Understanding Consumer Preferences and Behaviors through Neuromarketing: An Empirical Study

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ABSTRACT

This study aims to introduce neuromarketing, a new application in marketing activities, by determining consumer preferences and behaviors. The research intends to assess the relationship between consumers' personality traits, decision-making styles, and neuromarketing. The study sample consists of 409 randomly selected participants between the ages of 18-65. The questionnaire is composed of three parts. The first part includes questions about shopping preferences and consumption behaviors. The second part is about the character traits of the participants. In the last part, the demographic characteristics of the participants and questions about examining which brain region is dominant are asked. The study findings which were analyzed by statistical methods showed significant effects at various levels between male and female participants and between right-brain and left-brain dominant participants in the sub-dimensions of personality traits and consumption behaviors. In addition, the research also shows that personality traits are related to consumer behavior dimensions in various ways.
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1.INTRODUCTION

Neuromarketing is a relatively new marketing application approach. With the recent acceleration of technological developments and developments in brain imaging technologies, the number of studies exploring the human brain has increased. Neuromarketing is a branch of marketing that analyzes and develops marketing strategies based on the consumer's unconscious movements and habits.

In the wake of the COVID-19 pandemic, digital marketing has gained greater importance, which has been a boon for the global neuromarketing market. The study of neuromarketing has gained more significance due to the growing focus on the consumer and the widespread adoption of digital technology. The market has been propelled forward by advancements in eye tracking and facial coding and cutting-edge technology brought about by the fourth industrial revolution. Despite companies' continued commitment to a consumer-first approach, the global neuromarketing market size was valued at $2,493 million in 2021 and is expected to reach $21,218 million by 2030, growing at a CAGR of 8.9% during the forecast period (2022-2030) (Straits Research, 2021).

Giving an opinion on human behavior allows brands to capture the consumer's attention and correct the message they want to send to the consumer. Brands can reach a larger audience by using this technique, which is both technical and practical. Neuromarketing is a relatively new field that successfully combines neuroscience and consumer psychology. By measuring consumers' emotional and unconscious responses, neuromarketing has transformed marketing research. It accomplishes this by determining the origins of consumer behavior and then using neuroimaging techniques and other biological metrics to persuade consumers to make purchases. The scope of the application in this process is attempting to understand the factors affecting the consumer (Kong et al., 2013).

Neuromarketing is based on neuroscientist Antonio Damasio's claim that people make decisions with emotions rather than rational minds. Thus, neuromarketing is the neurological examination of consumers' reactions and mental states in response to marketing or advertising messages. The primary goal of neuromarketing is a better understanding and prediction of consumer behavior.

Neuromarketing is a new way of studying consumer behavior that incorporates findings and techniques from neuroscience, cognitive psychology, and marketing (Ariely & Berns, 2010). Cognitive neuroscience and psychophysiology, we believe, are at the forefront of neuromarketing research. Before discussing Neuromarketing, it is necessary to define the terms neuroscience and psychophysiology. The biological responses of the human brain are studied in neuroscience to reveal the decision-making process (Renvoise & Morin, 2007). Psychophysiology is the study of the interaction between the human brain and the body (Precourt, 2015). Psychophysiology encompasses psychological processes such as fear and anger and cognitive processes such as problem-solving and decision-making (Andreassi, 2013).

Neuromarketing, as defined by neuroscience and psychophysiology, is the application of neuroscience and psychophysiology findings to marketing (Hubert & Kenning, 2008). It develops marketing strategies and activities using data obtained from medical techniques for non-medical purposes (Lewis, 2013).

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. This study aimed to accomplish this by examining the brain region utilized (right or left) and its correlation with purchasing behavior and personality traits.

2. CONCEPTUAL FRAMEWORK
2.1.Brain Imaging Techniques

After WWII, neuroscience research emerged to investigate how people make decisions. Individual cells were examined under a microscope to study changes in neurons in the 1970s. Neuroimaging devices that can see inside the brain and track the evolution of synapses in real time are now available (Jensen & Nutt, 2014). However, the most severe research on neuromarketing occurred in the 1990s, when Harvard University's Gerry Zaltman and Stephen Kosslyn announced the use of functional magnetic resonance imaging in their marketing research (Fisher et al., 2010).

