the formation of personality and character, planning, decision-making, motivation, and abstract thinking. As a result of frontal lobe damage, a negative change in personality and behavior is seen in individuals whose previous behaviors were normal.

The relationship between the frontal lobes and character traits were revealed in the famous Phineas Gage case, or Boston Crowbar Case (Göka et al., 2009). In 1848, a railroad foreman named Phineas Gage worked blasting rocks in the USA. First, he drilled the rocks to be detonated, then he pushed the dynamite inside with the iron rod in his hand, and then detonated the dynamite. One day, while he was pressing the dynamite with the compression rod again, the dynamite exploded due to an accident; a 6.5 kg iron rod flew out and pierced the left side of the unfortunate worker. At this time, his frontal region was severely damaged. Fortunately, however, Gage survived. Only his left eye was blind. He touched, heard, saw, used his hands skillfully as before, and walked. There were no noticeable disruptions in speaking and language skills. However, as time went on, the people around him noticed that Phineas Gage had noticeably changed his personality. Gage, who had been responsible, decent, moderate, energetic, hardworking, and resourceful before the accident, turned into a different person after the accident. He had become vulgar, devoid of moral value judgments, abusive, intolerant when his wishes were hindered, had no coherent plans for the future, did not listen to any advice,

and could not make a reasonable decision on any issue. He was fired from his job when there was no trace of his former productivity at work (Smith, 1993). Although Gage's abilities such as attention, perception, memory, language, and intelligence did not deteriorate after the accident, problems began to occur in his character and social life. In particular, it concluded that the prefrontal cortex is related to the ability to plan the future, act according to the social rules that one has learned, and make and implement decisions that will ultimately benefit the person's survival (Savrun, 2005). In summary, Gage's case revealed that the brain's frontal lobe plays a critical role in forming personality and the formation of different mental activities (Azara, 2005).

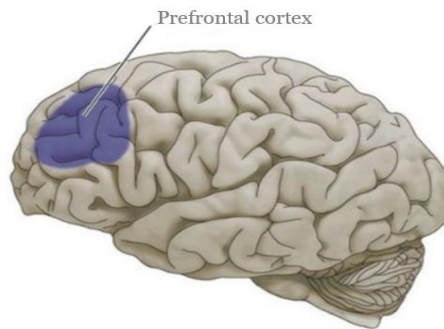
In addition, frontal structural abnormalities were observed in notorious killers' magnetic resonance imaging techniques. Many publications on frontal hypofunction and performance impairment in frontal system tasks in neuropsychological tests. Moreover, brain damage thought to be due to beatings in childhood was found in MRI techniques of many criminals who brutally murdered people and disorders such as neuronal hyperexcitability and disruption in their EEGs. At the same time, chronic alcohol drinkers have been found to have frontal dysfunction (Ziylan & Murshid, 2000).

The frontal lobe is functionally composed of the motor cortex, the prefrontal cortex, and the premotor cortex. The posterior part of the frontal cortex is composed of the motor cortex and the premotor cortex, which occur movements. These sections are responsible for motor control. On the other hand, the front parts of the brain, called the prefrontal cortex, play an important role in maturing thoughts and regulating personality and behavior (McGee, 2004).

2.3.2.2.1.1. Prefrontal cortex.

Figure 17

Prefrontal Cortex



Note. Quora. (n.d.). Neuroanatomy: What are the primary functions of the dorsolateral prefrontal cortex? Retrieved May 17, 2022, from <https://www.quora.com/Neuroanatomy-What-are-the-primary-functions-of-the-dorsolateral-prefrontal-cortex>

The prefrontal cortex contains centers that play a vital role in an individual's personality and behavior. Prefrontal areas have many different cognitive functions, such as maintaining attention, recognizing written words, working memory, semantic memory, short-term memory, planning, and controlling. It is also effective in controlling emotions and the ability to speak. The prefrontal cortex contains the most recently developed structures in human evolution and is therefore responsible for higher managerial functions. It is not involved in sensory and motor functions. Our actions have functions, such as realizing them for specific purposes, reasoning abstractly, and coordinating attention and cognition (Cozolino, 2014). It is thought that the prefrontal cortex is the center where functions such as various emotional changes, courtesy, moral and ceremonial behaviors, logical thinking, foresight, mature interpretation, decision making, and problem-solving are managed (Yıldırım, 2007). The prefrontal cortex receives signals from the brain stem and takes over executive functions. It effectively exhibits

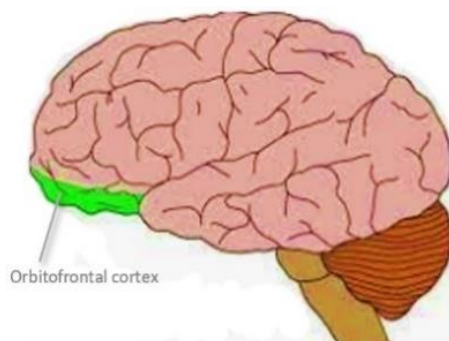
behavior by considering future possibilities. It maintains attention, planning the future, abstract thinking, being flexible, and stopping inappropriate responses.

The prefrontal cortex development, which plays a role in analyzing incoming stimuli and transforming them into a healthy behavior, continued until the 20s. People's brand loyalty and purchasing sickness are related to the incomplete development of this region (Uzbay, 2014). The Pepsi and Coca-Cola taste tests were repeated using neuromarketing techniques. In the research, when the subjects tasted these products without seeing the brand name, they liked the taste of Pepsi; when they saw the brand name, they said that they liked the taste of Coca-Cola. When the brain images of the subjects were examined with the fMRI device, when the subjects tasted the product without knowing the brand name, a revival occurred in the anterior putamen region of their brains. Knowing the brand names, the prefrontal cortex was activated when they tasted the product. This research has proven a link between the brain and the brand (Lindstrom, 2010).

2.3.2.2.1.1.1. Orbitofrontal cortex.

Figure 18

Orbitofrontal Cortex



Note. Orbitofrontal Korteks nedir? Nasıl işler? Savaşçı geni nasıl ortaya çıkar? [What is the Orbitofrontal Cortex? How does it work? How does the warrior gene arise?] (2021, September 6). *Alanya*. <https://www.yenialanya.com/haber/7755338/orbitofrontal-korteks-nedir-nasil-isler-savas-ci-geni-nasil-ortaya-cikar>

The orbitofrontal cortex is the smallest part of the frontal lobe in the brain and is a region of the prefrontal cortex (Netinbag, 2020). This region involves sensory integration, representation of emotional values, decision-making processes, and expectations. It is in close communication with the limbic system, especially with the amygdala. This region also facilitates empathy, as the orbitofrontal cortex evokes emotions and bodily states elicited by hypothetical activities. This region allows individuals to experience emotions that someone else would feel in a particular environment. This empathy can facilitate social behavior.

On the other hand, the orbitofrontal cortex regulates impulses and emotions in inappropriate behaviors due to the destruction of this region (Üngüren, 2015). It communicates with the amygdala. Thanks to this field, a person can predict whether a behavior will be positive in the future. Suppose things do not work out as predicted. In that case, the orbitofrontal cortex develops the capacity to adapt to these conditions to not experience the same emotional state in the face of similar situations. In a study conducted at Stanford University, 20 subjects were asked to taste wines at different prices. The subjects do not know that these wines, which differ in price, are the same. Looking at the brain images, it was seen that the expensive wine caused activation in the orbitofrontal cortices of the subjects, which is related to the perception of pleasure. From this research, it was concluded that having a high-priced product increases the feeling of enjoyment.

When people see a high price, their expectations for that product rise, this causes activation in the orbitofrontal region, making assumptions about the future (Lindstrom, 2010).

2.3.2.2.2. *Parietal lobe.*

Figure 19

Parietal Lobe



Note. Noroblog. (2020). Beyin Lobları: Beynimizde kaç lob var, beyin lobları ne işe yarar? Retrieved from <https://noroblog.net/2020/02/01/beyin-loblari-beynimizde-kac-lob-var-beyin-loblari-ne-ise-yarar/>

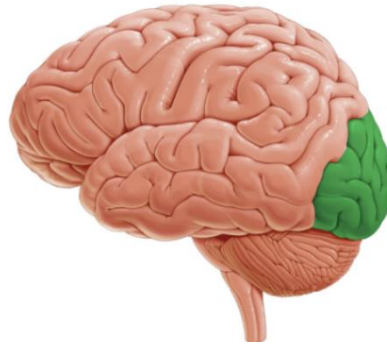
The parietal lobe is separated from the frontal lobe by a deep cleft. This lobe, located in the middle of the brain, behind the frontal lobe, is the sensory center. It perceives the sensations of heat, cold, pressure, touch, taste, and general movement of the body (Smith, 1993). In addition, this part of the brain perceives stimuli from limbs and organs. For example, sensations such as pain and discomfort are felt here. Parietal lobe lesions are seen in parietal lobe lesions, language and speech difficulties in understanding and expressing spoken words, apraxia, dysphasia, and intellectual destruction. The parietal lobe evaluates general senses and senses of taste. It includes the general sense, basic sense, secondary sense, and sensory association centers. The skin and deep sensory impulses are carried to the primary sensory center, and the secondary sensory center is

accepted as the center where the pain is perceived. The sensory association center performs the memory, analysis, and integration of different sensory modalities. As the name of the taste center suggests, the stimuli coming from our language are interpreted here as bitter, sweet, and sour (Yıldırım, 2007).

2.3.2.2.3. Occipital lobe.

Figure 20

Occipital Lobe



Note. Noroblog. (2020). Beyin Lobları: Beynimizde kaç lob var, beyin lobları ne işe yarar? Retrieved from <https://noroblog.net/2020/02/01/beyin-loblari-beynimizde-kac-lob-var-beyin-loblari-ne-ise-yarar/>

The occipital lobe has visual centers and occipital eye movement centers. The basic or primary visual center related to seeing an object is keeping it in memory and recognizing it. The center of the occipital eye movements is related to reflexes and following an object (Yıldırım, 2007). The Occipital Lobe, this lobe at the back of the brain, is connected with the sense of sight. A small wound on the back of the head can often lead to complete blindness (Smith, 1993). Destructions in the brain, both due to experiments and accidents, revealed that the occipital lobe is related to vision. The patient, whose occipital lobe was stimulated during brain surgery, saw the light or had

some perceptions of vision. People with damaged occipital lobe have experienced significant vision loss and hallucinations in chaotic geometric products and lights.

2.3.2.2.4. *Temporal lobe.*

Figure 21

Temporal Lobe



Note. Noroblog. (2020). Beyin Lobları: Beynimizde kaç lob var, beyin lobları ne işe yarar? Retrieved from <https://noroblog.net/2020/02/01/beyin-loblari-beynimizde-kac-lob-var-beyin-loblari-ne-ise-yarar/>

The temporal lobe provides speech, comprehension, processing, medium and long-term memory, the formation of language and words, emotional balance, and the storage and processing of heard and seen data. Understanding what is spoken, perceiving, interpreting the emotionality, interpreting and storing what is read, and new information takes place in the temporal lobe. When there is impaired functioning of this region, inability to find appropriate words, inability to communicate, and reading difficulties occur. At the same time, problems in the operation of the temporal region can cause memory disorders (Johnson, 2020). The state of success in one's life causes the memory to be processed and changed repeatedly. If the temporal lobe is problematic, the information in the memory cannot be refreshed; it remains constant. This situation causes the person to be fixed-minded.

The person's temporal lobe has decided on an event or a person. Even if the later information indicates that the event or person has changed since this information cannot be processed, our old opinion will be permanent. We will make our decision accordingly. Studies have reported that people whose right temporal lobe has been damaged have a rigid and unchanging worldview. In other words, social relations are significantly impaired by temporal lobe problems. The temporal lobe fulfills a certain degree of emotional, memory, and speech functions, especially hearing and balance.

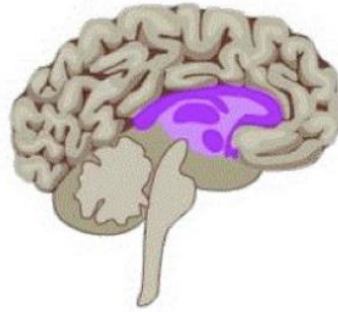
The temporal lobe outside the auditory center is called the "psychic cortex," related to our spiritual world, behavior, and memory functions. It is closely related to the limbic system. It is accepted that it is related to visceral activity, emotions, behaviors, and the storage of memory, records, and experiences (Yıldırım, 2007).

The right and left temporal lobes are located in the lower part of the brain, around and above the ears. This region is mainly responsible for hearing (hearing), memory, understanding, and language (Smith, 1993). It has been found that the right temporal region is particularly effective in perceiving music. For Parsons et al. (2005), they had a pianist play a Bach concerto blindfolded, and during this time, they took Positron Emission Tomography. They determined that the superior and middle temporal cortex were activated due to the research.

2.3.2.3. *Limbic brain/ Middle brain/ Limbic system.*

Figure 22

Limbic Brain



Note. Bilimfili. (2016). Beynimizi Özel Yapan Nedir? Retrieved from <https://bilimfili.com/beynimizi-ozel-yapan-nedir>

Limbic means border in Latin. French neurologist Paul Broca drew attention to the existence of a different group of cortical structures on the inner surface of the brain than the cortex that covers the outside of the brain. Broca called these structures the Limbic Lobe, which means ring or border in Latin, because they surround the brain stem. The most inner part of the temporal lobes is also known as the limbic system. This region was first associated with fear, but later, as the limbic system's functions were better understood, the term limbic system gained a meaning that encompasses all of the neuronal circuits that control emotional behaviors and motivations (Arıncı & Elhan, 2006). The Limbic Brain is the region responsible for receiving all sensations from the brain. These senses are vision, hearing, smell, taste, touch, temperature, proprioception, and electrical activity. Information is distributed to the required area according to the characteristics of the stimuli. Since the limbic system controls our senses and memory, we remember things more efficiently with which we have an emotional connection. When we feel good, our brain releases endorphins. This secreted endorphin facilitates the

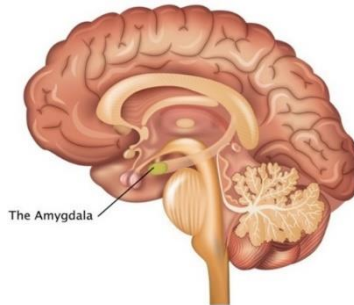
connection between neurons and provides more connections between neurons. If even a part of the limbic system is damaged, the desire to eat and drink, the feeling of restlessness and excitement, and the behavior and sexual desire managed by the autonomous system change.

Movements in defense vary. Memory and the olfactory system are affected (Arıncı & Elhan, 2006). The limbic system consists of the thalamus, hypothalamus, and amygdala. The limbic system is also called the emotional brain because it controls emotions (Çengelci, 2007). McLean defined the limbic system, which includes the hippocampus and amygdala, as the center of the senses. External stimuli are directed primarily at the hippocampus and amygdala. The hippocampus is associated with the medial temporal lobe memory system and evaluates external stimuli, the amygdala deals with the emotional dimension of these external stimuli. The amygdala, area septal, hypothalamus, epithalamus, and many thalamus nuclei and their connections form the limbic system (Arıncı & Elhan, 2006). The limbic system is associated with emotions and emotions (Öktem, 2006). In addition, the limbic system is an important brain region responsible for memory and mood changes and the control of involuntary behaviors such as sleep, attention, body functioning, hormones, sexuality, fear, and the production of many brain chemicals (Uzbay, 2014). In summary, the limbic system manages behaviors, exciting events, and behaviors necessary for the survival of the individual, mostly with instinct. In other words, the other lobes of the brain and the limbic system work together to regulate the purposeful behavior of the person according to the information coming from the inner and outer environment.

2.3.2.3.1. Amygdala.

Figure 23

Amygdala



Note. SoP. (2018). Amygdala. Retrieved from <https://www.thescienceofpsychotherapy.com/glossary/amygdala/>

The amygdala (corpus amygdaloideum) is an almond-shaped mass of interconnected structures located below the limbic ring, above the brain stem. The amygdala is so named because it means "almond" in Latin. The amygdala is located in the deep part of both the temporal lobes. In particular, it ensures that emotions such as aggression and fear are associated with certain environmental situations and control the person's behavior in different social situations (Arıkan et al., 2008).

