BJMKT
BRAZILIAN JOURNAL OF MARKETING

**Received:** 30 Dec. 2022 /**Approved:** 21 Aug. 2023
**Responsible editors:** Julio Araujo Carneiro da Cunha & André Torres Urdan
**Guest Editors:** Nairana Radtke Caneppele; Helena Belintani Shigaki; Fernando Antonio Ribeiro Serra; Luis Hernan Contreras Pinochet & Renato Hübner Barcelos
**Evaluation Process**: *Double Blind Review*
**e-ISSN:** 2177-5184
https://doi.org/10.5585/remark.v23i1.23563

**Special Issue: Applications of neurosciences to the marketing field**

# EXAMINATION OF FAMOUS USE IN TELEVISION ADVERTISEMENTS WITH ELECTROENCEPHALOGRAM (EEG): THE EXAMPLE OF TURKEY

**Turgay OYMAN**
Igdır University Faculty of Applied Sciences
Iğdır – Türkiye
turgayoyman@hotmail.com

**Objective:** The research aims to analyze the changes in brain activity of emotions caused by the use of celebrities in television (TV) commercials using Electroencephalography (EEG). It tries to determine the positive (liking, having fun) and negative (disliking, bored) emotions of the audience with Electroencephalography (EEG).

**Method:** We tried to determine the emotional states of the volunteers who watched the commercials by examining the theta activities in different parts of their brains. A questionnaire was applied to 36 volunteers in our research before and after watching the advertisements. EEG recordings were made while the volunteers were watching the commercials. Theta activities obtained as a result of EEG recording were tabulated as duration. The hypotheses were tested by using the responses of the volunteers to the questionnaires and the EEG results comparatively with frequency tables and the Independent-Samples T test.

**Originality/Relevance:** Both the preparation and broadcasting of TV advertisements, which have a very important place in marketing communication, can be very costly for businesses. Neuromarketing, which encourages interdisciplinary work, allows the use of methods, designs, theories and technologies used in neuroscience in areas such as marketing and advertising. In this study, with the help of EEG, one of the techniques used in neuromarketing, it has been tried to determine the emotions that the advertisements will create in the audience. It is among the few experimental studies conducted in Turkey.

**Results:** Although EEG results shows that the activity intensity in the left hemisphere and left frontal lobe was higher than the activity intensity observed in the right hemisphere and right frontal lobe in the volunteers watching TV commercials, and the activity intensity in the left hemisphere and left frontal lobe in the volunteers where the advertisements created positive emotions, and the activity intensity in the left hemisphere and left frontal lobe in the volunteers, where the advertisements created negative emotions, statistically, as our hypotheses suggest, no significant activity difference was observed.

**Theoretical/methodological contributions:** The research contributes to the scientific community by deepening the knowledge on neuromarketing, which is under development in Turkey as in many countries. It also provides clues about the use of neuromarketing in advertising research. This study will contribute to the preparation of effective advertisements by understanding the emotions of the audience.

**Managerial implications:** Research findings can help businesses and advertisers prepare more effective commercials, thereby saving businesses costs.

**Keywords:** Neuromarketing. Electroencephalography (EEG). Television Advertising. Celebrity.

**How to cite the article**

*American Psychological Association (APA)*

OYMAN, T. (2024, Jan./Mar.). Examınatıon of famous use ın televısıon advertısements wıth electroencephalogram (eeg): the example of Turkey. *Brazilian Journal of Marketing*, *23*(Special Issues), 72-96. https://doi.org/10.5585/remark.v23i1.23563

## 1 Introduction

At the point where our world has come, computers, tablets, mobile phones, etc., which function as televisions and televisions. devices have entered almost every area of our lives, such as the living room of our home, our kitchen, our workplace or the vehicles we travel. This situation shows us how large audiences TV commercials can reach and the extent of the contribution that businesses can make to connect with consumers. Another dimension of TV commercials is the high cost that businesses have to bear during the preparation, shooting and broadcasting stages. (Siefert et al., 2008:428; Özüpek and Özer, 2018). About 400 billion dollars are spent annually on advertising and promotion. In this large market, a small improvement in performance can have a huge impact (Khurana et al., 2021:732). Understanding consumers' emotional states can reveal their true preferences and help improve purchasing processes and advertising (Malär et al., 2011; Garrido-Morgado et al., 2015). With the combination of traditional methods and neuromarketing methods, data ranging from the most obvious (that is, conscious and self-reportable) to the most implicit (which cannot be reported automatically and verbally) can be collected simultaneously in many ways. Neuromarketing tries to reveal what the participants really think in cases where they hide the truth or cannot express it, for reasons such as not being able to describe what they really feel completely and accurately (Ural, 2008:426 - 428). Models recognized by analyzing neuropsychology can help create neuromarketing strategies. Studies have examined the activity of different parts of the brain in perceptual decision making. It is stated that with the relatively lower cost EEG, consumers have reached 79% accuracy in determining their future preferences (Amin et al., 2020: 2061)..