Many researchers, advertisers, and marketing researchers have used neuromarketing techniques since the emergence of neuromarketing and the idea that human physiology can be used outside of verbal expressions to understand consumer preferences. Emotions and thoughts are formed as a result of neurons communicating with one another via electrical messages. Understanding human behavior requires the observation of these electrical signals using imaging devices (Jensen & Nutt, 2014). It is possible to comment on what consumers react to

the most based on the electrochemistry observed in different parts of the human brain using brain-scanning technology.

While brain imaging measures attention, memory, mental influences, and preferences, it also measures behaviors before and after these processes. Neuromarketing brain scanning tests reveal subconscious thoughts, feelings, and desires that influence consumer purchasing decisions. Advertisements, images, logos, and other materials related to the subject of research are available to researchers to monitor the activity in the subjects' brains and measure how they responded to it after showing it to them (Hart, 2009).

Neuroscience methods entail measuring, mapping, and recording brain and neural activity in behavior using tools and techniques. These techniques enable neuroscientists to observe neural processes in behavior; they can be classified as neuroscience tools and techniques for recording neural activity or techniques for manipulating it (Lim, 2018). According to Oliveira and Giraldi (2017), without neuroscientific measures, marketing research cannot be classified as neuromarketing. Neurometry should be supplemented with biometric measurement to determine the specific meaning of emotional data. Neuromarketing techniques have a higher cost-benefit ratio than traditional techniques (Ariely & Berns, 2010). Neuromarketing techniques, such as fMRI and EEG, help us understand how our brain responds to advertisements, brands, and products, particularly unconsciously (Miller, 2006).

According to Agarwal and Xavier (2015), fMRI has grown in popularity in neuromarketing research over the last decade due to its high spatial resolution, or ability to peer deeply into the consumer's brain. Researchers can use fMRI to monitor neural activity and examine researchers' cognitive and advertising responses to print advertisements (Wilson et al., 2008). Preferences can be determined by electrical movements in the brain. Consumer tastes, favorite music genres, and willingness to buy can all be measured using fMRI.

The most common and well-known neuroscience measurement technique is electroencephalography, or EEG, which is measured with an electrode placed on the scalp. The degree of density and measurement accuracy increase as the applied electrode charge increases (Ariely & Berns, 2010). EEG has a long history in neurology and is widely used to measure brain activity. When a specific stimulus activates our neural circuitry, which is made up of more than 100 billion neurons and trillions of synaptic connections that form the basis of our cognitive response, the neurons are activated, producing a small amplifiable electrical current (Morin, 2011).

Magnetoencephalography, or MEG, is a technique used to study brain activity. It measures continuous brain activity in milliseconds and displays the location of the brain activity. A Magnetic Brain X-ray produces a snapshot of the brain that shows which parts of the brain are active in response to a stimulus. It operates with a slight delay compared to devices with similar functionality (Sutherland, 2007).

To understand consumer responses to stimuli, neuromarketing employs biometric methods as well as other neuroimaging and brain activity measurement techniques (Brenninkmeijer et al., 2020). Computer-controlled systems designed to measure consumers' physical and behavioral responses are examples of biometric measurements. The most common biometric measurement techniques in neuromarketing include pupil movements, facial movements, electrochemical responses, electrification, and transepidermal sweating measurement (Shiv & Yoon, 2012).

Eye-tracking data is obtained by tracking the position of the eyes to determine where a person is looking (Bergstrom & Schall, 2014). The eye's path was used to investigate visual perception, cognitive purpose, and preference.

The galvanic response, or GSR, is an autonomic nervous system response that indicates specific responses of the skin, specifically the palms, to both pleasure and stress. Parts

of the image or product that please or irritate them are determined by monitoring these reactions (Plassmann et al., 2015). For example, increased sweating in response to emotional responses is a sign of increased electrical resistance in the skin, which causes excitement (LaBarbera & Tucciarone, 1995).

Faces are a valuable source of information. We can tell if a face belongs to someone we know by looking at it. A person's gender, race, or emotional state can all be determined despite minor differences in facial features (Pearce & Arnold, 2013). Face coding is the process of collecting data by measuring the changes in facial expressions caused by emotions (Renvoise & Morin, 2007).

People's heart rates fluctuate as a result of emotional changes. We can also see changes in heart rate as a result of emotions like fear and excitement. According to research, the heart rate increases in response to unpleasant stimuli. In response to pleasant stimuli, the heart rate slows (Watson & Gatchel, 1979).