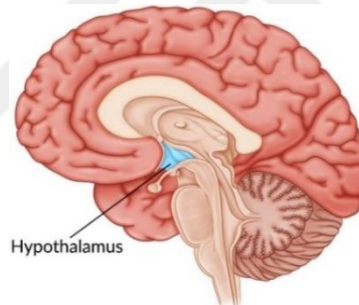
The amygdala is a region that plays an active role in establishing a connection between events and emotions and in the coding of emotional memory. In his experiments, LeDoux revealed that people whose amygdala has been removed experience an inability to evaluate the emotional meaning of events, and in a sense, they experience emotional blindness. It has been stated that all passions, fear, and sorrow are replaced by great silence and apathy in these people, and they even forget to cry (Yurdakoş, 2008). The amygdala, which is of great importance to the senses, plays a vital role in establishing a connection between the senses. The amygdala is "an important element of neural networks related to fear, attachment, early memories, and lifelong emotional experiences" (Cozolino, 2014).

There is a difference between the hippocampus and the amygdala, which are the main centers of the brain involved in remembering. While the hippocampus remembers dry facts, the amygdala tries to remember by establishing connections. For example, when a person encounters a person, whether he knows that person before or not, it is remembered through the hippocampus. In contrast, whether he likes or dislikes that person is determined by the amygdala. Because of the amygdala, we feel the same fear and anxiety when we relive a scary moment in the past (Cöngeloğlu, 2009).

2.3.2.3.2. *Hypothalamus.*

Figure 24

Hypothalamus



Note. Flint Rehab. (2021). Hypothalamus Brain Injury: Causes, Symptoms, and Treatment. Retrieved from <https://www.flintrehab.com/hypothalamus-brain-injury/>

The hypothalamus is the size of a small sugar cube and is located between the thalamus and the pituitary gland. The hypothalamus carries out the connection between the nervous system and the hormonal system. It governs instinctive behaviors such as body temperature, hunger, thirst, maternal behaviors, childbirth and lactation, sleep, and sexuality (Wolfe, 2001). The hypothalamus is very small compared to other brain parts with its four-gram structure, but it has many functions. It integrates the autonomic system and the endocrine system. Controlling it ensures that the events in our body against our will occur in a balanced way and control our organs' regular functioning. The

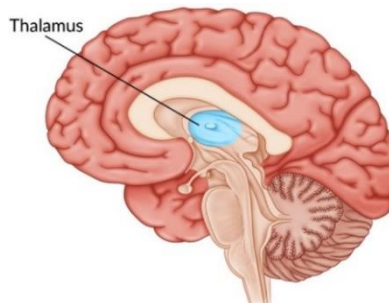
hypothalamus is a higher center that controls the lower centers of the autonomic system in the brain stem and spinal cord.

Thanks to some hormones it secretes, it ensures the secretion of other hormones. It lowers body temperature by expanding peripheral vessels and promoting sweating, and it raises body temperature by narrowing vessels and stopping sweating. The center provides the beginning and end of hunger and satiety. The formation, degree, and control of our feelings, emotions, excitement, and behaviors are determined by the hypothalamus, the limbic system, and the anterior part of the frontal cortex. Although sleep and wakefulness occur with the activating effect of the thalamus, limbic system, and rectal system, these are controlled by the hypothalamus (Arıncı & Elhan, 2006). Briefly, the hypothalamus can be compared to the body's thermostat. In addition, the hypothalamus is central to the hormonal control of behavior. Therefore, it contains many neurochemical substances (Yurdakoş, 2008). A minor injury to the hypothalamus or the presence of a tumor nearby results in a loss of the body's ability to self-control (Smith, 1993).

2.3.2.3.3. *Thalamus.*

Figure 25

Thalamus



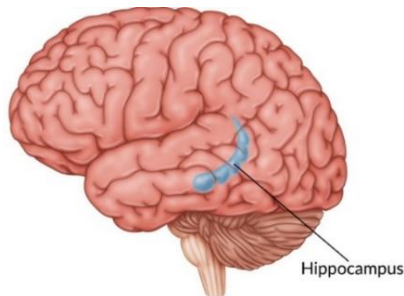
Note. Flint Rehab. (2021). Damage to the Thalamus: Understanding the Side Effects and Recovery Process. Retrieved from <https://www.flintrehab.com/thalamus-damage/>

The thalamus acts on our motor functions, sense of sensation such as depression or moral feelings, and hypothalamus. It takes part in speech and memory events. It reveals our personality by providing our sensitivity to events. It adjusts the rate of our perception of sensations and events coming from the brain stem and creates the attitude that we will take against our will, especially in the face of pain. Its connection with the corpus striatum also aids in movement control (Arıncı & Elhan, 2006). The thalamus is where all the senses' emotions are gathered, except for the smell. In other words, the thalamus played an essential role in classifying the senses. Information from different parts of the body is evaluated in the thalamus and sent to the relevant areas in the cerebral cortex. In the thalamus, which works in cooperation with other brain parts, pain, warmth, sweetness, beautiful, bad, ugly, etc., senses are defined and classified (Tokcan, 2007). In short, the thalamus is an essential center for receiving and distributing sensory input (Kılıçoğlu, 2007).

2.3.2.3.4. *Hippocampus.*

Figure 26

Hippocampus



Note. Flint Rehab. (2020). Understanding Hippocampus Damage: Functions, Side Effects, and Recovery. Retrieved from <https://www.flintrehab.com/hippocampus-brain-injury/>

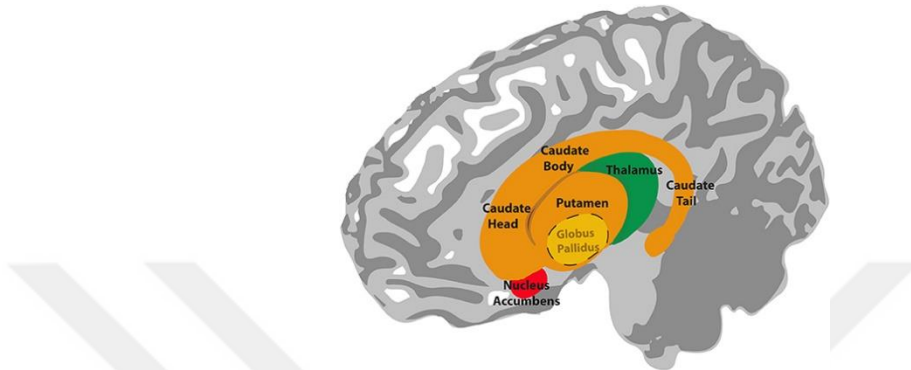
Since the hippocampus resembles a sea horse in shape, it was named the hippocampus, which means sea horse in Greek (Songur et al., 2001). The hippocampus is a structure approximately 4 cm long, extending from front to back in an arc on the inner surface of the temporal lobe (Arikan et al., 2008). The hippocampus is located in the center of the temporal lobe and is responsible for memory and learning (Kılıçoğlu, 2007).

Almost any sensory stimulus such as sight, hearing, smell, touch, visceral senses, etc., activates the hippocampus. In addition, the hippocampus also sends signals to the ventral thalamus, hypothalamus, and other parts of the limbic system. Thus, the hippocampus, which affects the limbic system before the movements turn into behavior, shapes the behaviors. It has been stated that the hippocampus is the center related to memory. In particular, the hippocampus is known to be involved in short-term memory. Short-term memory refers to the capacity to store new information. Therefore, regardless of the mechanism, it is not possible for long-term verbal or symbolic memories to be permanent without the right and left hippocampus. On the other hand, the right hippocampus shows more activity in the functions related to visual memory and the left hippocampus in verbal memory functions, and the related memory loss develops in the lesions of these regions (Songur et al., 2001).

2.3.2.4. Extra brain areas.

Figure 27

Accumbens, Putamen and Caudate



Note. Lim, S. J., Fiez, J. A., & Holt, L. L. (2014). How may the basal ganglia contribute to auditory categorization and speech perception?. *Frontiers in neuroscience*, 8, 230.

Addressing the general framework of the relevant brain areas in neuromarketing research will help understand the subject. The brain areas mentioned in Lindstrom's *Buyology* book, which monitors the brain images of approximately two thousand people and Oxford University researchers (Hammou et al., 2013), are as follows: nucleus accumbens, putamen, caudate nucleus, and insula region (Lindstrom, 2010).

2.3.2.4.1. Nucleus accumbens.

The nucleus accumbens, known as the pleasure center, plays a role in the cognitive processing of motives. It acts as a functional interface between the limbic and motor systems (Wacker et al., 2009). The ventral striatum and ventral tegmental area are linked to pleasure, reward, and desire. It is the brain region that comes to life when complimented. Neurons in the ventral tegmental area affect neuronal activity in the nucleus accumbens. The brain's reward system works through nerve fibers to the frontal

cortex via the ventral tegmental area and contains dopamine. For example, purchasing a favorite product triggers the secretion of dopamine (Uzbay, 2014). Dopamine is secreted from the nucleus accumbens, and this secretion activates the surrounding neurons, enabling the brain to remember events (Hung et al., 2017). In addition, dopamine mediates the rewarding effects of natural stimuli such as food, water, and sex (Salamone et al., 1997).

2.3.2.4.2. *Putamen.*

The putamen is a round structure located at the base of the forebrain. Putamen in Latin means shell. The putamen and caudate nucleus together form the dorsal striatum. The caudate nucleus and putamen contain the same neurons and circuits. Many neuroanatomists even view the dorsal striatum as a single structure divided by the inner capsule into two parts putamen and caudate nucleus. It is also one of the structures that make up the basal nuclei. The putamen is the outer part of the basal ganglia. The basal ganglia are associated with general domain functions essential for motor control, cognition, emotion, learning, and language support in mammals. The primary function of the putamen is to regulate movements in various stages, such as preparation and execution stages, and to influence various types of learning. It also plays a role in degenerative neurological disorders such as Parkinson's disease (Wang et al., 2018).

2.3.2.4.3. *Caudate nucleus.*

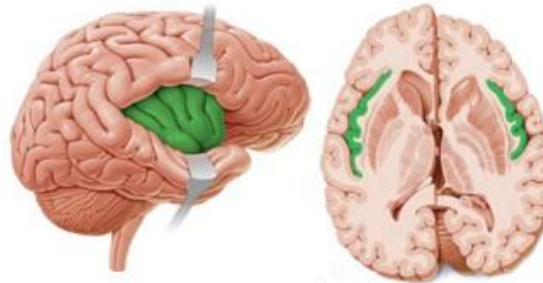
The caudate nucleus, like the putamen, is one of the basic neuronal circuits of the basal ganglia. Basal ganglia play a role in the subconscious, automatic execution of learned movements such as writing, speaking, and driving. Voluntary motor action first

appears as a thought. The caudate nucleus plans this movement and gives the command to move. Thus, thought turns into automatic motor action. For example, it automatically starts running when a predator is encountered to transmit the fear stimulus perceived by the sensory cortex to the caudate to give an order for movement (Kale, 2012). In 2006, at the University of Montreal, Canada, Dr. Mario Beauregard and Dr. Vincent Paquette researched which regions of the brain activity were in response to religious emotions such as prayer. At such moments, neuronal activity in the brain's caudate nucleus and the movement nucleus in the Insula has been detected (Lindstrom, 2010).

2.3.2.4.4. *Insula region.*

Figure 28

Insula Region



Note. Noroblog. (2020). Beyin Lobları: Beynimizde kaç lob var, beyin lobları ne işe yarar? Retrieved from <https://noroblog.net/2020/02/01/beyin-loblari-beynimizde-kac-lob-var-beyin-loblari-ne-ise-yarar/>

The Insula Region is about inner experiences connected to all limbic structures. It mediates all emotions. It is activated during the recall of emotional memories and in creative works involving images (Cozolino, 2014).

2.3.3. Neurotransmitters.

Billions of neurons in the brain are in constant communication with each other and with distant neurons. All kinds of simple or complex behaviors occur with a group of neurons located in different brain parts. Communication between neurons is essential for the brain to function. Neurotransmitters are chemical secretions that enable communication between neurons. In short, neurons communicate by utilizing neurotransmitters and cause the person to behave in specific ways in communication. So far, around 100 chemicals that function as neurotransmitters have been identified. This section will discuss the most researched and frequently found in the central nervous system, neurotransmitters buying like dopamine, serotonin, norepinephrine, etc., and the effects of these transmitters on personality and behavior.

2.3.3.1. Dopamine.

Dopamine is a naturally produced neurotransmitter in the body. Dopamine's job as a neurotransmitter is to transfer information to the brain from one nerve cell to another. Dopamine plays a physiologically important role in attention, addiction, reward-seeking, regulating behaviors, and hormonal regulation. The most effective neurotransmitter in the brain's reward system is dopamine. In other words, dopamine is mainly associated with the sense of pleasure in the brain's reward system (Uzbay, 2014). As long as any object or activity triggers dopamine secretion, the person enjoys these objects or activities that release dopamine. For example, a good meal, a conversation with friends in the evening, and entering a warm house in cold weather all-cause dopamine to be released in the brain during the moment. If an activity causes dopamine to be released in the person's brain, the person feels pleasure and wants to repeat this activity as long as he enjoys it. Of

course, not every event is enjoyed the same way, and some stimulants provide more pleasure to the user. In such cases, the cells that release dopamine in the person's brain work harder. Unfortunately, the person is unaware of whether the dopamine stimulant is beneficial or harmful. The only task of dopamine is to provide pleasure (Sayar, 2010).

Therefore, dopamine is also called the pleasure molecule or the anti-stress molecule. When dopamine is released into the synaptic space, it can cause a decrease in the feeling of stress and a more comfortable feeling by stimulating many dopaminergic receptors (Öztürk et al., 2007). In a study conducted by Vanderbilt University in the USA, it was determined that the dopamine hormone, which gives a feeling of joy and pleasure, is secreted differently in people who take the highest risk. Usually, dopamine cells have autoreceptors that prevent excessive hormone secretion and reduce hormone production. Research has concluded that people at risk of danger, seeking excitement, and spending money comfortably has fewer autoreceptors. For example, reckless behavior such as reckless spending, impulsiveness, and risk-taking has been associated with low levels of autoreceptors. Studies have shown that apart from substance abuse such as alcohol and cigarettes, gambling, shopping, and technology addiction are also directly related to dopamine secretion.

2.3.3.2. Serotonin.

Serotonin is effective in the regulation of different mood states, including mood, anxiety, thought, orientation, appetite, anger, impulse control, and sexual activity, by controlling the neurotransmitter secretion of other systems, and changes in its production and metabolism are associated with the emergence of many different behaviors (Yazıcı & Yazıcı, 2010). At the same time, serotonin plays a restraining role in internalized anger

control and prevents people from directing their anger towards themselves (Uğur, 2008). Serotonin is a neurotransmitter that has been associated with symptoms of depression. Serotonin regulates sleep, mood, cravings, and appetite. Low serotonin levels can lead to irritable, restless, and depressed moods. One of the ways to increase the amount of serotonin in the body is to eat foods rich in sugar and carbohydrates.

2.3.3.3. Norepinephrine (NE-noradrenaline).

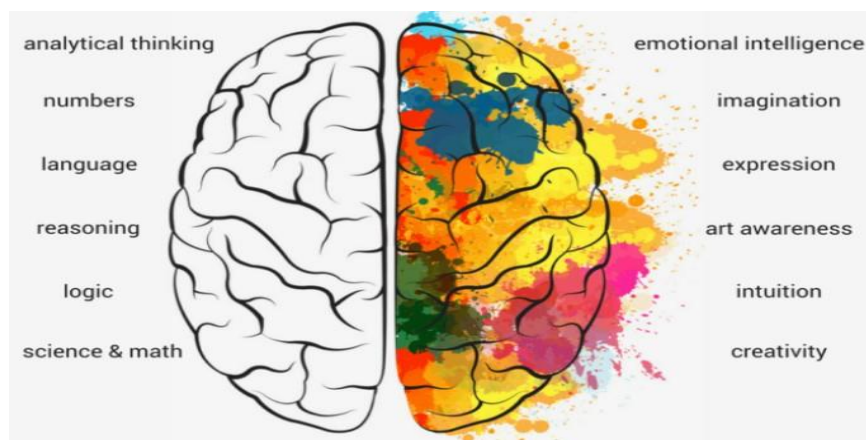
The brain's center is where most noradrenergic neurons, or norepinephrine-carrying cells, are located and perform behavior, mood, emotions, and movements. The noradrenergic system regulates mood, blood pressure, and heart rate. Increased noradrenergic activity is associated with anxiety, mania, hypervigilance, and stimulation of the brain reward system. In addition, it has been observed that excessive secretion of the noradrenergic system is effective in the emergence of mood and anxiety disorders and some symptoms of schizophrenia (Uzbay, 2014).