In this study, EEG recording method, which is one of the neuromarketing methods, was used. When the volunteers watched the commercials, their EEGs were taken and the changes in their brain activities and their reactions were evaluated together with the answers given by the volunteers to the questionnaire questions. In the study, it was investigated whether the positive or negative attitudes of the audience towards the advertisements could be determined by using the EEG results.

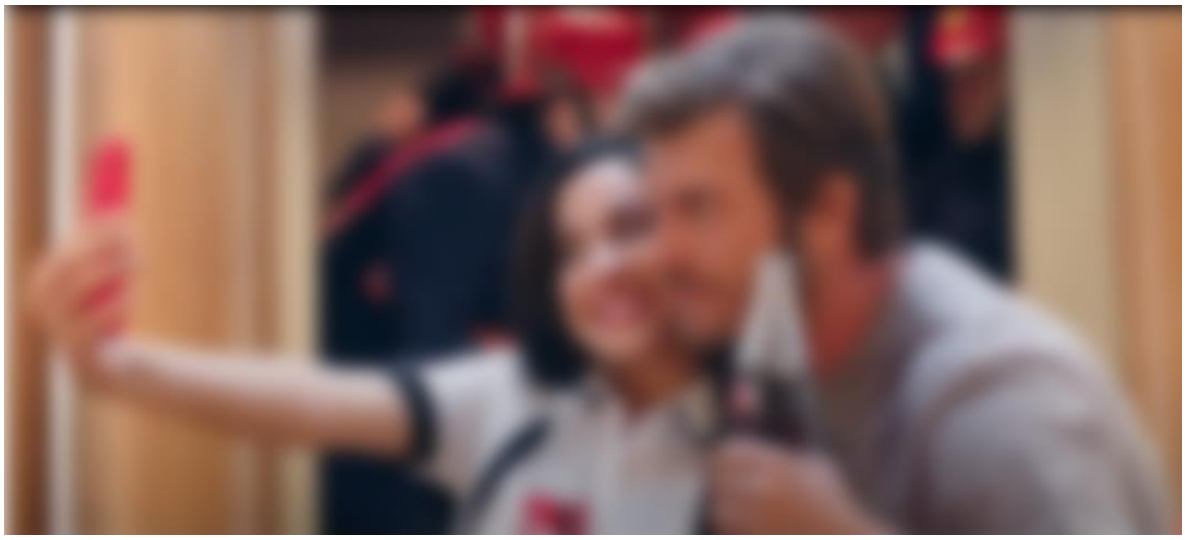
## 2 Theoretical framework

Advertising is one of the most important communication tools between businesses and buyers in the target market. Advertisements are used to create voluntary behavior change in consumers, to draw their attention to a thought or product, to give information and to adopt an

attitude (Çakır, 2006:32, Çakar, 2006:3). Consumers, on the other hand, benefit from advertisements to make the most rational decision to meet their needs among countless similar products surrounding them. Consumers learn from advertisements what distinguishes the features and prices of products from their counterparts and how they should be used, and use them in decision-making processes (Çakır, 2006:32). Businesses that try to connect with the brand and product in order to sell their products are trying to realize the cognitive, sensory and behavioral goals of advertisements (Çay, 2012:5; Aizezi, 2017:13; Çakır, 2006:33). For this, different charms are used in advertisements. In this study, the Coca-Cola advertisement, which used the famous charm and broadcast on television in Turkey, was examined. Turkish television and film actor Kıvanç TATLITUĞ took part in the advertisement.