2.2.The Brain

One of the techniques used by marketing science to reach consumers is neuromarketing, which directs us to our brains. Brain research is becoming more important as scientists begin to unravel the mysteries of the brain. The physiological structure of the brain, as well as the role of logic and emotions in our decisions, are being studied. Neuromarketers are also attempting to comprehend the human brain, which is also responsible for consumer behavior and manages the majority of daily functions (Morin, 2011).

The human brain is the most complex and unexplored organ on the planet, with over a hundred million nerve cells and trillions of synaptic connections (Morin, 2011). Many systems in the body are controlled by the brain. When the brain is examined closely, it is discovered to have a deep cleft from front to back as well as two separate hemispheres on the right and left (Ziylan & Murshid, 2000). These two hemispheres are divided into four major parts: the frontal lobe, the parietal lobe, the occipital lobe, and the temporal lobe (Kolb & Whishaw, 2009). In short, the brain consists of these four lobes, the cerebellum, and the brain stem, as well as the limbic system.

For practical purposes, such as comprehension, the brain is also divided into three parts. The reptilian brain, limbic brain, and rational brain are the parts of the brain that are also known as the consumer's brain (Valencia, 2017). The reptilian brain is the first. The reptilian brain is entirely focused on survival. The limbic system, the other stage, is concerned with emotions. The neocortex, the third stage, is associated with higher-order thinking (Eagleman, 2014). The effect of these three different structures, according to Rapaille and Roemer (2015), should be known as an ideal marketing technique.

The reptilian brain is located in the midbrain and brain stem. It is in charge of unconscious behavior such as breathing, heartbeat, and animal instincts. This region is thought to be related to the desire to survive and pass on to the next generation.

The rational brain coordinates activities in the brain's outer regions. The remaining area is information sharing between cells and making informed decisions. It is made up of four lobes with distinct functions that are located in both of our brain hemispheres: the frontal lobe, the parietal lobe, the occipital lobe, and the temporal lobe.

The frontal lobes are located in the front of the head and cover roughly one-third of the cerebral hemispheres. The frontal lobe, also known as the motor lobe, contains two functional centers. The first regulates voluntary movements, including those related to speech, whereas the second is disorganized and concerned with emotional expressions as well as moral and ethical behavior. Higher executive functions such as emotional regulation, planning, reasoning, and problem-solving are frequently performed in the frontal lobe. As a result, it can

be linked to personality, and personality changes can be observed when it is damaged (Plotnik et al., 2009).

The story of railroad worker Phineas Gage is the most well-known example of frontal lobe dysfunction. Gage was using a ramming iron to pack gunpowder in order to blow up a tunnel through the rock in 1848. A false blow caused an explosion that forced the stick upwards into his left eye and out of his skull as his head was turned slightly. Gage miraculously survived, though he was blind in his left eye and had most of his left frontal lobe damage. Others noticed changes in Gage's personality after the accident: before the accident, he was known as responsible and hardworking, but later became disrespectful and abusive, and had difficulty carrying out his plans (Smith, 1993).

A deep cleft separates the parietal lobe from the frontal lobe. The sensory center is located in the middle of the brain, behind the frontal lobe. It detects sensations such as heat, cold, pressure, touch, taste, and general body movement (Smith, 1993).

The Occipital Lobe, located at the back of the brain, is associated with vision. A small wound on the back of the head can frequently result in total blindness (Smith, 1993).

The temporal lobe is responsible for speech, comprehension, processing, medium and long-term memory, language and word formation, emotional balance, and the storage and processing of heard and seen data, also responsible for understanding what is said, perceiving, interpreting emotionality, interpreting and storing what is read, and learning new information. When this region's functioning is impaired, it causes difficulty finding appropriate words, communicating, and reading. At the same time, problems with the temporal region's operation can lead to memory problems (Johnson, 2020).

The limbic brain is the area of the brain that lies between the cerebral hemispheres and the brain stem. This region was originally associated with fear, but the term limbic system later came to refer to all of the neuronal circuits that control emotional behaviors and motivations (Arnc & Elhan, 2006). The limbic system is an important brain region that controls involuntary behaviors such as sleep, attention, body function, hormones, sexuality, fear, and the production of many brain chemicals (Uzbay, 2014). If even a small portion of the limbic system is damaged, the desire to eat and drink, the sensations of restlessness and excitement, and the behavior and sexual desire controlled by the autonomous system all change. The limbic system is made up of three parts: the thalamus, hypothalamus, and amygdala (Çengelci, 2007).