2.3.4. Brain models.

2.3.4.1. Split-brain model.

Figure 29

Split-Brain Model



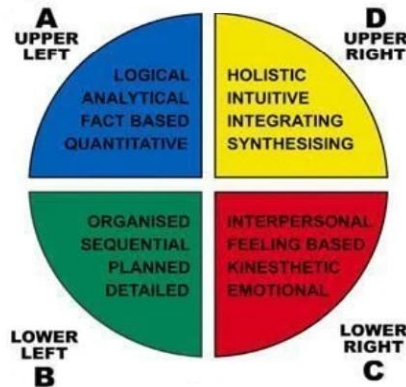
Note. Canna Daily. (n.d.). Cannabis and the right brain hemisphere. Retrieved May 17, 2022, from <https://cannadaily.news/cannabis-and-the-right-brain-hemisphere/>

Among the models that describe the brain's functioning, perhaps the most well-known is the split-brain model (Schechter, 2009). In 1860, French scientist Paul Broca stated that speech disorders occur when a particular left-brain area is damaged. He discovered that speech remains intact when the same area in the right brain is damaged. Studies at the California Institute of Technology have revealed the existence of independent learning and memory functions in separate hemispheres of the human brain (LeCompte & Rush, 1981). Although this model initially suggests that the left half of our brain controls the right side of our body and the right half of our body controls the left side of our body, as research progresses, this approach shows that the left half of our brain represents the logical side of the brain, arithmetic operations, language development, writing, organizing ideas, verbal executing logical and analytical functions. It has been revealed that the right hemisphere, which represents the design and creativity aspect of our brain, is related to the perception of imagination, color, music, rhythm, shapes, and schemes, using intuition, dealing with uncertainties, processing random and open-ended ideas, executing visual-spatial operations, and our emotions (Yorgancılar, 2015). The cerebrum is divided into two separate hemispheres, right and left, by a deep cleft. The corpus callosum provides communication between these hemispheres. The only task of the corpus callosum is to connect the right and left hemispheres and coordinate the functions of these hemispheres (Waxman, 2003). To summarize, it is a well-known fact that the left and right hemispheres of the brain use different strategies while receiving different types of information in different ways.

2.3.4.2. Herrmann's whole brain model.

Figure 30

Herrmann's Whole Brain Model



Note. Alchetron. (2021). Ned Herrmann. Retrieved from <https://alchetron.com/Ned-Herrmann#ned-Herrmann#ned-herrmann-71da9a4d-fd03-454e-8aab-328c63fbd48-resize-750.jpg>

Ned Herrmann divided the brain into four quadrants (Hughes et al., 2017). These four quadrants represent four mindsets, and each region has very different cognitive functions. These are called dominant regions (Kirstein & Kunz, 2016). These metaphorical sections are based on the cerebral, or upper, and limbic, or lower, parts of the human brain (Hughes et al., 2017); the upper left quadrant region is symbolized by the letter "A", the lower left quarter region "B", the lower right quarter region "C", The upper right quarter region "D." A quarter zone: this region, also known as the blue region, represents cerebral processing (Kirstein & Kunz, 2016). The blue zone is logical and realistic. It carries out analytical thinking, analysis of facts, and processing numbers. This B quarter zone also called the green zone represents organized and detailed thinking and learning; it deals with planning approaches and organizes facts. It is also known as the "red zone," representing emotional and passionate approaches. It represents personalized,

interpersonal, expressive, and emotion-based thinking and learning. This region, also called the yellow region, represents visual, creative, holistic, conceptual, and future-oriented thinking and learning (Kirstein & Kunz, 2016).

2.4. Neuromarketing and Purchasing Behaviors

Neuromarketing focuses on developing marketing methods by examining the neural mechanisms in the brain. In other words, neuromarketing tries to understand how consumers make their purchasing decisions in real-life conditions rather than what basis they make them. Consumer behavior is a science that studies why and how a good or service is consumed (Chaudhuri, 2006). At the same time, consumer behavior is a process of consumers' decisions about which goods and services to buy and where, when, how, and from whom they will buy them (Walters, 1974).

Consumers' purchasing behavior is affected by personal, social, economic, and psychological factors (Derakhshi, 2017). Personal factors: age, gender, occupation, education level, marital status, income level, personal taste, role-playing, physical activity, and sensuality. Social factors include bargaining pleasure, status and authority, social experiences, peer group activities, communicating with others, and culture. (Tauber, 1972). Psychological factors are needs and motives, perception, learning, beliefs and attitudes, personality, and lifestyle (Derakhshi, 2017).

The situation and changes in the minds of consumers, the first effect and level of attention, the level of recall of a message, the degree of appreciation and interest in a given stimulus, and the quality of the emotions it evokes can be measured by neuromarketing. Scientific studies on human behavior reveal that emotions are also effective in human behavior and the mind (Bayassova & Kazan, 2016). Variables such as

consumers' emotional, self-affirmation, trust in the brand, brand awareness, discounts, and motivation affect the amount paid for a product or service and shape purchasing behavior.

Companies increase their brand awareness by instilling confidence in their brands by believing that some companies will fall into unhealthy and bad situations if they do not buy their products (Lindstrom, 2010). Trust is a command gaining importance in marketing in recent years. Trust given by the brand, which plays an important role in customer loyalty, is an emotional element. Its impact on health and the environment can be given as an example. In this context, it is thought that using neuromarketing and neuroscientific methods can provide important insights into the nature and development of trust (Lee et al., 2007).

The persuasive use of both positive emotions such as love and negative emotions such as sadness, which is an important part of creating a consumer experience, has been studied with increasing interest in the literature (Panda et al., 2013). Neuromarketing is a field that examines the "unreasonable" and "irrational" decisions of the consumer while criticizing their purchase decisions. These are irrational and emotional decisions made according to the stimuli perceived by our impulsive and five sense organs (Yücel & Çubuk, 2014). Many studies in the advertising and marketing industry show that people make their purchasing decisions emotionally, not rationally. In addition, the purchase decision is made very quickly.

The more options a person has in front of them, the harder it will be to decide. When we look at it from the seller's point of view, the fact that there are many options available to the buyer will perhaps cause the sale not to occur. In such cases, the

consumer will make his decisions intuitively rather than by design. Instinctive buying is an unexpected and irrational purchasing behavior involving consumers' emotional reactions to stimuli such as products, packages, and sales presentations (Gülmez & Dörtyol, 2009). Instinctive buying, which consumers see as a way to get rid of daily worries, is defined as an uncontrolled way of spending that develops in response to the negative mood of the consumer. Companies that know their customers' instinctive buying behavior can increase sales if the relevant mood is strategically used in in-store sales and promotions (Shoham & Brencic, 2003).

Moreover, how the shelf arrangement of Neuromarketing product placement should be made. Solutions to questions such as which products attract consumers' attention are being sought. People often feel it before they know it. It is important to activate the sensory centers in the brain by influencing the consumers' feelings to affect their behavior. Suppose the decoration that welcomes the customer upon entering a store, the music that comes to his ears, the scent accompanying this music, and the environment's lighting envelop the customer and create pleasant and positive emotions. In that case, this situation will positively affect the customer's behavior in the direction of purchase. While conducting neuromarketing activity, it is important to consider the external environment and create an environment that will attract customers, as in the example (Şimşek, 2016).

When it comes to consumer behavior, neuromarketing, which is used to determine the level of attention, emotional commitment/strain, and memorability of the consumer, is used to determine where the consumer focuses, what he is afraid of, what he likes, and what he does not (Yücel & Coşkun, 2017). For manufacturers and marketing managers

who want to sell their goods and services to their consumers for a lifetime, analyzing the purchasing behaviors of consumers and learning which products and brands they buy when, where, and how is a vital task.

For years, marketers have been trying to understand how consumers make their purchasing decisions. Although marketers have conducted studies through focus groups and surveys, they have not uncovered the emotional motives behind the decision. Despite understanding the value of science in revealing motives, they have not developed an effective model to predict consumer behavior. Because most of our thoughts arise unconsciously, classical research methods overlook the variables influencing consumer behavior (Özdoğan et al., 2008). Some of the subjects participating in research using classical research methods either hide their original thoughts because they are ashamed, do not tell or lie, or give the answers that the researcher wants to hear. Most of the market research or consumer research done does not give the right results, and a handful of money is wasted on the conduct of these studies (Walton, 2004). The most important advantage of neuromarketing research over the traditional survey and focus group interview methods is that it eliminates the difference between the verbal response of the consumer and what he thinks (Ural, 2008).

Neuromarketing assumes that directly measuring a brain response allows for slightly more accurate and pure data from observation (Wolpe, 2019). What is expected from neuromarketing studies is to reveal the underlying causes of consumer behavior (Ustaahmetoğlu, 2015). Traditional research methods may not be able to reveal what the participants think in cases where they hide the truth or cannot express it due to neighborhood pressure, fear of being shamed, a tendency not to go beyond the general

public, or not being able to describe what they feel completely and accurately. It should not be understood that neuromarketing will completely replace traditional methods by eliminating them. Traditional research and big data analysis will be used in many subjects, such as demographic information, shopping habits, products, media, the internet, and technology usage frequencies.

Neuromarketing seeks to explore the neurological basis of purchasing behavior. Neuroscience contributes to the prediction of behavior. The behavior that may occur with the electrification occurs in the relevant region of the brain before the decision is predicted (Plassmann et al., 2015). The main task of neuroscience here is to illuminate the unknown dark area in the consumer's mind and predict consumer behavior (Plassmann et al., 2015). Neuroscientific techniques try to find the "buy" button in the consumer's brain. If this is possible, it will bring us closer to understanding the black box in the consumer's brain (Fugate, 2007).

Neuromarketing should not be thought of as pushing the purchase button in the consumer's mind; rather, neuromarketing describes the way to this button (Yücel & Çubuk, 2014). Here, this magnificent ability, obtained thanks to the techniques used in neuromarketing, provides marketers with a new tool that shows how the black box in the brain processes images and messages and how decisions are reached (Miller, 2006).

The benefits of using neuroscience in marketing and consumer behavior are as follows. Consumer decision-making and simultaneous measurement of brain waves are ensured. It provides the opportunity to test existing right-brain and left-brain theories to determine whether appropriate results are obtained. It allows the consumer to be measured more objectively (Hubert & Kenning, 2008). Two important points are

emphasized in using neuroscientific techniques to understand and analyze consumer buying behavior. First, the definition moves neuromarketing away from businesses' understanding of neuroscientific techniques as a tool to generate more profit. Secondly, it does not limit the field of neuromarketing research to consumer behavior but expands it to other disciplines (Lee et al., 2007). While some researchers support each other with their theories, some can put forward the opposite thesis and show us that there is no complete consensus on how the brain works and how it affects our behavior. This is unsurprising given the complexities of human behavior.

Neuromarketing studies focus on relationship findings rather than cause-and-effect inferences. Neuroscientific studies provide information about the consumer's brain rather than consumer behavior (Plassmann et al., 2015). Different situations affect our decisions through different brain regions and their interactions. Neuromarketing is used to understand the factors that affect consumers' choice mechanisms and reconstruct the same meaning. Measuring the activity change in different brain regions shows why consumers choose that product and which brain part is active in this choice (Ural, 2008). Our brains create shortcuts to help us make purchasing decisions. Every experience leaves a mark. When we burn our hands in the oven or catch a cold or the flu, we create a shortcut, in other words, a "somatic cursor" in our brain about this experience. Formed by our past experiences of reward and punishment, these cursors connect an experience or emotion with a concrete expected response. It guides us to the decision that will lead to the best, most painless outcome. These cognitive shortcuts underlie most purchasing decisions (Lindstrom, 2010).

According to much research, it is a common problem that people do not know unmitigated what they know, want, and feel. Mental processes such as emotions, drives, and motivation occur below our threshold of awareness, to which we have no conscious access. Neuromarketing is growing daily due to marketing research's alternative solutions to these handicaps (Erdemir & Yavuz, 2016). While people consciously notice some of the data coming from their environment, they also send some of it unconsciously. The reason for the consumer's brand loyalty may not be at the level of conscious awareness most of the time. Subconscious data affect the consumer's decision-making phase (Girişken & Giray, 2014). Studies have shown that the unconscious affects higher-up mental processes. Unconscious motivational processes affect mental health. For example, subjects were first shown a picture of a dog in one study and then asked to press the button when they saw the meaningful word in mixed letters. People who were shown the word "terrier" noticed the word "dog" earlier (Bulut, 2015). In a structure where perception eliminates what consciousness evaluates, the subconscious has no chance of evaluation or elimination.

Our brains encounter nearly 2,000 messages a day. Perception, which is the acceptance of external stimuli, is general and instantaneous. Only a tiny number of these stimuli are consciously defined by the brain and undergo certain processes. The rest is related to subconscious memory. Useless information disappears, while others settle into the subconscious. We cannot change the information placed in our subconscious. We cannot judge them, and therefore, we cannot easily forget them. Our subconscious memories now impact our actions and decisions (İzgören, 2006).

Subliminal messages are defined as messages that are recorded just below our conscious perception level and that only our subconscious mind can detect, calling out to our sight, hearing, or another sense, and businesses that want to influence consumers try to gain a place for their brands in their subconscious minds (Lindstrom, 2010). This study states that most of what we do, think, and feel is beyond our conscious control, based this claim on the following research: The participating men were shown pictures of women with half their pupils enlarged, and they were asked which ones they found attractive. It was observed that the participants preferred women with dilated pupils to other women. Nevertheless, they have no awareness of why they chose those women. While the brain decides on behavior in response to stimuli, consciousness may or may not be active (Eagleman, 2014). It is impossible to verbally express the data in the unconscious. By studying the changes in the electrical movement patterns in the brain in real-time, which can be expressed as the measurement of the digitized responses of the subconscious mind, especially the person's thought structure, affect, attention, interest, and emotional attraction, there is a deep understanding of what exactly is going on inside the human mind at any given moment. Namely, neuromarketing makes analysis possible.

2.5. Advertising and Neuromarketing

Neuromarketing examines consumers' reactions and mental states when encountering marketing or advertising messages (Özdoğan et al., 2008). Neuromarketing allows marketers to move away from traditional marketing research and use new methods while applying neuroscientific methods to understand and analyze consumer behavior. Neuromarketing focuses on how the nerve centers in the brain are stimulated while using the nerve mechanisms in the brain for advertising and marketing purposes (Hatip, 2008).

Today, every big company uses the findings of neuroscience, behavioral economics, and consumer psychology to gain customer loyalty. The fact that the expenditures of the advertising sector in the USA and Great Britain are more than the budget allocated for education, 313 billion dollars versus 132 billion dollars, proves that advertising has the potential to influence consumers (Lewis, 2013).

Advertising is one of the marketing communication elements that inform, persuade, remind, reinforce, and promote the product and brand (Fırat & Kömürcüoğlu, 2016). Advertising is seen as an easy and fast way for a business to establish a bond with its customers by creating positive feelings about its brand or product (Aizezi, 2017). Another definition of advertisement in terms of consumer behavior is "an announcement made by using communication tools in exchange for the price of the message created to create a voluntary behavior change in consumers, to draw their attention to a thought or product, to provide information, or to adopt an attitude" (Çakır, 2006). Business advertisements promote the products and services produced and increase sales. Advertisements are communications conveyed in any form and for a fee to deliver the goods or services it generates to the masses who need or are likely to require them.