**Figure 1**

*TV Ad. Screenshot*



**Source**: https://www.youtube.com/watch?v=CG480NxO0NA

*2.1. Celebrity use in advertisements*

People usually set themselves an idol, a role model. They try to shape themselves, their lifestyles and consumption habits according to this model. Sometimes they choose these models from their close circle, sometimes from popular, well-known people. However, today, with the developing media opportunities and the effect of popular culture, people idolize the people they see on the screen and can easily reach these people through the media. Celebrities are people who have gained a certain status in their lives, appear attractive to consumers with their physical

appearance, popularity and impressiveness, and build trust (Choi & Rifon, 2007: 306). Celebrities are perceived as models of success for many societies (Muda et al., 2014: 12).

Today, hundreds of brands in different sectors are trying to establish a bond between their consumers and increase the attractiveness of their advertisements by using the fame, reputation, trust, respectability, love, admiration, imitation, etc. of famous people in their advertisements. Celebrities used in advertisements include movie stars, singers, artists, models, athletes, politicians and businessmen, scientists, social media phenomena, entertainers. Celebrities create a related image between themselves and the brand or product by transferring their own images to the brand and product they represent (Armağan & Gürsoy 2017: 1044). The most important issue in the use of famous person is the choice of celebrity. It is very important that the celebrity to be chosen is compatible with both the product and the brand and the consumer group (Albert et al., 2017: 97). On the other hand, variables such as the celebrity's attractiveness, credibility, cost, ease of work, and the possibility of the celebrity causing a problem after the contract should also be taken into account. In addition, the possibility of shifting attention and attention to the celebrity rather than the product and the advertising message (vampire effect), and the possibility of the brand being in the shadow of the celebrity, the decrease in the popularity of the celebrity or the involvement of an event that will harm the image of the brand, and the possible changes that may occur in the celebrity's life should be well analyzed (Reichert et al. 2007: 64).

### *2.2. Use of EEG in advertising studies*

EEG, whose use in neurology goes back a long way, is accepted as a good way to measure brain activity (Morin, 2011:133). The use of EEG is very attractive due to its portability and cost (Canappela et al., 2022: 243). When more than 100,000 brain cells (neurons) in the 1 mm square cortex area under our scalp are activated, regional electrical currents are produced. These electrical currents are detected by electrodes placed on the scalp and are seen as a very powerful tool for monitoring brain activity. (Teplan, 2002:1-4, Jain et al., 2018:435). High temporal resolution allows detection of short neuronal events and is an advantage over fMRI (Colaferro & Crescitelli, 2014). This makes the technique ideal for recording the brain activity of people watching advertisements or reacting to any stimulus (Shigaki, Gonçalves and Santos, 2017:444). It is seen that various studies have been carried out in which EEG is used to detect the emotional states of people (Polat and Özerdem, 2016: 4). The fact that human emotions can be understood with brain signals has attracted the attention

of marketers and popularized the use of EEG in this field, and studies have begun on its usability instead of verbal expression, which is considered suspicious in determining the effect experienced by the consumer, especially in the testing of TV commercials (Ohme et al., 2010:785).

Uva et al. (2015) observed beta and gamma waves in a study examining TV commercials and gender differences. They concluded that likability, attractiveness, and emotions are related to the prefrontal cortex (Bazzani et. al., 2020:7). Young (2002) created an interactive index using beta, alpha, and theta waves to predict advertising success. Daugherty et al. get. (2016) used EEG data to compare three successful and three unsuccessful advertisements (Lin et. al., 2018:77). Lee (2016) showed that enhanced theta activation in the frontal region is associated with increased empathy and purchasing rates (Mashrur et al., 2021:808).

When our neural circuit, which consists of over 100 billion neurons and trillions of synaptic connections, which form the basis of our cognitive response, is stimulated by a certain stimulus, such as an advertisement, the neurons fire and produce a small electrical current that can be strengthened (Morin, 2011:133). Captured signals are amplified by EEG and then converted to a graphical representation (curve). The shape and character of the curves depend on the current activity of the brain. By extracting useful information from the captured signal, we can predict or classify the brain state of the consumer under investigation (Rabcan and Kvassay).