The amygdala, which is crucial to the senses, is crucial in establishing a connection between the senses. The amygdala is a critical component of neural networks that are involved in fear, attachment, early memories, and lifelong emotional experiences (Cozolino, 2014).

The hypothalamus is in charge of connecting the nervous and hormonal systems. It regulates instinctive behaviors like body temperature, hunger, thirst, maternal behavior, childbirth and lactation, sleep, and sexuality (Wolfe, 2001).

The thalamus influences our motor functions, sensations such as depression and moral feelings, and the hypothalamus. It participates in speech and memory events. It reveals our character by demonstrating our sensitivity to events. It modifies the rate at which we perceive sensations and events coming from the brain stem and creates an attitude that we will adopt against our will, particularly in the face of pain. Its connection with the corpus striatum helps with movement control as well (Arıncı & Elhan, 2006).

The limbic system and the other lobes of the brain collaborate to regulate the person's purposeful behavior based on information from the inner and outer environment. Neuromarketing is concerned with the development of marketing methods through the study of neural mechanisms in the brain. In other words, neuromarketing seeks to understand how consumers make purchasing decisions in the real world rather than on what basis they do so.

2.3. Split-Brain Model

Among the various models that describe the brain's functioning, the split-brain model is one of the most widely recognized (Schechter, 2009). In 1860, French scientist Paul Broca discovered that speech disorders occur when a specific area in the left brain is damaged, while speech remains intact if the same area in the right brain is damaged. Studies at the California Institute of Technology have revealed the presence of independent learning and memory functions in separate hemispheres of the human brain (LeCompte & Rush, 1981).

Initially, this model suggests that the left half of the brain controls the right side of the body, while the right half of the brain controls the left side of the body. However, as research has advanced, it has become clear that the left half of the brain represents the logical side, which is responsible for arithmetic operations, language development, writing, organizing ideas, and performing logical and analytical functions (Waxman, 2003).

The cerebrum is divided into two distinct hemispheres, right and left, by a deep cleft, and the corpus callosum provides communication between these hemispheres. Its sole function is to connect the right and left hemispheres and coordinate their functions (Waxman, 2003). To summarize, it is well established that the left and right hemispheres of the brain employ different strategies and process different types of information in unique ways.

2.4. Herrmann's Whole Brain Model

Ned Herrmann divided the brain into four quadrants (Hughes et al., 2017). These four sections symbolize four different modes of thinking, each with distinct cognitive functions known as dominant regions (Kirstein & Kunz, 2016). These metaphorical divisions are based on the upper (cerebral) and lower (limbic) parts of the human brain (Hughes et al., 2017); the upper left region is designated by the letter "A", the lower left region "B", the lower right region "C", and the upper right region "D."

The "A" region, also referred to as the "blue region," represents cerebral processing (Kirstein & Kunz, 2016). It is characterized by logical and realistic thinking, analyzing facts, and processing numbers. The "B" region, also known as the "green region," is organized and detail-oriented, dealing with planning and organizing facts. The "C" region, referred to as the "red zone," is emotional and passionate, representing personalized, interpersonal, expressive, and emotion-based thinking and learning. Finally, the "D" region, also called the "yellow region," represents visual, creative, holistic, conceptual, and future-oriented thinking and learning (Kirstein & Kunz, 2016).

2.5. Neuromarketing and Consumer Behaviour

Information and communication technologies are rapidly evolving in today's marketing world. However, despite evolving technology and techniques, the reasons underlying the target audience's purchasing behavior cannot be revealed. This is because the consumer is exposed to stimuli without being aware of them. Due to the inadequacy of traditional research techniques for understanding consumers, businesses have turned to alternative research methods. As a result, the understanding of marketing has taken a new turn in order to solve the consumer decision-making mechanism.

Discovering the true reasons for consumer preferences will assist marketing managers in developing an effective strategy. Neuromarketing seeks to understand the consumer by analyzing unknowns and subconscious thoughts in their minds. Neuromarketing research examines the true emotional reasons underlying consumers' preferences for goods or services using scientific methods to produce definite results. Although neuromarketing appears to be a tool that only helps determine the wishes and expectations of the target audience, it is an important type of research that explains the psychological and biological causes of social behavior. From this perspective, neuromarketing is an approach that requires extensive research and comprehension.