Consumers benefit from advertisements by making the most rational decision to meet their needs among countless similar products surrounding them. (Çakır, 2006). Brengman et al. (2001) examined the purposes of advertisements in three parts: cognitive, sensory, and behavioral. The first is the cognitive purpose of advertisements, which is to raise the consumer's awareness of the brand and provide brand awareness. The second of these purposes is the sensory purpose, which aims to create a positive attitude towards the advertisement and the brand by arousing some feelings in the consumers and ensuring

that the brand is liked, preferred, and ultimately satisfied. The third, behavioral purpose, is to create a purchase intention in the consumer, ensure the purchase, maintain it, and ensure brand loyalty.

Businesses aim to reach as many people as possible to increase their sales. Businesses must convey the most accurate message to attract consumers' attention. Consumers do not give the right answers in focus groups or surveys during advertising research, and therefore, producers are mistaken. Neuromarketing, however, scientifically reveals where and how the customer is influenced, which area of the brain is affected, when, and how. If advertisers could read people's minds, they would want to know what they are thinking, how they feel, and what emotions they can use when marketing to create immediate buying impulses. Advertisers and marketing researchers prefer and use neuromarketing more and more to minimize the mistakes made during the promotion of new products introduced to the market. Among the tools that businesses use to predict their products' future success or failure, traditional market research will become smaller day by day, and neuromarketing will become the main tool because what people say and do frequently contradicts each other (Lindstrom, 2010). Therefore, ads that can capture consumers emotionally rather than rationally, as neuromarketing reveals, are more successful.

Emotions are the things that create desire in consumers. An example of this is the person's emotions in the advertisement, saying or showing what they will feel while drinking or enjoying their products. Emotions have three important functions that serve advertising purposes (Çakır, 2006). The advertising message is the emotion itself. The benefit obtained from a brand or product that emotionally satisfies a need is the feeling

that that brand or product provides. Consumers prefer this feeling. Emotions are message carriers. Adding emotion to the message can help to strengthen the communication in an advertisement for a product that provides a physical benefit. Emotions directly affect attitudes. If a brand or product is consistently presented with the same feeling, that feeling will be remembered when the brand or product is mentioned after a while.

In today's competitive conditions, in a market where many products are equal in terms of product features, price, and accessibility, the admiration of advertisements can take businesses one step ahead of their competitors. For this reason, emotional reactions to advertisements become important (MacInnis & Jaworski, 1989). He states that the signs used in the advertisement, the ability of persuasion in the message, the dreams of the audience, and other elements in the advertisement can create emotional reactions to the advertisement, which may sometimes occur unconsciously or as a result of a cognitive process. No matter how it occurs, our emotional reactions to our attitude towards advertising are reflected in the brand attitude (Çakır, 2006). The fact that the product placed in the film is part of the story in the script of the film or is related to the processing of the subject of the film causes it to be in the minds of consumers, resulting in the product placed by the advertiser being more memorable to the audience.

Advertisements made in the form of implicitly involving the advertised good or service in an unrelated subject are also referred to as "hidden advertisements," in other words, product placement (Elden, 2009). For example, the appearance of the car, laptop, and mobile phone brand of the actor playing in a movie. It is hoped that the advertised brands will influence the target audience in these advertisements, which are made without the consumers' consent and are used in various computer games, movies, and television

programs (Wilson et al., 2008). For example, it is one of the most important information marketing managers want to learn. For example, how effective it is for businesses to display their brands with product placement anywhere and whether these brands are in the minds of consumers after watching a movie.

According to the results obtained from brain-scanning studies conducted within the scope of neuromarketing, it has been revealed that brands that cannot be an integral part of the scenario of a movie or program do not occupy a place in the minds of consumers or their target audience. The reason why snapshots of Fed-Ex, Louis Vuitton, and other products in James Bond's movie *Casino Royal* never stood out in our minds is that none of them had anything to do with the story in the movie (Lindstrom, 2010). Stories also provide emotional integration for consumers. Stories are compelling at attracting attention and stimulating emotions. For a good story, it is necessary to create a world full of emotional details that will make the audience feel that the event happened; the story must be associated with the customer's world; and the story must have a clear main idea or point (Renvoise & Morin, 2007).

The emotions evoked by the advertisements increase the attention towards the advertisement, increase the stimulating effect of the message, and, accordingly, the depth of processing of the advertisement, evaluate the messages more positively, and provide a higher recall rate (Çakır, 2006). Studies by Friestad and Thorson (1993) found that emotional advertisements are easier to remember than those that do not use emotional elements. Studies conducted by Milton Keynes University and London Business School have revealed that consumers make emotional choices based on their past experiences when choosing a brand when purchasing a product. In this case, the memory center of the

brain becomes more active. It shows that when the frontal lobe, which carries out the functions of abstract thinking, reasoning, planning, and self-evaluation in the brain, is activated, a certain image in the advertisement is highly appreciated. The data accompanying the emotion is easier to learn and retain in permanent memory. For this reason, we remember the details of old events when we experienced intense emotions, just like watching a slow-motion movie.

In neuromarketing research, it is necessary to examine whether any marketing message affects the amygdala and whether to use the message prepared in this direction. Neuromarketing research has determined that the most reliable and valid criterion for advertising efficiency is whether the consumer stays in his memory regardless of which product or brand it is. It has been observed that these consumers also affect their future purchasing behavior (Lindstrom, 2010). Consumers' perception of the ad and how they remember it is of great importance for the success of the ad campaign and the brand.

Neuromarketing makes advertising more effective. With neuromarketing, it is possible to determine which advertisements affect the consumers and which advertisements do not cause any reaction in their minds. An advertisement is watched no matter how bad it is. Still, the most important thing is how much the advertisement is in their minds when that advertisement is over and the information that will encourage them to buy that product (Firat & Kömürcüoğlu, 2016). Neuromarketing, with the devices and techniques it uses, helps marketers and advertisers to understand what goes through the minds of consumers, measure the precious subliminal responses that traditional research techniques cannot provide, and determine what consumers feel and think about a brand, logo, or advertisement rather than what they seem to say or imply measures. Apart from

these, measuring trust in the business and the product, effective store design, product placement, selection of media tools, effective sales negotiations, factors affecting consumers' product and brand choices, creating an effective advertising message, measuring the reaction to advertising messages, and finally remembering the advertisement as well as assessing its attractiveness (Aytekin & Kahraman, 2014).

While organizing advertising campaigns, managers try to organize the campaign to provide the maximum benefit. In this context, they seek answers to the questions of what opportunities will increase the company's profitability, in which areas advertisements will be more effective than other promotional elements, how the advertisement will be better, how the advertising cost will be reduced, and how the advertising results can be most accurately measured. The answers to these questions play an important role in determining the basic strategy of the advertising campaign. The audience's interest, stimulation, and motivation toward the advertisement's message are significant for achieving its goals. These affect the information processing process of the consumer (Çakır, 2006). In addition to these, being liked is one of the most important factors in achieving the goal of the advertisement. Admiration of the advertisement means that a positive attitude is formed in the audience. He mentioned that persuading the consumer is among the important purposes of advertising. Persuasion in advertising depends on the psychological attraction of consumers (Çakır, 2006).

To motivate consumer behavior, the statement in an advertisement must be about the person's interests, goals, or problems (Chiou, 2002). The creative process in advertisements consists of data collection, identifying the problem, determining alternative solutions, and finding and applying the most appropriate solution. High-cost

advertisements can achieve their goals, help save money and create more effective advertisements by removing unnecessary parts, especially in high-cost TV advertisements, by identifying the points that attract the consumer's attention and bore them (Ural, 2008). To measure the effectiveness of advertising in advertising research, physiological measurements, which are measurements in laboratory environments where the communication effectiveness of the whole of the advertisement and the elements that make up the advertising message are tested, have been used by researchers for at least 20 years (Elden, 2009).

Brain research reports that things that appeal to the eye and other senses cause various brain parts activity. In particular, it has been observed that visual and audible or visual and odorous objects cause many movements in the brain. These have a more permanent effect on people when combined in this way. Colors are also part of it. (Hart, 2009). Neuromarketing measures what points the consumer pays attention to first when looking at a product's packaging, what emotional changes he feels while observing the packaging, and which parts of the package he sees are remembered. Thus, the most effective packaging designs can be created using the right visuals (Ceylan & Ceylan, 2015).

Neuromarketing generally has usage areas such as measuring advertising efficiency, creating brand loyalty, product design and packaging, pricing, politics, architecture, entertainment, and the film industry (Akin & Sütütemiz, 2014). Wishes are not long-lived, and manufacturers must constantly create desires to get people to buy products repeatedly. Therefore, businesses aim to create desire in people before, during, and after purchasing (Imbriale, 2007).

Neuromarketing tries to determine which brain parts are triggered during all these activities. Scientists have determined that when we see a product that we like, there is an activity in the frontal cortex of our brain. This part of the brain is associated with personal perception and social emotions. Therefore, for example, this brain area is activated in male subjects shown pictures of sports cars. Businesses hope that the brands of their products will also activate this part of the brain. The rituals we develop depending on our habits also positively activate the brain. When we wake up in the morning, we must wash our faces, eat breakfast, brush our teeth, etc. This is due to a desire to keep the day under control and thus feel secure. Some rituals also include birthdays, New Year's Eve, etc. It has to do with the things we do to celebrate special occasions. For example, our lucky sweater, perfume, etc., like it is.

When we furnish a house, we always prefer the same brand of furniture or white goods. For this reason, businesses attribute emotional meanings to their brands that will appeal to people's feelings and make such advertisements on special days. When a person looks at a printed ad, some of the 125 million visual neural receptors are activated in both eyes, and neural signals travel to the midbrain. This part is where people focus and coordinate their eye movements with the advertisement. Other signals also reach various parts of the brain so that the right half of the ad is perceived on the left side of the brain and the left half of the ad on the right side of the brain. Information coming to the brain goes through the processing process as shape, color, and geometric location. It is then joined at the back of the brain. Advertising-activated memories are stored in the cerebral and intellectual cortex of the brain. The amygdala processes stored emotional memories and valences (Wilson et al., 2008).

Stating that the brain consists of three parts, Morin (2011) stated that what should be targeted in sales, marketing, and advertising is not the rational brain, which is the thinking part of the brain, or the limbic brain, where emotions are processed, but the reptilian brain, which is responsible for the operation of our basic instincts and enables us to make decisions. Marketers have targeted the wrong part of the brain, the rational brain; Morin (2011) emphasizes that if messages are to be conveyed in the same way in China or Turkey, they should be prepared based on the reptilian brain. It focuses on how advertising and marketing stimulate the nerve centers in the brain, with neuromarketing aiming to accurately determine the products to be produced by basing marketing on scientific foundations and delivering them to the right audience at the right time the right amount, and the right audience.

With the data obtained from the studies with the subjects, the level of dopamine secretion, etc., such as marketing and advertising strategies, are directed (Hatip, 2008). As soon as consumers buy any good or service they want, neural and chemical changes are observed in their brains, and dopamine, the brain's reward, and pleasure hormones, are secreted. Dopamine is one of the chemicals that bring happiness to the brain. Dopamine is partly responsible for decision-making in the buying process, which takes less than 2.5 seconds. Shopping makes us happy, even for a short time, as the brain releases dopamine during shopping.

In addition, studies on the brain in neuromarketing show that constantly seeing a new product in magazines, on the internet, or on television makes it more desirable to consumers. Mirror neurons cause this. When we see someone doing something, our brain reacts as if we were doing it ourselves. That is why we smile when we see someone

happy and sad when we see them hurt. These mirror neurons are responsible for empathy. Mirror neurons cause us to be influenced by that person when we observe them and come into play when we read a magazine or newspaper or see someone doing something on the internet. The brain activity results of neuromarketing studies show that mirror neurons increase viewers' attention to beautiful, sexy people, models, or celebrities in advertisements (Tüzel, 2010). Mirror neurons are also important in terms of consumer behavior. Thanks to mirror neurons, we see a stylishly dressed mannequin and think we will be stylish like him by wearing those clothes (Şimşek, 2016). Mirror neurons not only help in understanding the behavior of others but also help the observer decide on the most appropriate behavioral response. People learn from infancy by observing their environment and imitating what they see. While some mirror neurons respond to communication and feeding movements, some respond to movements performed using tools or sounds resulting from certain actions. Some mirror neurons also respond from the observer's point of view.

If businesses show people who use their products and are happy using them in their advertisements in the media, potential customers watching the advertisement are affected by what they see and want to buy the product. Of course, customers who watch the ad buy the product not to have it but to be happy.

2.5.1. Advertising appeals.

Our perceptions work in harmony, and for this reason, the visual, auditory, and sensory stimuli transmitted to the consumer must be in harmony as well. The fact that these stimuli come from different sources will reduce the concentration. The messages given with these stimuli should also be compatible with the image and promise of the

companies/brands. Of course, harmony needs to be chosen according to the advertisements' attractiveness. The message must be conveyed to the consumer by the brand and its promise in terms of marketing. Neuromarketing explores ways to convey more than one sense to the consumer with such harmony. Although the demographic characteristics of consumers and general attitudes towards the advertised product/service are essential indicators for sustainable consumption, studies show that the use of different advertising appeals can significantly affect consumers' attitudes and behaviors towards consumption (Yang et al., 2015).

Advertising appeals are thought to influence actual purchasing behavior and influence consumers' perspectives by comparing, often positively, with models appearing in an advertisement. Therefore, it is essential to understand how different advertising appeals used in advertisements affect consumer perceptions, emotions, and behaviors (Chang et al., 2016). Advertising appeals affect the emotional centers of the brain. Neuromarketing explores the possibilities and methods of transmitting both information and emotion to the brain in the same message that will activate these centers.

Advertising attractiveness is defined by advertising activities designed to persuade consumers or change their attitude towards a product, idea, or brand (Ergin et al., 2018). Advertising attractiveness is at the center of advertising to connect the brand to consumer wants and needs. It is like the glue that binds the audience to the advertising message (Dix & Marchegiani, 2013). Emotional advertising appeals such as fear, humor, and sexuality are often used in advertisements. The attraction to be selected is planned according to the target audience. After determining the target audience's demographic characteristics, expectations, needs, and requirements, whether they will be reached with

rational advertising appeals to which information-based messages will be given or emotional appeals that will make them cry and laugh (Şahin & Aslan, 2017).

2.5.1.1. Rational appeals.

The purpose of rational appeals is to encourage rational thinking in the audience. These attractions tend to sell directly. It indicates the brand name and product recommendations. Comparison with competitors talks about the product's performance, advantages, and special distinguishing features for consumers (Okazaki et al., 2010), how it works, and its practical benefits (Kazakova et al., 2016). Rational appeals generally deal with the consumer's basic motivation levels, such as physiological, informational, and safety needs (Zhang et al., 2014). Rational appeals such as value, economy, popularity, convenience, health, performance, and durability emphasize the functional value of the brand (Dix & Marchegiani, 2013). Using rational appeals, Ads provide accurate, relevant information about the brand, immediately important information to the potential consumer, and data that the consumer accepts as verifiable.

2.5.1.2. Emotional appeals.

Ads that use emotional appeals, on the other hand, provide a more prosperous, warmer, more exciting, and more enjoyable experience of using the product than an objective definition of the advertised brand. They bind the experience of the ad so tightly with the experience of using the brand that consumers cannot remember the brand without remembering the experience created by the ad (Puto & Wells, 1984). Emotional appeals are related to consumers' needs for encouragement, self-expression, social approval, and self-confidence (Zhang et al., 2014). Emotional appeals tend to be subtle and indirect. Indirect methods such as an image, an atmosphere, a beautiful scene, or the

development of an emotional story are used (Okazaki et al., 2010). Emotional appeals are used to create an emotional response in the audience. While these appeals include artistic styles and images of product use, they do not talk much about product quality (Okazaki et al., 2010). Emotional appeals such as humor, sex, guilt, nostalgia, pride, and joy stimulate emotions around the brand message (Dix & Marchegiani, 2013). Because of somatic cursors, neuromarketing has determined that people are affected by the fear and humor used in advertisements.

2.5.1.2.1. Fear appeals.

Fear is also one of the most potent somatic cursor generators, as somatic cursors are based on past experiences of reward and punishment. Most brands use fear to trigger their buying behavior (Lindstrom, 2010). Fear is an evolving mechanism for human survival, and nothing is more important than survival. For this reason, this emotion may be stronger than the brain's logical thinking and reasoning abilities. Fear appeals are based on people's fears. Fear is a disturbing emotional state characterized by the expectation of pain or great distress, accompanied by increased autonomic activity, particularly involving the nervous system (Williams, 2012).