## 3 Conceptual model and hypotheses

Singer (1976) suggests that due to the specialization of the hemispheres, watching television tends to produce more activity in the right hemisphere (Appel et al. 1979:8). Vecchiato et al. (2011) state that with comforting and pleasing emotions, viewers have an increase in activity in the theta waves of the left frontal and left prefrontal regions, and there is an increase in activity in the right frontal and right prefrontal regions in advertisement scenes evaluated with unpleasant emotions. (Vecchiato et al., 2011:582)

Wang et al. (2016) state that video ads produce higher theta activation in the left frontal and bilateral occipital region and higher gamma activation of the limbic system (Wang et al., 2016:1).

In this study, we performed an EEG experiment on 36 volunteers while watching a commercial, and we tested the following hypotheses by examining the results of theta activities.

**$H_1$:** Volunteers watching television commercials produce more theta activity in the left hemisphere than in the right hemisphere.

**$H_2$:** The intensity of theta activity in the left frontal region increases in volunteers who experience positive feelings such as likes and tastes while watching the advertisement.

**$H_3$**: The intensity of theta activity in the right frontal region increases in volunteers who experience negative feelings such as dislike and boredom while watching the advertisement.

## 4 Method

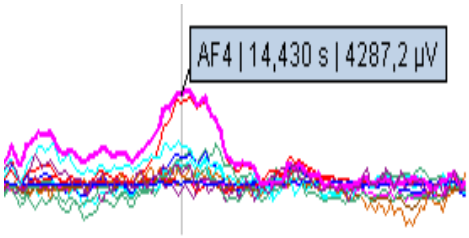
Before starting this study, an ethics committee decision was taken at the Iğdır University Scientific Research and Publication Ethics Committee (decision dated 30 June 2022 and meeting number 2022/11). Volunteers to take part in the study were asked to fill in the "Volunteer Consent Form".

In our study, EEG recording and Questionnaire methods were used together. Two different questionnaires with a likert scale were administered to the volunteers. The first of these questionnaires was administered before EEG recording. This survey aims to determine the demographic information of the volunteers, their attitudes towards advertisements, their attitudes about the products mentioned in the advertisements and whether they use them. After the first questionnaire form was applied, the volunteers were made to watch the commercial film. While the volunteers watched the commercial, the electrical signals of their brains were recorded with EEG. After watching the commercial, the 2nd Questionnaire was applied to the volunteers. The second survey aims to determine the feelings and thoughts of the volunteers about the advertisements, the attitude they form towards the brand, the points they remember and pay attention to about the advertisement. Before watching the commercial, the volunteers were informed about the purpose of the study and explained how to do the EEG recording. In order to ensure that the volunteers behave naturally and to avoid their extraordinary attention and care, no information was given about the survey to be applied after watching the advertisements.

In this study, only theta activities were examined. Brain activity in a frequency range of 4 to 7 Hz is called Theta activity. Theta rhythm detected in EEG measurement has an amplitude greater than about 30 millivolts (mV). The duration of the responses detected in the theta wave was used as the value in the Independent-Samples T test. The response detected in theta wave in the AF4 electrode is shown in Figure-2

**Figure 2**

*Response Detected in Theta Wave in AF4 Electrode*




EEG recordings were performed using the 14-channel, 128 Hz frequency Emotiv – Epoc device. The placement of the electrodes is as follows: AF3, F7, F3, FC5, T7, P7, O1, O2, P8, T8, FC6, F4, F8, AF4. This high-resolution device, defined as the Emotiv EPOC, collects data at a frequency of 2048 Hz per second. The EEG device transfers the collected data to the computer via a wireless network within a 128Hz frequency sample.

36 adult volunteers between the ages of 18 and 50 participate in the study. It is understood from their own statements that the participating volunteers do not have brain damage and mental disorders, and they do not have alcohol and drug addictions. Of the volunteers, 31 use their right hand and 5 use their left hand. The age and gender information of the volunteers participating in the study are given in Table-1.