Consumer behavior is the process by which consumers decide which goods and services to purchase and where, when, how, and from whom they will purchase them (Walters, 1974). Personal, social, economic, and psychological factors all influence consumer purchasing behavior (Derakhshi, 2017). Age, gender, occupation, education level, marital status, income level, personal taste, role-playing, physical activity, and sensuality are all personal factors. Bargaining pleasure, status, authority, social experiences, peer group activities, communicating with others, and culture are all examples of social factors (Tauter, 1972). Needs and motivations, perception, learning, beliefs and attitudes, personality, and lifestyle are all psychological factors (Derakhshi, 2017). Emotions, self-affirmation, trust in the brand, brand awareness, discounts, and motivation all influence the amount paid for a product or service and shape purchasing behavior.

Many marketing studies show that people make purchasing decisions emotionally rather than rationally. Furthermore, the purchase decision is made in a very short period. Consciousness may or may not be active while the brain decides on behavior in response to stimuli (Eagleman, 2014). The unconscious data cannot be expressed verbally. There is a deep understanding of what exactly is going on inside the human mind at any given moment 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.

Our brains devise shortcuts to assist us in making purchasing decisions. Every experience leaves its imprint. When we burn our hands in the oven or catch a cold or the flu, our brain creates a shortcut, or "somatic cursor," about the experience. These cursors, formed by our previous experiences with reward and punishment, connect an experience or emotion with a concrete expected response. It directs us to the decision that will result in the best and most painless outcome. Most purchasing decisions are influenced by these cognitive shortcuts (Lindstrom, 2010).

The goal of neuromarketing is to investigate the neurological basis of purchasing behavior. Neuroscience contributes to behavior prediction. The electrification-related behavior occurs in the relevant region of the brain before the decision is predicted; 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). Relationship findings, rather than cause-and-effect inferences, are the focus of neuromarketing research. Neuroscientific studies, rather than consumer behavior, provide information about the consumer's brain (Plassmann et al., 2015).

The following are the advantages of using neuroscience in marketing and consumer behavior. Consumer decision-making and simultaneous brain wave measurement are both guaranteed. It allows for the testing of existing right-brain and left-brain theories to see if appropriate results are obtained. It enables a more objective evaluation of the consumer (Hubert & Kenning, 2008). Two key points are highlighted when using neuroscientific techniques to understand and analyze consumer purchasing behavior. For starters, the definition shifts neuromarketing away from businesses' understanding of neuroscientific techniques as a means of increasing profits. Second, it broadens the scope of neuromarketing research beyond consumer behavior to include other disciplines (Lee et al., 2007).

Neuromarketing techniques seek to locate the consumer's brain's "buy" button. If this is possible, we will be one step closer to comprehending the black box in the consumer's mind (Fugate, 2007).

2.6.Hedonic and Rational Consumption

Consumer behavior refers to individuals' processes to identify, purchase, use, and dispose of products and services that fulfill their needs and wants. It encompasses motivations, attitudes, and emotions that drive consumers' decision-making. Hedonic consumption, on the other hand, refers to consuming goods and services that provide pleasure, excitement, or sensory stimulation. This type of consumption is driven by emotional or experiential needs rather than practical or functional ones.

The impact of emotions on consumer behavior and found that positive emotions are often associated with increased consumer satisfaction, brand loyalty, and impulse buying (Arnold & Reynolds, 2003). This supports the idea that consumers engage in hedonic consumption to experience positive emotions. The role of brand name in hedonic consumption found that consumers are more likely to engage in hedonic consumption of a well-known brand, as it is perceived to provide a higher level of quality and pleasure Okada, E.M. (2005). This highlights the importance of brand reputation in the hedonic consumption context. There is an interplay between product variety and consumer decision-making in hedonic consumption. Many options could lead to heightened consumer enjoyment and satisfaction. However, it can also cause indecision or an inability to choose (Alba & Williams, 2013).

Consumer behavior and hedonic consumption are closely related and have been the subject of much research over the years. Emotions, brand reputation, product variety, and consumer decision-making are essential in hedonic consumption. Understanding these factors can help marketers better cater to consumers' emotional and experiential needs.

Also, the concept of rational consumption is complex and multidimensional, with different authors offering different perspectives on its definition and impact on consumer behavior. While it may lead to greater satisfaction and better outcomes for individuals, it is essential to consider the more significant societal and environmental implications of consumption.

Halnon (2002) defines rational consumption as a decision-making process where consumers consider the costs and benefits of a particular product or service before making a purchase. This involves analyzing the price, quality, and availability of the product and its suitability for the individual's needs and wants. According to Halnon, rational consumption leads to greater satisfaction and better consumer outcomes.