The amygdala is activated when the brain is exposed to fear-related stimuli. When the intensity of the fear stimulus increases, the activity of the amygdala also increases (Kryklywy et al., 2013). The impact of the presidential election campaign between Bush and Kerry on the American people has been studied in the United States. According to the research results, the images in the campaign caused activity in the participants' amygdala. For example, the image of a little girl exploding a nuclear bomb in the election campaign was used (Lindstrom, 2010). Fear appeals constitute one of the most frequently

used driving forces to get people to help themselves (Williams, 2012). The attraction of fear is seen in marketing messages or insurance advertisements aimed at deterring the use of addictive substances such as cigarettes, alcohol, and drugs.

The fear appeal in advertisements aims to arouse fear by exposing consumers to threats (Shin et al., 2017) and persuade people to change their risky behaviors by explaining the negative consequences that will happen to them if they do not follow the suggestions in the message (Mostafa, 2018). We can give examples of advertising and selling creams and skincare products to overcome our fear of aging, cereals containing cereals to prevent obesity, and various hair care capsules and shampoos to get rid of hair loss.

2.5.1.2.2. Humor appeals.

Some advertisers create somatic cursors in the minds of consumers through humor. Among the most commonly used charms in advertisements, humor attracts the audience's attention by making the intended meaning more effective (Solak, 2017). Humor entertains and is sympathetic to audiences, making viewers more sympathetic and vulnerable to advertising. Almost all industries use humor in advertisements because it attracts attention and remembers advertisements. Using humor, advertisers aim to establish a bond with the audience/target audience, evoke positive emotions, turn negative emotions and thoughts into positive ones, and then display purchasing behavior towards the product at the purchasing stage (Solak, 2017). Another critical point to consider is the cultural background of the audience. While some researchers argue that humor is universal and can be used in the same way everywhere, some researchers state that how people with different cultural backgrounds perceive the humorous advertising

message and what they find funny varies, and that this should be considered in advertisements (Hoffmann et al., 2014).

2.5.1.2.3. Sexual appeals.

One of the factors affecting consumer behavior is sexuality. That is used in advertising messages. Although sexuality does not always bring sales, brain scan tests have shown that mirror neurons increase people's desire to emulate the beautiful and sexy people, models, or celebrities they see in advertisements. People who watch these advertisements buy the product, thinking that if they use the product used in the advertisement, they will be like those people. In some cases, however, such advertisements backfire due to empathy and are ineffective for the consumer. The biggest reason for this is that people love and internalize those similar to them. Consumers who see someone in advertisements who resembles themselves or family members identify with them, feel close to them, and buy the advertised products (Linsdstrom, 2008). Some researchers argue that it is necessary to be very careful in using sexuality in advertisements. Previous studies have consistently documented how attractive and entertaining sexual attraction in advertisements can be. However, this may lead the viewer away from the main message and decrease recognition and recall. Explicit sexual messages in advertisements might prevent consumers from processing message arguments and brand information, reducing understanding of the messages. For example, sexuality in advertisements is one of the attractiveness types that is extensively used in almost all categories, whether relevant or not, for reasons such as attracting attention to the product and ensuring its retention (Bakır, 2013). The second point is that if there is no relationship between the product in the advertisement and the sexual attraction used, it

will not contribute to the recall of the advertisement (Liu et al., 2009). The amygdala evaluates the emotional elements. The amygdala, like other emotional stimuli, evaluates sexual appeal. These elements also affect the old brain's simple survival drive.

Another critical factor affecting the use of sexual attraction in advertisements is culture. Violation of cultural norms leads to sanctions or punishments ranging from mild social approval to expulsion from the group. Therefore, sexual content in advertisements may be successful in one culture but unsuccessful in another (Sawang, 2010). The intended benefits of using sexual attraction in advertisements are to draw attention to the advertisement immediately and keep it there for a long time, to contribute to recall of the messages highlighted in the advertisement, to establish an emotional bond by arousing a sense of arousal and lust, to create a purchase intention, and to increase persuasiveness. It can also be summarized as increasing. Finally, the effect of sexual attractions used in advertisements on men and women is different. It is known that men approach such attractiveness more positively than women (Lanseng, 2016).

2.6. Neuromarketing and Artificial Intelligence

It is difficult to find a common definition of artificial intelligence because it is the subject of different application areas. However, the common conclusion drawn from the definitions of artificial intelligence is this: Artificial intelligence aims to design machines that can do human intelligence tasks. Artificial intelligence is the ability of a computer-controlled machine to perform human qualities, make innovative applications, and solve problems. Artificial intelligence technology aims to conduct scientific studies to develop smart programs. Machine imitation of human-specific rational movements has primarily examined human intelligence (Nabiyev, 2016).

Basically, in artificial intelligence, concepts such as "machine learning," "artificial neural networks," "expert systems," "fuzzy logic," and "genetic algorithms" are mentioned. Machine learning refers to computer-based methods that extract patterns or information from data and perform optimization tasks with minimal human intervention. These methods are rooted in artificial intelligence and dynamic programming (Cui, Wong, & Lui, 2006). Machine learning is an innovative method that can improve predictive models and aid management decision-making. Direct marketing, which relies on generating accurate forecasting models from databases, is one of the areas that can benefit from such applications (Cui et al., 2006). An artificial neural network contains several computational units, cells, or neurons, connected to these units by a series of one-way data links (Krycha & Wagner, 1999).

To understand how biological brains work, some cognitive neuroscience and neuroscience researchers try to understand the real structure of brains directly and imitate them on a computer. In the early years of cognitive neuroscience, computers were seen as a metaphor for the mind and compared the human mind to a cognitive processor (Friedenberg & Silverman, 2006). Today, it is understood that the human brain does not have an operating system and software like a computer. The brain is a structure with a network of neurons. While the computer does something at the speed of light, the brain does it at 320 km. Despite this popularity, the brain leaves the computer behind because it does not have a single operating system like a computer: it has more than 100 billion neurons connected simultaneously (Koyuncu, 2015). However, computer technologies and artificial intelligence are used to understand the human brain. Developed technologies and methods can define mental activity.

Experimental data and modeling, also used in artificial intelligence, are essential in cognitive science. Cognitive neuroscience examines various mental processes such as attention, memory, and problem solving while using technology (Friedenberg & Silverman, 2006). Artificial Neural Networks, or ANN, developed after being inspired by how the human brain works, consist of a structure that works in parallel with each other, transmitting and receiving information. Artificial nerve cells connected in a network are used for problem-solving. The connections' values that provide information flow between cells are shown with relations, and the system's learning ability and intelligent behavior are provided by using connection values (Tekin, 2009). This process works by adhering to deep learning algorithms and artificial neural networks. The more data the system is exposed to, the more it learns and the more effective it becomes over time. An artificial neural network can also be expressed as a complex "tree" of decisions the computer can make to arrive at an answer or a solution (Marr, 2016).

Artificial neural networks have recently been increasingly used in management, marketing, and retail. Among these application types, it can be expressed as market forecasting, consumer preference forecasting, tourism marketing, buyer and seller relationship analysis, and market segmentation analysis (Alon, Qi, & Sadowski, 2001). Many disciplines deal with artificial intelligence: computer engineering, philosophy, cognitive science, electronic sciences, etc. The differences and similarities between the brain and the computer must be compared to comprehend the topic of artificial intelligence. As a result, AI enables businesses to more effectively match information about potential consumers' products and services with the information they require (Sterne, 2017).

Today, first-generation AI applications can be found almost everywhere. With the help of AI, faces in Facebook images were recognized, and users were tagged, Siri understood the user's voice and acted accordingly, and Tesla developed self-driving cars (Kaplan & Haenlein, 2019). However, the applications of AI in marketing are evolving rapidly. As AI technology is more accessible than ever, it is possible to gain some insights and see marketing potential unfold in its various formats. AI is an advanced technology that enables companies to have more detailed and fine-grained information about their target audience.

Its core point is data and the data processing process. Automated marketing decisions are made and implemented by considering the data collected on consumers' preferences, habits, behaviors, economic developments, and other market factors. Financial institutions, retailers, and businesses in nearly every industry that sells products and services began collecting, managing, and exchanging data about people years ago. While applications that provide data collection were more limited and under control in the past, with the rise of social networks, smartphones, and online advertising, especially after 2017, data-based marketing strategies have increased their effectiveness (Christl et al., 2017).

Artificial intelligence technologies allow companies to have unilateral and comprehensive access to information about the lives of billions of people, constantly monitoring people and classifying them as they see fit. Big data plays an important role in developing AI decisions and capabilities (Smith, 2018). Businesses that can gain useful insights from big data can make better predictions about consumer behavior, design more compelling offers, better target their customers, and develop tools that encourage

consumers to make purchasing decisions that favor their products. Thus, big data can initiate processes of consumer purchase that are beneficial, cyclical, and engaging, leading to greater profitability (Grewal et al., 2017). The question of how best to analyze and use individual customer data is an important issue on managers' agenda. In the current era of big data, most businesses can learn about customers and the market. Still, smart companies strive to get more information at every possible customer touchpoint. These touchpoints include communication between all types of customers and businesses, such as customer exchanges, information provided by the sales force, service and support calls, web and social media site visits, satisfaction surveys, credit and payment interactions, and market research studies (Kotler & Armstrong, 2018).

AI systems are trained on large data sets to learn. Algorithms that install skills that allow machines to understand consumer behavior also serve as the foundation for many applications that streamline all business processes (Karaman, 2021). Marketing practices that use data are the products of an understanding in which the consumer is at the center, aiming to influence them completely. Thanks to the algorithmic marketing applications of the companies, the digital consumer can filter the products specific to him and see personalized offers (Karaman, 2021). Marketers also use algorithms to reach and understand consumers.

Berthon & Pitt (2018) explain that artificial intelligence, which facilitates the collection, storage, and analysis of consumer information, has led to many new data-based opportunities and methods in marketing. The primary purpose of data-driven marketing applications is to monitor and interact with consumers in all digital environments directly. On the other hand, consumers respond to brands' corporate

tracking strategies by using internet search engines, purchasing products, downloading files, filling out forms, commenting and liking, watching ads, creating content on social media, adding videos, and sharing geolocations, and many other ways. Businesses filter, classify and make sense of the internal data they collect on their customers and the third type of potential customer data, transferring it to their marketing and communication strategies (Karaman, 2021).

Artificial intelligence and digital marketing have become two important elements that act together. Artificial intelligence can transform digital strategy to collect, analyze, apply, and learn data. As developments in artificial intelligence continue, their ability to develop digital marketing strategies and understand key consumer insights will also increase (Martin, 2018). Traditional advertising has lost its blood in the digital age, and personalized advertising, the product of algorithms, has come to the fore. Suggestion systems are programmed to learn about customer preferences on the one hand and present goods and services with personalized recommendations. This tool, which is very useful for personalized marketing, allows us to target each customer separately (Shen, 2014).

Marketers are increasingly seeking personalization to help improve their marketing performance. The personalization effort comes largely from the expected benefits of one-on-one marketing and customer relationship management. Information and communication technologies have created new opportunities to collect and analyze customer data and apply personalized marketing (Vesonen, 2007). Personalization can be a complex and time-consuming task, but it has been facilitated by artificial intelligence applications (Morgan, 2019). Advertising algorithms leverage large datasets, including online shopping behavior and even offline point-of-sale data. The best product offer

worth presenting to the consumer is created from this foresight, and it is hoped that the promoted product is the product that the consumer will want to buy (Karaman, 2021).

To summarize, with the advent of artificial intelligence, analysis and data processing are becoming more and more efficient. Machine learning in marketing is increasingly helping to predict human behavior. Companies using AI applications can analyze consumer responses to a particular ad in their ad campaigns, improving their ad development strategies.

Neuromarketing investigates the behavior of the prefrontal cortex, which houses the brain's decision mechanism, as well as the person's relationship with the product during the purchasing and selection process. Neuromarketing, which is accepted as a sub-branch of neurology, uses artificial intelligence to detect movements in the frontal cortex and process the obtained data, making it meaningful. With artificial intelligence in neuromarketing, neuromarketing techniques are developing and starting to play a more active role in the sales department. Simultaneously, neuromarketing techniques are expected to give more accurate results with the development of artificial intelligence.

We can observe that the advertising, sales, and marketing sectors move away from traditional methods as companies begin to give more importance to these techniques while advertising and designing their products. There are many issues that neurologists still cannot explain about the brain and subconscious mind. However, in the light of the data we have, it is predicted that such artificial intelligence-supported studies can support science in solving the unexplained secrets of well-trained artificial intelligence in the coming years (Önver, 2020). In other words, artificial intelligence has begun to be used and developed as a tool for neuromarketing research. Moreover, neuromarketing research

also benefits from new technologies such as artificial intelligence, big data, machine learning, and artificial neural networks.

Algorithms developed using classical neuromarketing methods such as EEG, fMRI, eye tracking, and face coding detect consumers' emotions. Simultaneously, neuromarketing techniques are expected to give more accurate results with the development of artificial intelligence. It is observed that the advertising, sales, and marketing sectors are moving away from traditional methods as companies begin to give more importance to these techniques when advertising and designing their products (Önver, 2020). Some applications combine neuromarketing with artificial intelligence technology. These applications benefit from artificial intelligence software that works with the logic of devices such as EEG and fMRI, which are used in classical neuromarketing research. Thanks to this artificial intelligence-based software, attention can be measured just like eye tracking. Attention can be measured using artificial intelligence, machine learning technologies, and big data. New eye-tracking data is constantly loaded, allowing the system to learn from this data. This software provides us with information about visual attention by modeling with machine learning technology running in the background. In this manner, the design flaws in the ad and campaign are identified and optimized before publication. It works like eye tracking from classical methods, but it provides advantages to companies by reducing costs and time. In addition, technology such as image recognition and biometrics is used in neuromarketing. Image recognition and computer vision offer many uses in marketing.

These technologies include artificial intelligence, which uses convolutional neural networks, or CNNs, enabling computers to analyze image data more efficiently by

gathering pixel groups together to increase efficiency (Kim et al., 2017). Recent developments in image recognition are especially beneficial for using images in digital marketing studies and provide useful tools for marketing studies. Image recognition technology has been used for years for face recognition on Facebook and image search on Google. This technology is now seen in many other marketing-based applications as well. Image recognition technology allows marketing professionals to understand their consumers by watching them and interacting with them accordingly (Cannella, 2018). Biometrics, the science of monitoring and analyzing the unique biological characteristics of people, also offers interesting possibilities for marketers. Although these technologies are mostly used in security fields, they can also help marketers identify customers and create personalized messages (Van Der Tuyn, 2020). Today, face recognition technologies in marketing studies can be seen, especially in interactive marketing campaigns and experiential marketing studies. In interactive marketing studies carried out using face recognition, an entertaining experience is provided to the participants, the internet users using the service, by reading the biometrics while capturing data about the consumer's emotions and moods. (Cannella, 2018).

Companies globally can conduct neuromarketing research online using artificial intelligence and "machine learning" technologies. Artificial intelligence and machine learning technologies in marketing research are preferred by many brands such as Coca-Cola, Facebook, Lego, Heineken, Kantar, and Microsoft worldwide. It is also shaping the future of marketing research (Genç, 2021).

3. METHOD

3.1. Importance and Objective of the Research

In today's marketing world, information and communication technologies are developing rapidly. However, despite the developing technology and techniques, the reasons underlying the purchasing behavior of consumers, who are the target audience, cannot be revealed. The reason for this; is that the consumer is exposed to stimuli without being aware of them. The inadequacy of traditional research techniques to understand consumers has led businesses to alternative research techniques. For this reason, the understanding of marketing has gained a new direction to solve the decision-making mechanism of consumers. Uncovering the real reasons behind consumer preferences will help marketing managers create an effective strategy. As a young practice approach consisting of basic scientific disciplines such as neuroscience, marketing communication, and cognitive psychology, Neuromarketing aims to analyze the unknowns and subconscious thoughts in consumers' minds and understand the consumer. Thanks to neuromarketing research, the real emotional reasons underlying consumers' preference for goods or services are examined with scientific methods to reach definite results. Although Neuromarketing seems to be a tool that only helps determine the wishes and expectations of the target audience, it is an essential type of research that explains the causes of social behavior psychologically and biologically. From this point of view, Neuromarketing is an approach that needs to be researched and understood comprehensively.

For this reason, it has been tried to reveal the relationship between consumer styles formed by the merger of neuroscience and marketing and research techniques and

how these techniques can be used in neuromarketing research. This study investigated and interpreted the differences between consumers' consumption behaviors and brain regions according to their demographic characteristics, decision-making styles, and personalities. The research aims to measure the relationship between consumers' character traits, decision-making styles, and Neuromarketing. To learn the characteristics of consumers, understand how they behave and define the variables related to the subject. The relationship between them, the factors affecting consumers' consumption behavior, and their relationship with Neuromarketing were investigated. In addition, to understand the main reason for consumer behavior in the decision stage of the purchasing process, to reveal the main stimulating factors. This study was carried out to solve the unknowns in the consumer's mind. What are consumers' attitudes with different personality traits, whether they purchase with a rational or emotional decision, are examined?

Neuroscience, marketing communication, cognitive psychology, and neuropsychology are the primary scientific disciplines of Neuromarketing. Findings from these disciplines. Diagnosis and analysis will bring a new perspective to marketing research. Conducting and disseminating recent studies to understand the consumer from a neuromarketing perspective will provide more accurate and reliable information. The output and results obtained from the research results are very important in bringing a new perspective to neuromarketing research and increasing social awareness. There are not many studies examining the effect on consumer perception. In this respect, it is essential to understand the importance of the study and its contribution to the limited number of studies. This study is also necessary for making a scientific contribution to the neuromarketing literature.

3.2. Sample of the Research

The framework of the research is consumers who are open to all education levels, between 18 and 65, and use the internet in Turkey. The survey sample is all consumers who carry out traditional and digital marketing activities. The number of participants in the questionnaire is 409.

3.3. Data Collection Method of The Research and Analysis of The Data

The questionnaire technique was used as a data collection tool. The questionnaire was published on the internet to reach consumers with various demographic characteristics and income groups. The survey form link created via Google Forms was sent to the participants electronically. The participants could access the prepared questionnaire and answer the questions by following this link. In addition, possible errors were avoided with limitations such as sending an answer to each participant only once and not being able to complete the survey without answering every question. There are 64 questions in total in the survey. The inquiries related to the questionnaire were obtained as a result of the literature review. The survey consists of three parts. In the first part of the questionnaire, there are six questions about the demographic characteristics of the participants, such as gender, age, income, and marital status. The purpose of asking these questions is to obtain general information about the participants. Again, there are eight multiple-choice questions in the first part to understand which brain region the participants use. In the second part of the questionnaire, 23 questions were created to determine the participants' personality traits. Using a five-point Likert type scale, 1; The levels of participation in the statements were determined from strongly disagree to 5 to strongly agree. In the third part of the questionnaire, 27 questions were created to

determine the consumption behaviors of the participants. These questions are one on the Five-point Likert Scale; it consists of judgments ranging from strongly disagree (1) to strongly agree (5). The inquiries related to the questionnaire were obtained as a result of the literature review. The data obtained through the questionnaire were recorded and analyzed in the IBM SPSS Statistics Version22 software.

3.4. Limitations

During the research, the main limitation is that only the questionnaire method was used as the data collection method in the study. The questionnaire study could not support experimental studies using neuroimaging techniques such as EEG and fMRI. The main reason for this situation is the high cost of empirical studies, the need for a laboratory environment, and time constraints.

4. FINDINGS

4.1. Findings on Demographic Characteristics

Percentage distribution was examined to define the participants' demographic characteristics. Participants' findings regarding demographic characteristics are given in Table 2.

Table 2

Distribution of demographic features

Age	Count	%	Profession	Count	%
18-25	95	23,2	Public sector	106	25,9
26-33	86	21,0	Private Sector Employee	128	31,3
34-41	54	13,2	Self-Employment	38	9,3
42-49	77	18,8	Retired	43	10,5
50-57	72	17,6	Student	55	13,4
58-65	25	6,1	Not Employed	18	4,4
			Other	21	5,1
Monthly Income	Count	%	Education Level	Count	%
3000-6000 TL	208	50,9	Less than a high school degree	11	2,7
6000-15000 TL	157	38,4	High school	58	14,2
Over 15000 TL	44	10,8	Associate degree	30	7,3
			Bachelor degree	245	59,9
			Master degree	65	15,9
Gender	Count	%	Marital Status	Count	%
Female	237	57,9	Single	193	47,2
Male	171	41,8	Married	216	52,8
Transgender	1	0,2			
Total	409	100		409	100

Looking at Table 2, where demographic characteristics are presented, 57.9% of the participants are female, 41.8% are male, and 0.2% are transgender. When the age distribution of the respondents is examined, the participants between the ages of 18-and 25 (23.2%) had the highest participation. After this age range, participants between the ages of 26 and 33 (21%) have the highest participation, followed by participants between 42 and 49 (18.8%). Then the participants between the ages of 50 and 57 (17.6%) were followed by the participants between the ages of 34-and 41 (13.2%). Participants between the ages of 58 and 65 (6.1%) had minor participation. It is seen that 52.8% of the participants are married, and 47.2% are single. We are looking at the education level, 2.7% have less than high school, 14.2% have a high school, 7.3% have an associate degree, 59.9% have bachelor, and 15.9% have a master's degree. It is understood that 50.9% of the participants have an income between 3000 and 6000 TL, 38.4% have an income between 6000 TL and 15000 TL, and 10.8% have an income of 15000 TL or more. Finally, 25.9% of the participants are in the public sector, 31.3% are in the private sector, 10.5% are retired, 13.4% are students, 9.3% are self-employed, and 5% are other. It is seen that 1% of them work in one of the other occupational groups, and 4.4% of them are unemployed.

4.2. Factor Analysis

The data set is separated into two groups because there are too many variables. These groups were named as character traits and consumption behavior groups. While these groups were created, some variables in the data group were not included in the analysis as they were out of the scope of the research. After that, exploratory factor analysis was applied to each group separately to reduce the dimension, that is, to reveal

the hidden dimensions that cannot be observed and measured. In this investigation, the varimax rotation approach was applied.

Before the factor analysis for the character traits group, the KMO value was used to check whether the data was suitable for factor analysis. Since the KMO value was .82 and Bartlett's test p-value of 0.00 was significant ($p < 0.05$), it was accepted that the scale was ideal for applying factor analysis.

The variables in the first group, "Character traits," are given in Table 3.

Table 3

Variables in the character traits group

Character	Traits
1. I am talkative, so I usually start the conversation.	13. I am open to innovation.
2. I like to be tidy and pay attention to details.	14. I am not quarrelsome; I avoid conflict.
3. I am curious, and I have many interests.	15. I am not cold and distant.
4. I take care to be kind and considerate of others.	16. I do not shy away from duty or responsibility.
5. I am pessimistic.	17. I have a forgiving nature.
6. I spend time thinking about the events. I visualize the events in my mind.	18. I find it challenging to remain calm in stressful situations, and I cannot manage stress well.
7. I am friendly and pleasant.	
8. I do my work efficiently, and I am meticulous in my work.	19. My mood changes often, and I get depressed very quickly.
9. I often feel depressed or anxious.	20. I am energetic and enthusiastic
10. I get angry quickly.	21. I am a planned and programmed person.
11. I feel at ease in social situations.	22. I have a strong imagination and am creative.
12. I am open to cooperation.	23. I am easily distracted.

The scree plot obtained from the factor analysis applied to this group is shown in Figure 31.

Figure 31

Scree plot for a group of character traits

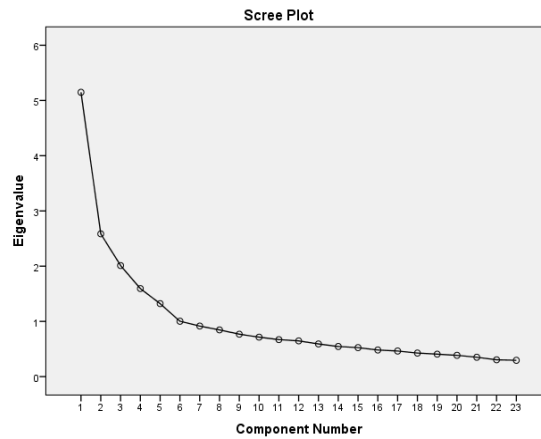


Figure 31 shows a distinctive drop in the graph after the sixth component, so there are five important components.

Table 4 displays the factor loadings and communalities identified by the varimax rotation approach for the five components named extraversion, anxious, responsible, imaginative, and agreeableness.

Table 4

Factor analysis results for the character traits group (N=409)

Item	Factor loadings	Communality
<u>Factor 1: Extraversion</u>		
7. I am friendly and pleasant.	,791	,721
1. I am talkative, so I usually start the conversation.	,763	,625
15. I am not cold and distant.	,730	,577
20. I am energetic and enthusiastic	,632	,608
11. I feel at ease in social situations.	,570	,529

<u>Factor 2: Anxious</u>		
19. My mood changes often, and I get depressed very quickly.	,734	,579
5. I am pessimistic.		
9. I often feel depressed or anxious.	,718	,574
10. I get angry quickly.	,697	,596
23. I am easily distracted.	,628	,620
6. I spend time thinking about the events. I visualize the events in my mind.	,532	,391
	,532	,380
18. I find it challenging to remain calm in stressful situations, and I cannot manage stress well.	,448	,444
<u>Factor 3: Responsible</u>		
8. I do my work efficiently, and I am meticulous in my work.	,799	,687
21. I am a planned and programmed person.		
16. I do not shy away from duty or responsibility.	,796	,653
2. I like to be tidy and pay attention to details.	,609	,542
12. I am open to cooperation.	,584	,449
	,427	,512
<u>Factor 4: Imaginative</u>		
3. I am curious, and I have many interests.	,752	,608
13. I am open to innovation.	,697	,542
22. I have a strong imagination and am creative.	,639	,457
<u>Factor 5: Agreeableness</u>		
17. I have a forgiving nature.	,750	,577
14. I am not quarrelsome; I avoid conflict.	,593	,436
4. I take care to be kind and considerate of others.	,504	,554

Before performing factor analysis for the Consumption behavior group, the KMO value was used to check whether the data was suitable for factor analysis. Since the KMO value was .93 and Bartlett's test p-value of 0.00 was significant ($p < 0.05$), it was accepted that the scale was suitable for applying factor analysis.

The 27 variables in the second group, the “Consumption behavior” group, are given in Table 5.

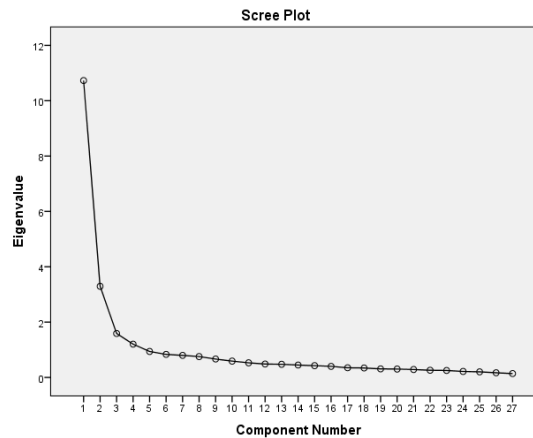
Table 5*Variables in the consumption behavior group*

Consumption	Behavior
1. Making sensible choices in my shopping makes me feel good.	15. Sometimes, I create false needs or excuses for myself to shop.
2. I take care to buy what I have planned in my shopping.	16. I make my purchasing decisions based on my emotions.
6. I make logical purchase decisions.	17. I prefer branded products and am willing to pay more.
4. I shop as often as I need to. I do not overdo it.	18. Shopping gives me pleasure. I shop to be happy.
5. I go shopping knowing what I need.	19. I don't understand how time passes while shopping.
3. I behave in a controlled manner in my shopping preferences.	20. I often visit local and online stores of my favorite brands.
7. Even if my financial situation is sufficient, I try to make logical choices in my shopping preferences.	21. When I come across discounts or campaigns, I always buy something.
8. I am only interested in the product/products that I will buy in my online shopping.	22. When I see a product that excites me, I immediately want to buy it.
9. I do not buy products without doing price research and reading reviews.	23. In my shopping preferences, the stores' atmosphere (design, lights, aesthetics, etc.) causes me to buy more.
10. Even if a product excites me, if I do not need it, I will not buy it.	24. The images and usage (colors, design, etc.) of the website I shop from cause me to buy more.
11. I can also push my budget with shopping, which is unnecessary.	25. I can spend extra time evaluating the coupons or campaigns I have won from online stores.
12. I buy new ones before a product gets old, deteriorates, and ends its useful life.	26. The higher-priced products are of better quality.
13. I may purchase new products due to differences in color, brand, or design, even though they have similar functions and features.	27. In my online shopping, I look forward to receiving my order as soon as possible, and when my orders reach me, I am happy as if I had received a gift.
14. There are times when I shop more than I need.	

The scree plot obtained from the factor analysis applied to this group is shown in Figure 32.

Figure 32

Scree plot for a group of consumption behavior



When deciding on the number of factors, considering the scree plot, it is seen that the scale has four factors. The factor loadings and common effects found from the varimax rotation method regarding the four factors called rational consumption behavior, addiction tendency hedonic consumption behavior, emotion-focused hedonic consumption behavior, and discount and visual oriented hedonic consumption behavior are given in Table 6.

Table 6

Factor analysis results for the consumption behavior group (N=409)

Item	Factor loadings	Communality
<u>Factor 1: Rational Consumption Behavior</u>		
5. I go shopping knowing what I need.	,849	,766
2. I take care to buy what I have planned in my shopping.	,813	,728
6. I behave in a controlled manner in my shopping preferences.	,790	,757
7. Even if my financial situation is sufficient, I try to make logical choices in my shopping preferences.	,789	,691
1. Making sensible choices in my shopping makes me feel good.	,756	,598
3. I make logical purchase decisions.	,666	,537

4. I shop as often as I need to. I do not overdo it.	,639	,653
8. I am only interested in the product/products that I will buy in my online shopping.	,619	,467
9. I do not buy products without doing price research and reading reviews.	,549	,457
10. Even if a product excites me, if I do not need it, I will not buy it.	,516	,503
<u>Factor 2: Addiction Tendency Hedonic</u>		
<u>Consumption Behavior</u>		
11. I can also push my budget with shopping, which is unnecessary.	,691	,708
12. I buy new ones before a product gets old, deteriorates, and ends its useful life.	,691	,645
14. There are times when I shop more than I need.	,690	,681
13. I may purchase new products due to differences in color, brand, or design, even though they have similar functions and features.	,653	,620
15. Sometimes, I create false needs or excuses for myself to shop.	,632	,638
16. I make my purchasing decisions based on my emotions.	,583	,522
17. I prefer branded products and am willing to pay more.	,522	,386
<u>Factor 3: Emotion-focused Hedonic</u>		
<u>Consumption Behavior</u>		
18. Shopping gives me pleasure. I shop to be happy.	,792	,770
19. I don't understand how time passes while shopping.	,741	,651
20. I often visit local and online stores of my favorite brands.	,731	,666
27. In my online shopping, I look forward to receiving my order as soon as possible, and when my orders reach me, I am happy as if I had received a gift.	,710	,634
22. When I see a product that excites me, I immediately want to buy it.	,680	,663

<u>Factor 4: Discount and Visual Oriented Hedonic Consumption</u>		
	<u>Behavior</u>	
23. In my shopping preferences, the stores' atmosphere (design, lights, aesthetics, etc.) causes me to buy more.	,784	,687
24. The images and usage (colors, design, etc.) of the website I shop from cause me to buy more.	,755	,724
25. I can spend extra time evaluating the coupons or campaigns I have won from online stores.	,601	,578
26. The higher-priced products are of better quality.	,572	,491
21. When I come across discounts or campaigns, I always buy something.	,564	,593

The reliability analyses performed for the factors are summarized in Table 7 and Table 8, respectively. Cronbach's alpha values were examined to evaluate the internal consistency of the questions in the scale.

Reliability analysis results of the first group, "Character traits" are given in Table 7.