The concept of rational consumption is subjective and depends on the individual's cultural, social, and economic background. Consumers may not always make rational decisions, as their decision-making may be influenced by various factors such as emotions, beliefs, and social norms (Aldridge, 1994). Ferguson (2006) explores the relationship between rational consumption and consumer behavior, suggesting that consumers may not always act rationally when making purchasing decisions. He suggests that consumers may be influenced by factors such as emotional appeals, brand loyalty, and social norms, which may lead to mindless consumption.

3.METHOD

The research used a set of linked questions that were applied to several participants, and it was based on a field study whose data collection was done by questionnaire. After factor analyses and reliability analyses were performed to examine the relationship between variables, Pearson's Correlation Test, T-test Analysis, and Chi-square Test Analysis for categorical variables were used. The questionnaire data were recorded and analyzed using the IBM SPSS Statistics Version22 software.

3.1.The Research

The sample of the study includes consumers between the ages of 18-65 and using the internet at all education levels in Turkey. All consumers engaged in traditional and digital marketing activities were included in the survey sample. 409 people filled out the questionnaire. Because there is only one trans person, it was excluded when performing gender-based analyzes so that the results of the gender-based analysis would not be affected.

3.2.Research Objectives

The research aims to examine the relationships among personality traits, brain region usage, and consumption behavior. Specifically, the following hypotheses will be tested:

H1: There exists a significant correlation between personality traits and hedonic consumption behavior.

H2: There exists a significant correlation between personality traits and rational consumption behavior.

H3: There exists a significant correlation between personality traits and the brain region utilized.

H4: There exists a significant correlation between the utilized brain region and hedonic consumption behavior.

H5: There exists a significant correlation between the utilized brain region and rational consumption behavior.

H6: There exists a significant correlation between personality traits and gender.

H7: There exists a significant correlation between gender and addiction tendency in hedonic consumption behavior.

H8: There exists a significant correlation between gender and emotion-focused hedonic consumption behavior.

H9: There exists a significant correlation between gender and hedonic consumption behavior.

H10: There exists a significant correlation between gender and rational consumption behavior.

H11: There exists a significant correlation between gender and the utilized brain region.

This study aims to contribute to the current understanding of the complex interactions between individual factors, brain functioning, and consumption behavior.

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

The questionnaire was distributed via the internet to consumers of various demographics and income levels. The survey form link, which was created using Google Forms, was emailed to the participants. Furthermore, potential errors were avoided by imposing constraints such as only sending an answer to each participant once and not being able to complete the survey without answering every question. The survey contains 64 questions in total. The questionnaire inquiries were obtained as a result of the literature review. The Big Five Trait Taxonomy (John & Srivastava, 1999) was utilized in the questions to assess personality traits. Researchers consider Herrmann's Whole Brain Theory in the questions to determine the brain region employed for this study (Herrmann, 1995).

The survey is divided into three sections. The first section of the questionnaire included 27 questions designed to determine the participants' consumption habits. These questions are one on a five-point Likert scale, with responses ranging from strongly disagree (1) to strongly agree (5). The second section of the questionnaire included 23 questions designed to assess the participants' personality traits. In the third part, there are eight multiple-choice questions to determine which brain region the participants use. The last section of the questionnaire contains six questions about the participants' demographic characteristics, such

as gender, age, income, and marital status. The purpose of asking these questions is to learn more about the participants.

4.FINDINGS

4.1.Findings on Demographic Characteristics

To define the demographic characteristics of the participants, the percentage distribution was examined. Table 1 summarizes the findings of participants regarding demographic characteristics.

Table 1

Distribution of demographic features

	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**

4.2.Factor and Reliability Analyses

Because there are too many variables, the data set is divided into two groups. Character traits and consumption behavior groups were named after these groups. While these groups were being formed, some variables in the data group were left out of the analysis because they were beyond the scope of the research. Then, for each group separately, exploratory factor analysis was used to reduce the dimension, that is, to reveal the hidden dimensions that cannot be observed or measured. The varimax rotation method was used in this investigation.

The KMO value was used before the factor analysis for the character traits group to determine whether the data was suitable for factor analysis. Because the KMO value was.82 and Bartlett's test p-value of 0.00 was significant ($p<0.05$), it was determined that the scale was suitable for factor analysis. The scree plot obtained from the factor analysis applied to this group, as well as a distinct drop in the graph after the sixth component, indicate that there are five significant components. The varimax rotation approach identifies the factor loadings and communalities for the five components extraversion, anxiousness, responsibility, imaginativeness, and agreeableness.