Table 7

Confidence analysis for the group of character traits

Factor	Alpha if Item Deleted
<u>1. Extraversion</u>	
7. I am friendly and pleasant.	,738
1. I am talkative, so I usually start the conversation.	,765
15. I am not cold and distant.	,788
20. I am energetic and enthusiastic	,773
11. I feel at ease in social situations.	,780
Cronbach Alfa	,806

<u>2. Anxious</u>	
19. My mood changes often, and I get depressed very quickly.	,699
5. I am pessimistic.	,700
9. I often feel depressed or anxious.	,709
10. I get angry quickly.	,725
23. I am easily distracted.	,745
6. I spend time thinking about the events. I visualize the events in my mind.	,762
18. I find it challenging to remain calm in stressful situations, and I cannot manage stress well.	,749
Cronbach Alfa	,758
<u>3. Responsible</u>	
8. I do my work efficiently, and I am meticulous in my work.	,623
21. I am a planned and programmed person.	,613
16. I do not shy away from duty or responsibility.	,667
2. I like to be tidy and pay attention to details.	,748
12. I am open to cooperation.	,705
Cronbach Alfa	,721
<u>4. Imaginative</u>	
3. I am curious, and I have many interests.	,399
13. I am open to innovation.	,560
22. I have a strong imagination and am creative.	,570
Cronbach Alfa	,613
<u>5. Agreeableness</u>	
17. I have a forgiving nature.	,205
14. I am not quarrelsome; I avoid conflict.	,422
4. I take care to be kind and considerate of others.	,398
Cronbach Alfa	,445

As seen in Table 7, the reliability of the extraversion factor is reliable because it is .80, the reliability of the anxious factor is reliable because it is .75, the reliability of the responsible factor is reliable as it is .72, the reliability of the imaginative factor is low since it is .61. The reliability of the agreeableness factor is quite reliable because it is .44.

The results of the reliability analysis of the second group, “Consumption behavior,” are given in Table 8.

Table 8

Confidence analysis for the group of consumption behaviors

Factor	Alpha if Item Deleted
<u>1. Rational Consumption Behavior</u>	
5. I go shopping knowing what I need.	,888
2. I take care to buy what I have planned in my shopping.	,889
6. I behave in a controlled manner in my shopping preferences.	,888
7. Even if my financial situation is sufficient, I try to make logical choices in my shopping preferences.	,890
1. Making sensible choices in my shopping makes me feel good.	,900
3. I make logical purchase decisions.	,896
4. I shop as often as I need to. I do not overdo it.	,893
8. I am only interested in the product/products that I will buy in my online shopping.	,905
9. I do not buy products without doing price research and reading reviews.	,910
10. Even if a product excites me, if I do not need it, I will not buy it.	,904
Cronbach Alfa	,906
<u>2. Addiction Tendency Hedonic Consumption Behavior</u>	
11. I can also push my budget with shopping, which is unnecessary.	,860
12. I buy new ones before a product gets old, deteriorates, and ends its useful life.	,866
14. There are times when I shop more than I need.	,861
13. I may purchase new products due to differences in color, brand, or design, even though they have similar functions and features.	,867
15. Sometimes, I create false needs or excuses for myself to shop.	,864
16. I make my purchasing decisions based on my emotions.	,875
17. I prefer branded products and am willing to pay more.	,900
Cronbach Alfa	,887

<u>3. Emotion-focused Hedonic Consumption Behavior</u>	
18. Shopping gives me pleasure. I shop to be happy.	,854
19. I don't understand how time passes while shopping.	,873
20. I often visit local and online stores of my favorite brands.	,876
27. In my online shopping, I look forward to receiving my order as soon as possible, and when my orders reach me, I am happy as if I had received a gift.	,878
22. When I see a product that excites me, I immediately want to buy it.	,873
Cronbach Alfa	,894
<u>4. Discount and Visual Oriented Hedonic Consumption Behavior</u>	
23. In my shopping preferences, the stores' atmosphere (design, lights, aesthetics, etc.) causes me to buy more.	,758
24. The images and usage (colors, design, etc.) of the website I shop from cause me to buy more.	,740
25. I can spend extra time evaluating the coupons or campaigns I have won from online stores.	,761
26. The higher-priced products are of better quality.	,830
21. When I come across discounts or campaigns, I always buy something.	,772
Cronbach Alfa	,811

As seen in Table 8, the reliability of the rational consumption behavior factor is .90, the reliability of the addiction tendency hedonic consumption behavior factor is .88, the reliability of the emotion-focused hedonic consumption behavior factor is .89, and the discount and visual oriented hedonic consumption behavior factor is .81. Therefore, since the reliability of the factors is more than .80, we can say that they are very reliable.

5. HYPOTHESES OF THE RESEARCH

5.1. Hypotheses

Gender from demographic data, factor variables of groups obtained from factor analysis, and used brain region data included in the hypotheses. In this direction, the following 39 hypotheses were created:

H1: There is a relation between extraversion personality traits and addiction tendency hedonic consumption behavior.

H2: There is a relation between anxious personality traits and addiction tendency hedonic consumption behavior.

H3: There is a relation between responsive personality traits and addiction tendency hedonic consumption behavior.

H4: There is a relation between imaginative personality traits and addiction tendency hedonic consumption behavior.

H5: There is a relation between agreeableness personality traits and addiction tendency hedonic consumption behavior.

H6: There is a relation between extraversion personality traits and emotion-focused hedonic consumption behavior.

H7: There is a relation between anxious personality traits and emotion-focused hedonic consumption behavior.

H8: There is a relation between responsive personality traits and emotion-focused hedonic consumption behavior.

H9: There is a relation between imaginative personality traits and emotion-focused hedonic consumption behavior.

H10: There is a relation between agreeableness personality traits and emotion-focused hedonic consumption behavior.

H11: There is a relation between extraversion personality traits and discount and visual-oriented hedonic consumption behavior.

H12: There is a relation between anxious personality traits and discount and visual-oriented hedonic consumption behavior.

H13: There is a relation between responsive personality traits and discount and visual-oriented hedonic consumption behavior.

H14: There is a relation between imaginative personality traits and discount and visual-oriented hedonic consumption behavior.

H15: There is a relation between agreeableness personality traits and discount and visual-oriented hedonic consumption behavior.

H16: There is a relation between extraversion personality traits and rational consumption behavior.

H17: There is a relation between anxious personality traits and rational consumption behavior.

H18: There is a relation between responsive personality traits and rational consumption behavior.

H19: There is a relation between imaginative personality traits and rational consumption behavior.

H20: There is a relation between agreeableness personality traits and rational consumption behavior.

H21: There is a relation between the extraversion personality traits and the brain region used.

H22: There is a relation between anxious personality traits and the brain region used.

H23: There is a relation between responsive personality traits and the brain region used.

H24: There is a relation between the imaginative personality traits and the brain region used.

H25: There is a relation between agreeableness personality traits and the brain region used.

H26: There is a relation between the used brain region (right brain) and addiction tendency hedonic consumption behavior.

H27: There is a relation between the used brain region and emotion-focused hedonic consumption behavior.

H28: There is a relation between the used brain region and discount and visual-oriented hedonic consumption behavior.

H29: There is a relation between the used brain region and rational consumption behavior.

H30: There is a relation between the extraversion personality traits and gender.

H31: There is a relation between anxious personality traits and gender.

H32: There is a relation between responsive personality traits and gender.

H33: There is a relation between imaginative personality traits and gender.

H34: There is a relation between agreeableness personality traits and gender.

H35: There is a relation between gender and addiction tendency hedonic consumption behavior.

H36: There is a relation between gender and emotion-focused hedonic consumption behavior.

H37: There is a relation between gender and discount and visual-oriented hedonic consumption behavior.

H38: There is a relation between gender and rational consumption behavior.

H39: There is a relation between gender and the used brain region.

5.2. Hypotheses Tests

5.2.1. Correlations analysis.

This section analyzes whether there is a significant relationship between character traits and consumption behavior and the aspects of the relationship. A correlation test was applied to determine whether there is a relationship between two continuous variables.

Pearson's Correlation Coefficient test was applied since there is a sufficient sample size (N=409). It can be interpreted as a significant relationship in cases where the p-value was less than 0.05 or 0.01. There was no significant relationship in cases where the p-value was higher than 0.05.

Table 9

Correlation test results

Correlation Test Results	Extraversion	Anxious	Responsible	Imaginative	Agreeableness	Rational Consumption Behavior	Addiction Tendency Hedonic Consumption Behavior	Emotion- focused Hedonic Consumption Behavior	Discount and Visual Oriented Hedonic Consumption Behavior
Extraversion									
Anxious	-,257**								
Responsible	,341**	-,219**							
Imaginative	,415**	-,175**	,317**						
Agreeableness	,150**	-,214**	,252**	,172**					
Rational Consumption Behavior	-,037	-,193**	,225**	,033	,158**				
Addiction Tendency Hedonic Consumption Behavior	,020	,272**	-,167**	,001	-,142**	-,576**			
Emotion- focused Hedonic Consumption Behavior	,088	,321**	,004	,077	-,054	-,404**	,695**		
Discount and Visual Oriented Hedonic Consumption Behavior	-,034	,234**	-,180**	-,035	-,114*	-,359**	,631**	,561**	

*p<0,05 **p<0,01

Table 9 shows the results of the Pearson's Correlation Coefficient values applied between personality traits and consumption behaviors. The cases in which the relationship was statistically significant ($p < 0.05$ or $p < 0.01$) were indicated in the table, while in other cases, no significant relationship ($p > 0.05$) was observed. The sign of the correlation coefficient also shows the direction of the relationship. If the correlation coefficient is less than 0, there is a negative relationship, and if it is greater than 0, there is a positive relationship between two variables. In negative relationships, one value increases while the other decreases, while in positive relationships, one value increases as the other increases.

The cases in which a highly significant relationship was found according to the classification given above are discussed below.

Table 10

The cases in which the highest correlation coefficient

		Correlation Coefficient
Addiction Tendency Hedonic Consumption Behavior	Emotion-focused Hedonic Consumption Behavior	,695**
Discount and Visual Oriented Hedonic Consumption Behavior	Addiction Tendency Hedonic Consumption Behavior	,631**
Rational Consumption Behavior	Addiction Tendency Hedonic Consumption Behavior	-,576**
Emotion-focused Hedonic Consumption Behavior	Discount and Visual Oriented Hedonic Consumption Behavior	,561**

* $p < 0,05$ ** $p < 0,01$

According to the Table 10, there is a highly significant positive correlation between addiction tendency and emotion-focused hedonic consumption behavior. In other words, as the effectiveness of addiction tendency hedonic consumption behavior

increases, the effectiveness of emotion-focused hedonic consumption behavior increases ($p < 0.01$). Alternatively, as addiction tendency hedonic consumption behavior decrease, the effectiveness of emotion-focused hedonic consumption behavior also decreases. The scatter plot of the relationship is given in Figure 33. On the horizontal axis are the values of addiction tendency hedonic consumption behavior, and on the vertical axis are the values of emotion-focused hedonic consumption behavior. Each dot represents an individual. It is possible to see the relationship between both values from the graph. There is a highly significant positive correlation between the discount and visual oriented hedonic consumption behavior and the addiction tendency hedonic consumption behavior. In other words, as the effectiveness of discount and visual-oriented hedonic consumption behavior increases, the effectiveness of addiction tendency increases ($p < 0.01$). Alternatively, as discount and visual-oriented hedonic consumption behavior decrease, addiction tendency also decreases. The scatter plot of the relationship is given in Figure 34. There is a highly significant negative correlation between rational consumption behavior and addiction tendency hedonic consumption behavior. In other words, as the effectiveness of rational consumption behavior increases, the effectiveness of hedonic consumption behavior decreases ($p < 0.01$). Alternatively, as rational consumption behavior decreases, the point of emotion-focused hedonic consumption behavior increases. The scatter plot of the relationship is given in Figure 35. There is a highly significant positive correlation between emotion-focused hedonic consumption behavior and discount and visual-oriented hedonic consumption behavior. In other words, as the effectiveness of emotion-focused hedonic consumption behavior increases, the effectiveness of discount and visual-oriented hedonic consumption behavior increases (p

< 0.01). Alternatively, as emotion-focused hedonic consumption behavior decreases, the effectiveness of discount and visual-oriented hedonic consumption behavior decreases.

The scatter plot of the relationship is given in Figure 36.

Figure 33

Addiction Tendency Hedonic&Emotion-focused Hedonic Scatter Plot

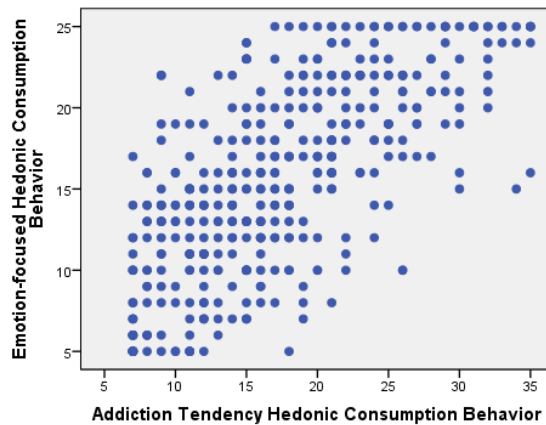


Figure 34

Discount and Visual Oriented Hedonic&Addiction Tendency Hedonic Scatter Plot

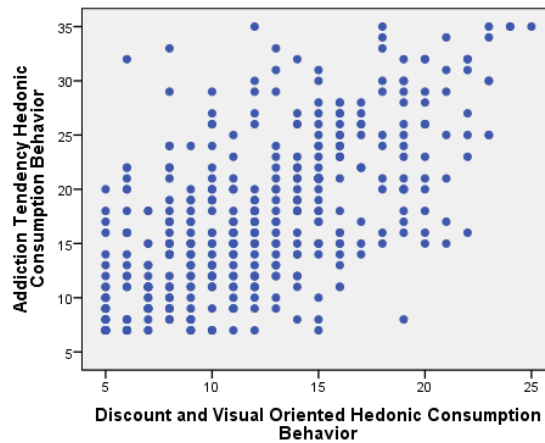
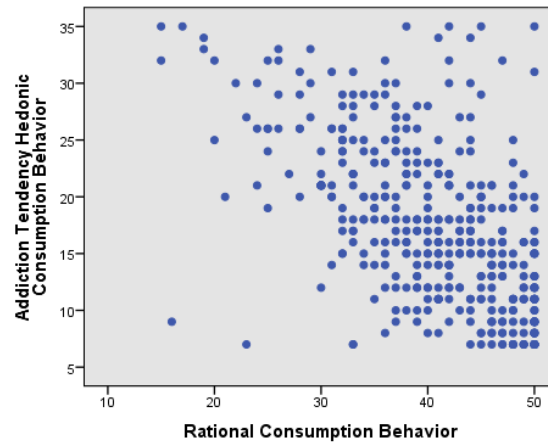
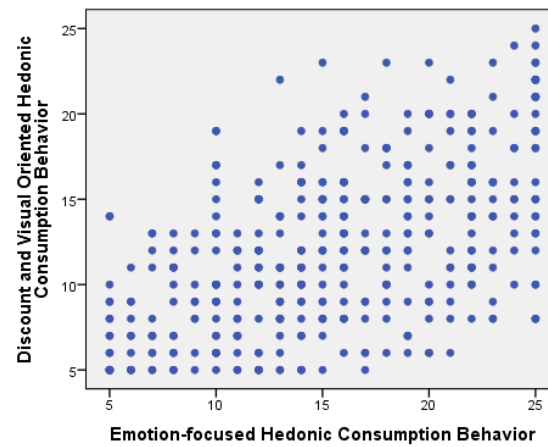


Figure 35

Rational&Addiction Tendency Hedonic Scatter Plot

**Figure 36**

Emotion-focused Hedonic&Discount and Visual Oriented Hedonic Scatter Plot



5.2.2. t-Test analysis.

Table 11 showing the results of the t-test comparing the results of gender with character traits analysis and consumption behavior analysis is given below. Since the number of only one transgender person was low, it was excluded to not affect the analysis results when performing gender-oriented analysis.