Table 2

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

Item	Factor loadings	Communality
Factor 1: Extraversion		
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
Factor 2: Anxious		
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
18. I find it challenging to remain calm in stressful situations, and I cannot manage stress well.	,532	,380
	,448	,444
Factor 3: Responsible		
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
Factor 4: Imaginative		
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
Factor 5: Agreeableness		
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

The second group, "Consumption behavior," has 27 variables. Before performing factor analysis for the Consumption behavior group, the KMO value was used to determine whether the data was suitable for factor analysis. The scale was accepted for factor analysis because the KMO value was .93 and Bartlett's test p-value of 0.00 was significant ($p < 0.05$). The scree plot produced by factor analysis was applied to this group, and when deciding on the number of factors, the scree plot revealed that the scale has four factors. The factor loadings and common effects discovered by the varimax rotation method for the four factors are known as rational consumption behavior, addiction tendency hedonic consumption behavior, emotion-focused hedonic consumption behavior, emotional-focused hedonic consumption behavior, and discount and visual-oriented hedonic consumption behavior.

Table 3

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

Item	Factor loadings	Communality
Factor 1: Rational Consumption Behavior		
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
Factor 2: Addiction Tendency Hedonic Consumption Behavior		
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
Factor 3: Emotion-focused Hedonic Consumption Behavior		
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
Factor 4: Discount and Visual Oriented Hedonic Consumption Behavior		
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

Cronbach's alpha values were examined in the factor reliability analyses to assess the internal consistency of the scale's questions. The extraversion factor is reliable, according to the reliability analysis results of the first group, "Character traits." .80, the anxious factor's dependability is reliable because it is .75, the dependability of the responsible factor is as it is .72, and the inventive factor's dependability is low because it is .61. The agreeableness factor's dependability is high because it is .44. 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 reliability of the discount and visual-oriented hedonic consumption behavior factor is .81, according to the results of the reliability analysis of the second group, "Consumption behavior." As a result, because the factors' reliability is greater than.80, we can say that they are very reliable.

4.3. Correlation Analyses

Determines whether or not there is a significant relationship between personality traits and consumption behavior, as well as the aspects of the relationship. To determine whether there is a relationship between two continuous variables, a correlation test was used. Addiction tendency and emotion-focused hedonic consumption behavior have a highly significant positive correlation. In other words, as the efficacy of addiction tendency hedonic consumption behavior increases, so does the efficacy of emotion-focused hedonic consumption behavior ($p < 0.01$). Alternatively, as the effectiveness of emotion-focused hedonic consumption behavior decreases, so does the effectiveness of addiction tendency hedonic consumption behavior. The discount and visual-oriented hedonic consumption behavior and the addiction tendency hedonic consumption behavior have a highly significant positive correlation. The addiction tendency hedonic consumption behavior has a highly significant negative correlation with rational consumption behavior. Emotion-focused hedonic consumption behavior and discount and visual-oriented hedonic consumption behavior have a highly significant positive correlation.

Table 4

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

4.4. t-test Analyses

Table 5

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

The t-test was used to compare the anxious characteristics of men and women, and the difference in anxious levels between male and female participants was found to be statistically significant (p=.003). As a result, female participants had higher anxiety levels (x =22.02) than male participants (x =20.39). The t-test was used to compare the imaginative features of men and women, and the difference between the imagination levels of male and female participants was found to be statistically significant. (p=.020). As a result, the imaginative levels of female participants (x =11.79) are lower than those of male participants (x =12.30). Following the t-test to compare men's and women's rational consumption behaviors, it was discovered that the difference between male and female participants' rational consumption behaviors was statistically significant (p=.000). As a result, females (x =39.11) exhibited less rational consumption behavior than males (x =42.11). The difference between the addiction tendency hedonic consumption behaviors of male and female participants was statistically significant (p=.000) after the t-test to compare the addiction tendency hedonic consumption behaviors of men and women. As a result, female participants (x =18.62) exhibit higher levels of addiction tendency and hedonic consumption behavior than male participants (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 (x̄=17.42) show more emotion-focused hedonic consumption behavioral characteristics than male participants (x̄ =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 (x̄ =12.67) show more discount and visual-oriented hedonic consumption behavior than male participants (x̄ =11.42). The difference between the emotion-focused hedonic consumption behaviors of male and female participants was statistically significant (p=.000) after the t-test to compare the emotion-focused hedonic consumption