Table 11

t-Test Table for Comparison of Men and Women

Factor	Gender	N	Mean	sd	df	t	p
Extraversion	Female	237	18,91	3,815	406	,119	,905
	Male	171	18,86	4,215			
Anxious	Female	237	22,02	5,637	406	3,018	,003*
	Male	171	20,39	4,967			
Responsible	Female	237	21,36	2,935	406	,145	,885
	Male	171	21,32	3,429			
Imaginative	Female	237	11,79	2,136	406	-2,336	,020*
	Male	171	12,30	2,180			
Agreeableness	Female	237	12,00	2,334	406	-,082	,934
	Male	171	12,02	1,957			
Rational Consumption Behavior	Female	237	39,11	8,071	406	-4,129	,000*
	Male	171	42,11	6,586			
Addiction Tendency Hedonic Consumption Behavior	Female	237	18,62	7,674	406	3,946	,000*
	Male	171	15,91	6,174			
Emotion-focused Hedonic Consumption Behavior	Female	237	17,42	5,499	406	7,918	,000*
	Male	171	13,09	5,382			
Discount and Visual Oriented Hedonic Consumption Behavior	Female	237	12,67	4,905	406	2,627	,009*
	Male	171	11,42	4,560			

*p<0,05

After the t-test to compare the anxious characteristics of men and women, it was found that the difference between the anxious levels of the male and female participants

was statistically significant ($p=.003$). Accordingly, female participants' anxiety levels ($\bar{x}=22.02$) were higher than male participants ($\bar{x}=20.39$). After the t-test to compare the imaginative features of women and men, it was found that the difference between the imagination levels of male and female participants was statistically significant. ($p=.020$). Accordingly, female participants' imaginative levels ($\bar{x}=11.79$) are lower than those of male participants ($\bar{x}=12.30$). After the t-test to compare the rational consumption behaviors of men and women, it was found that the difference between the rational consumption behaviors of male and female participants was statistically significant ($p=.000$). Accordingly, female participants ($\bar{x}=39.11$) show less rational consumption behavior than male participants ($\bar{x}=42.11$). After the t-test to compare the addiction tendency hedonic consumption behaviors of men and women, it was found that the difference between the addiction tendency hedonic consumption behaviors of the male and female participants was statistically significant ($p=.000$). Accordingly, female participants ($\bar{x}=18.62$) show more addiction tendency hedonic consumption behavior characteristics than male participants ($\bar{x}=15.91$). After the t-test to compare the emotion-focused hedonic consumption behaviors of men and women, it was found that the difference between the emotion-focused hedonic consumption behaviors of the male and female participants was statistically significant ($p=.000$). Accordingly, female participants ($\bar{x}=17.42$) show more emotion-focused hedonic consumption behavioral characteristics than male participants ($\bar{x}=13.09$). After the t-test to compare the Discount and Visual Oriented hedonic consumption behaviors of men and women, it was found that the difference between the Discount and Visual Oriented hedonic consumption behaviors of the female and male participants was statistically significant ($p=.009$).

Accordingly, female participants ($\bar{x}$ =12.67) show more discount and visual-oriented hedonic consumption behavior than male participants ($\bar{x}$ =11.42).

Table 12 showing the results of the t-test comparing the results of the used brain region with character traits analysis and consumption behavior analysis is given below.

Table 12

t-Test Table for Comparison of Brain-region

Factor	Brain-region	N	Mean	sd	df	T	p
Extraversion	Right Brain	330	19,11	3,893	407	2,289	,023*
	Left Brain	79	17,97	4,218			
Anxious	Right Brain	330	21,51	5,407	407	1,316	,189
	Left Brain	79	20,62	5,417			
Responsible	Right Brain	330	21,45	3,165	407	1,643	,101
	Left Brain	79	20,80	3,160			
Imaginative	Right Brain	330	12,06	2,136	407	1,111	,267
	Left Brain	79	11,76	2,277			
Agreeableness	Right Brain	330	11,91	2,218	407	-1,667	,096
	Left Brain	79	12,37	2,008			
Rational Consumption Behavior	Right Brain	330	40,28	7,806	407	-,357	,721
	Left Brain	79	40,62	6,864			
Addiction Tendency Hedonic Consumption Behavior	Right Brain	330	17,69	7,297	407	1,192	,234
	Left Brain	79	16,62	6,722			
Emotion-focused Hedonic Consumption Behavior	Right Brain	330	16,02	5,725	407	2,864	,004*
	Left Brain	79	13,94	6,077			
Discount and Visual Oriented Hedonic Consumption Behavior	Right Brain	330	12,18	4,864	407	,155	,877
	Left Brain	79	12,09	4,594			

*p<0,05

After the t-test to compare the extraversion characteristics of the participants according to the brain regions they used, it was found that the difference between the participants' extraversion levels and used brain regions was statistically significant ($p=0.023$). Accordingly, the extraversion levels of the right-brain dominant participants ($\bar{x} = 19.01$) were higher than the left-brain-dominant participants' extraversion levels ($\bar{x} = 17.97$). After the t-test to compare the emotion-focused hedonic consumption behaviors of the participants according to the brain regions they used, it was found that the difference between the participants' emotion-focused hedonic consumption behaviors and used brain regions was statistically significant ($p=0.004$). Accordingly, right-brain dominant participants ($\bar{x} = 16.02$) show more emotion-focused hedonic consumption behavioral characteristics than left-brain-dominant participants ($\bar{x} = 13.94$). There is no significant difference between anxious character traits and the brain regions used, responsible character traits and the brain regions used, imaginative character traits and the brain regions used, agreeableness character traits and the brain regions used. There is no significant difference between rational consumption behavior and the brain regions used, addiction tendency hedonic consumption behavior and the brain regions used, discount and visual oriented hedonic consumption behavior and the brain regions used.

5.2.3. Chi-square test analysis.

Since the question type was categorical in the analyses, the "chi-square" test statistics is used. The p-value calculated in the chi-square relationship test is compared with the significance coefficient of 0.05. If the calculated p-value is less than 0.05, it can be said that there is a relationship between the variables.

Table 13

Chi-Square Tests Table for Comparison of Gender and Used Brain Region

Gender		Used Brain Region		Total	χ^2	df	p
		Right Brain	Left Brain				
Female	Count	205	32	237	12,439	1	0,000*
	%	50,2%	7,8%	58,1%			
Male	Count	124	47	171			
	%	30,4%	11,5%	41,9%			
Total	Count	329	79	408			
	%	80,6%	19,4%	100,0%			

*p<0,05

There is a statistically significant relationship between gender and the used brain region ($\chi^2=12,439$ p=0.000 p<0.05). While 50.2% of women use the right brain region dominantly, 30.4% of men use the right brain region dominantly.

6. DISCUSSION

In our country, neuromarketing studies are superficial studies on advertisements and brands that are not supported by detailed data and are generally conducted for commercial purposes. Therefore, academic studies are essential. This study, with its originality and comprehensiveness, contributes to the literature by shedding light on future academic studies on neuromarketing, a new marketing approach, by giving direction and creating the groundwork. The results of the study analysis and the information obtained are summarized below.

To test Hypothesis 1–20, the relationship between character traits and consumption behaviors was analyzed with Pearson's Correlation Test. Hypotheses H1, H4, H6, H8, H9, H10, H11, H14, H16, and H19 were rejected. There is a positive relationship between anxious character traits and three hedonic behavior styles (addiction tendency, emotional-focused, discount, and visual-oriented) and a negative relationship between rational consumption behavior and responsibility and agreeableness as character traits. It has been determined that creative and extraversion character traits do not affect consumption behaviors, and there is no relationship between them.

The H21 and H27 hypotheses were accepted, while the H22, H23, H24, H25, H26, H28, and H29 hypotheses were rejected, based on the findings of the analysis conducted to test hypotheses 21-29 about whether personality traits and consumption behaviors differ significantly depending on the variable of the brain region used. A significant difference was observed between the extraversion character trait and the brain region used. Accordingly, the dominant use of the right brain region is higher than the left-brain region. In addition, a significant difference was found between the used brain

region variable and emotion-focused hedonic consumption behavior. Emotion-focused hedonic consumption behavior is higher in right-brain-dominated individuals than in left-brain-dominated ones.

According to the analysis results on whether personality traits and consumption behaviors show a significant difference according to the gender variable, H31, H33, H35, H36, H37, and H38 hypotheses were accepted, while H30, H32, and H34 hypotheses were rejected. A significant difference was observed between the anxious character trait and the gender variable. It has been analyzed that women show more anxious personality traits than men. In addition, a significant difference was found between the gender variable and the imaginative character trait. Women showed more imaginative personality traits than men. In addition, all hedonic consumer behaviors (addiction tendency, emotional-focused, discount, and visual-oriented), especially addiction tendency and emotional-focused consumption behavior, are proportionally higher in female participants than in male participants. Moreover, it was found that male participants showed much more rational shopping behavior than female participants.

The H39 hypothesis was accepted as a result of the analysis performed to determine whether there was a significant difference between the used brain region variable and the gender variable. Gender and brain region used were found to differ significantly. While women use their right brain more than men, men use their left brain more than women.

After all this hypothesis testing, the most effective result was that men showed more rational consumption behavior while women showed more hedonic shopping behavior. The second most compelling result was that men's use of the left-brain region

was proportionally higher than that of the female participants. It is also crucial that these two are consistent with each other and that they end up supporting each other. The positive relationship between the anxious character trait and hedonic consumption behaviors, the negative relationship with rational consumption behavior, and the positive relationship between the responsibility and compatibility character traits and rational purchasing behavior all support and are actual results of the analysis.

Table 14 gives the general picture of accepting or rejecting hypotheses.

Table 14

General table of evaluation of hypotheses

H1: There is a relation between extraversion personality traits and addiction tendency hedonic consumption behavior.	Reject
H2: There is a relation between anxious personality traits and addiction tendency hedonic consumption behavior.	Accept
H3: There is a relation between responsive personality traits and addiction tendency hedonic consumption behavior.	Accept
H4: There is a relation between imaginative personality traits and addiction tendency hedonic consumption behavior.	Reject
H5: There is a relation between agreeableness personality traits and addiction tendency hedonic consumption behavior.	Accept
H6: There is a relation between extraversion personality traits and emotion-focused hedonic consumption behavior.	Reject
H7: There is a relation between anxious personality traits and emotion-focused hedonic consumption behavior.	Accept
H8: There is a relation between responsive personality traits and emotion-focused hedonic consumption behavior.	Reject
H9: There is a relation between imaginative personality traits and emotion-focused hedonic consumption behavior.	Reject
H10: There is a relation between agreeableness personality traits and emotion-focused hedonic consumption behavior.	Reject
H11: There is a relation between extraversion personality traits and discount and visual-oriented hedonic consumption behavior.	Reject
H12: There is a relation between anxious personality traits and discount and visual-oriented hedonic consumption behavior.	Accept
H13: There is a relation between responsive personality traits and discount and visual-oriented hedonic consumption behavior.	Accept

H14: There is a relation between imaginative personality traits and discount and visual-oriented hedonic consumption behavior.	Reject
H15: There is a relation between agreeableness personality traits and discount and visual-oriented hedonic consumption behavior.	Accept
H16: There is a relation between extraversion personality traits and rational consumption behavior.	Reject
H17: There is a relation between anxious personality traits and rational consumption behavior.	Accept
H18: There is a relation between responsive personality traits and rational consumption behavior.	Accept
H19: There is a relation between imaginative personality traits and rational consumption behavior.	Reject
H20: There is a relation between agreeableness personality traits and rational consumption behavior.	Accept
H21: There is a relation between the extraversion personality traits and the brain region used.	Accept
H22: There is a relation between anxious personality traits and the brain region used.	Reject
H23: There is a relation between responsive personality traits and the brain region used.	Reject
H24: There is a relation between the imaginative personality traits and the brain region used.	Reject
H25: There is a relation between agreeableness personality traits and the brain region used.	Reject
H26: There is a relation between the used brain region (right brain) and addiction tendency hedonic consumption behavior.	Reject
H27: There is a relation between the used brain region and emotion-focused hedonic consumption behavior.	Accept
H28: There is a relation between the used brain region and discount and visual-oriented hedonic consumption behavior.	Reject
H29: There is a relation between the used brain region and rational consumption behavior.	Reject
H30: There is a relation between the extraversion personality traits and gender.	Reject
H31: There is a relation between anxious personality traits and gender.	Accept
H32: There is a relation between responsive personality traits and gender.	Reject
H33: There is a relation between imaginative personality traits and gender.	Accept
H34: There is a relation between agreeableness personality traits and gender.	Reject
H35: There is a relation between gender and addiction tendency hedonic consumption behavior.	Accept
H36: There is a relation between gender and emotion-focused hedonic consumption behavior.	Accept
H37: There is a relation between gender and discount and visual-oriented hedonic consumption behavior.	Accept
H38: There is a relation between gender and rational consumption behavior.	Accept
H39: There is a relation between gender and the used brain region.	Accept

7. CONCLUSION AND RECOMMENDATIONS

The ultimate goal of all businesses, large or small, is to make a profit. They make great efforts to maximize this. In today's increasingly competitive environment and marketing world, it is challenging for businesses to find a place and hold on. At this point, consumer needs and desires and how businesses react to them come to the fore. Knowing consumer needs in advance with a strategic attitude and developing appropriate policies will undoubtedly benefit businesses.

Consumers buy many products and services throughout their lives to meet their needs. Today, it is thought that consumers do not only shop within rational expectations, but their emotions, which are formed depending on their personality traits, are also effective in their shopping. Research reveals that subconscious factors are more effective when consumers make decisions during purchases. In this situation, traditional methods are insufficient for marketers, and neuromarketing comes into play. Neuromarketing helps to create an effective strategy in the field of marketing by revealing the real reasons for consumer preferences. With the help of the tools used in neuroscience, neuromarketing measures the brain waves of consumers on which factors such as age, gender, society, cultural values, and economic status are also effective and reveals how consumers react to the messages given the marketers. Thanks to reaching the raw state of consumer behavior in mind, they get the chance to offer the products they want to the consumer.

Neuromarketing provides excellent opportunities not only for marketers but also for consumers. So that this method reveals the fundamental ideas of the consumers about the products. This allows marketers to design their products in line with the consumer's

wishes, consider the consumer's opinion while determining the pricing policies, and develop new strategies to gain trust. This situation provides excellent opportunities for the consumer who wants their needs to be met in the shortest time and in the best way. Neuromarketing is an approach that should be considered comprehensively in consumer decisions. For this reason, it is considered essential to determine the personality traits of consumers and reveal their consumption habits. For this purpose, the relationship between consumer behavior and consumers' personality traits has been examined.

Although many studies examine the effects of personality traits on consumers' behaviors, this study is thought to be critical in addressing the relationship between personality traits that affect individuals' decisions and behaviors and consumption behavior dimensions. The study tried to explain the relationships between personality traits and consumption behaviors sub-dimensions, whether these sub-necks have a significant difference according to gender and the brain region used, with the help of correlation and t-tests and chi-square analysis. Other demographic variables such as age, marital status and education of the participants were not included in the hypotheses, and these data were presented for informational purposes. Research results show that personality traits are related to consumer behavior dimensions in various aspects. According to the findings of this study, there are significant effects at various levels between male and female participants and among participants with right-brain and left-brain dominant for personality traits and sub-dimensions of consumption behaviors.

The results obtained from this research show that businesses can gain a competitive advantage if they determine the personality traits of their customers correctly and meet the different needs and expectations of their customers, who show different

consumption behaviors in their shopping. Businesses will be able to respond to changing consumer needs. The inclusion of demographic data in comparative analyzes in future studies will yield more specific results. In addition, more precise analysis results can be obtained if more detailed questions about the use of the brain region are prepared and supported by neuroimaging techniques.

With the advancement of technology, the cost of devices used in neuromarketing will gradually decrease and become an indispensable part of consumer, market, and advertising research. Neuromarketing will be used more widely in the future by marketing managers and advertisers as it sheds light on what goes on in the human mind. Since it is thought that the neuromarketing approach will attract more attention in the future, studies in this field should be increased and supported. It is thought that more scientific results will be achieved with applied research, mainly if future research is financially supported within the project's scope. In addition, if a course on neuromarketing is added to the curriculum of the students who receive marketing education at universities, their awareness level in this area can be increased. As a result of these results, marketing companies and their managers envisaged that appropriate strategies could be developed for male and female consumers, taking into account consumer decision-making styles.

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