behaviors of men and women. Female participants (x=17.42) demonstrate more emotion-focused hedonic consumption behavioral characteristics than male participants (x =13.09). The t-test was used to compare the Discount and Visual Oriented hedonic consumption behaviors of men and women, and the difference between the Discount and Visual Oriented hedonic consumption behaviors of female and male participants was found to be statistically significant (p=.009). As a result, females (x =12.67) exhibit more discount and visual-oriented hedonic consumption behavior than males (x =11.42).

Table 6

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

The difference between the participants' extraversion levels and used brain regions was statistically significant (p=0.023) after the t-test to compare the extraversion characteristics of the participants according to the brain regions they used. As a result, the extraversion levels of right-brain dominant participants (x =19.01) were higher than those of left-brain dominant participants (x =17.97). The difference between the participants' emotion-focused hedonic consumption behaviors and used brain regions was statistically significant (p=0,004) after the t-test to compare the participants' emotion-focused hedonic consumption behaviors and used brain regions. As a result, participants with a dominant right brain (x =16.02) exhibit more emotion-focused hedonic consumption behavioral characteristics than participants with a dominant left brain (x =13.94). There is no significant relationship between anxious personality traits and brain regions used, responsible personality traits and brain regions used, imaginative personality traits and brain regions used, and agreeableness personality traits and 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, and discount and visual oriented hedonic consumption behavior and the brain regions used.

4.5.Chi-square Test Analyses

Table 7

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

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

*p<0,05

Gender and used brain region have a statistically significant relationship (x^2=12,439 p=0.000 p<0.05). While women use the right brain region dominantly 50.2% of the time, men use the right brain region dominantly 30.4% of the time.

5.CONCLUSION

Neuromarketing studies are generally conducted for commercial purposes and are superficial studies on advertisements and brands that are not supported by detailed data. As a result, academic studies are essential. This study contributes to the literature by shedding light on future academic studies on neuromarketing, a new marketing approach, by providing direction and laying the groundwork. The study analysis results and information obtained are summarized below.

Pearson's Correlation Test was used to examine the relationship between personality traits and consumption behaviors. Anxious character traits have a positive relationship with three hedonic behavior styles (addiction tendency, emotional-focused, discount, and visual-oriented) and a negative relationship with rational consumption behavior and responsibility and agreeableness as character traits. It has been determined that creative and extraversion personality traits have no effect on consumption behaviors and have no relationship with one another.

Based on the results of an analysis to see if personality traits and consumption behaviors differed significantly depending on the brain region used. There was a significant difference between the extraversion personality trait and the brain region used. As a result, the right brain region is used more than the left brain region. Furthermore, a significant relationship was discovered between the used brain region variable and emotion-focused hedonic consumption behavior. Emotion-focused hedonic consumption is more prevalent in right-brain dominant individuals than in left-brain dominant individuals.

According to the findings of the analysis, there is a significant difference between genders in personality traits and consumption behaviors. There was a significant difference between the anxious personality trait and the gender variable. Women have more anxious personality traits than men, according to research. Furthermore, a significant difference was discovered between the gender variable and the imaginative personality trait. Women exhibited more creative personality traits than men. Furthermore, all hedonic consumer behaviors (addiction tendency, emotional-focused, discount, and visual-oriented) are proportionally higher in female participants than in male participants, particularly addiction tendency and emotional-focused consumption behavior. Furthermore, male participants demonstrated significantly more rational shopping behavior than female participants.

The analysis was performed to see if there was a significant difference between the used brain region variable and the gender variable. Gender and brain region used were found to

be significantly different. Men use their left brain more than women, while women use their right brain more.

After all of this testing, the most effective result was that men exhibited more rational consumption behavior, whereas women exhibited more hedonic purchasing behavior. The second most compelling finding was that men used the left-brain region proportionally more than female participants. It is also critical that these two are consistent with one another and end up supporting one another. The analysis supports and is supported by 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.

Limitations

The main limitation of the research is that only the questionnaire method was used to collect data in the study. The questionnaire study did not provide evidence to support experimental studies using neuroimaging techniques such as EEG and fMRI. The primary causes of this situation are the high cost of empirical studies, the requirement for a laboratory environment, and time constraints.

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