**Table 1**

*Profile of Interview Respondents*

| Demographic Informations | | Gender | | Total |
|---|---|---|---|---|
| | | Male | Female | |
| **Educational Status** | High school | 1 | 0 | 1 |
| | University | 13 | 12 | 25 |
| | Post graduate | 9 | 1 | 10 |
| | **Total** | **23** | **13** | **26** |
| **Age** | Ages between 18-30 | 19 | 12 | 31 |
| | Ages between 31-40 | 3 | 0 | 3 |
| | Ages between 41-50 | 1 | 1 | 2 |
| **Total** | | **23** | **13** | **36** |

86% of the volunteers are between the ages of 18-30 and 77% are university graduates. Being reluctant to participate in an experimental study caused the demographic to be predominantly composed of young people with a high level of education. Therefore, a homogeneous demographic distribution could not be reached

*4.1. Determination of advertising film*

Although there are numerous commercials with the same features broadcast on TV, not all of them have the same effect on the audience. It is thought that the advertisements that affect the viewers and take their place in their minds will cause more distinct and distinguishable brain activities in the volunteers who will watch the commercial, compared to the other advertisements, and this can be detected by EEG. For this reason, while determining the advertisements, the most watched advertisements published during the day and the advertisements that the people around us were asked about the advertisements they liked the most were examined. For this reason, while determining the advertisements:

1- The most watched advertisements broadcast on television The most watched advertisements and

2- The pockets given by the people we encounter in our daily routine to the question of which advertisement do you like the most were examined.

The advertisements in the long list formed as a result of this research were evaluated and eliminated in terms of content, duration and shooting quality in a way to prevent the volunteers from being distracted and bored. At the end of this evaluation, 18 advertisements were pre-tested and 12 advertisements were determined. These 12 advertisements were watched by 140 volunteers and a questionnaire was applied. Three of these questionnaire forms were found invalid and 137 questionnaire forms were evaluated. In the survey, viewers were asked to mark the emotion they felt and the intensity of this emotion from the advertisements they watched. This process was carried out in the form of specifying the emotion aroused in the audience by each advertisement shown in the questionnaire, with a minimum of 1 and a maximum of 5, depending on the intensity. At the end of this process, the Coca Cola advertisement with the highest score and acted by Kıvanç TATLITUĞ was determined to be used in our study.

*4.2. Survey design*

Two different questionnaires were designed to be used in the study by reviewing the literature and taking the opinions of professionals. The created questionnaires were applied to a group of volunteers and errors and problems were tried to be eliminated. The first questionnaire, which was applied to the volunteers before the EEG recordings, aimed to determine the demographic information of the volunteers and their attitudes about the advertisements. The second questionnaire was applied immediately after the EEG recording. In

this survey, it was tried to determine the feelings and thoughts of the volunteers about the advertisement, the brand and the celebrity who took part in the advertisement.

After the questionnaires were created and the commercial film was determined, the study was simulated by making a group of 15 people watch the commercial. The aim of this simulation is to measure the intelligibility of the survey questions and the effect of the advertisement. At the end of this test, necessary corrections were made in the questionnaires and they were finalized.

## 5 Results

For the convenience of the readers, the results of the questionnaires applied to the volunteers and the EEG results are given in the form of subtitles.

### *5.1. Findings of the first questionnaire made before EEG recording*

This questionnaire was applied to the volunteers to determine their attitudes towards advertisements before EEG recording was made.

**Table-2**

*Findings Related to Advertising Which May Cause Attitude Change*

| Advertising can change my attitude towards the product | Frequency | Percentage |
|---|---|---|
| I strongly disagree | 1 | 2,8 |
| I do not agree | 3 | 8,3 |
| I am undecided | 12 | 33,3 |
| I agree | 15 | 41,7 |
| I absolutely agree | 5 | 13,9 |
| **Total** | **36** | **100,0** |

The opinions of the volunteers participating in the research that advertisements can change their attitudes towards the product are given in Table-2. According to the table, 1 of the volunteers (2.8%) strongly disagree, 3 (8.3%) disagree, saying that the advertisements will not change their attitudes towards the product, 12 (33.3%) are undecided, 15 (41.7) I agree, 5 (13.9%) answered as I strongly agree and stated that advertising can change their attitudes towards the product.

**Table-3**

*Findings Related to Advertising Can Arouse Buying Desire*

| Celebrities I see in advertisements make me want to buy that product/service. | Frequency | Percentage |
|---|---|---|
| I strongly disagree | 8 | 22,2 |
| I do not agree | 9 | 25,0 |
| I am undecided | 5 | 13,9 |
| I agree | 11 | 30,6 |
| I absolutely agree | 3 | 8,3 |
| **Total** | **36** | **100,0** |

The opinions of the volunteers participating in the research regarding the creation of purchasing desire by advertisements are given in Table-3. According to the table, 8 (22.2%) of the volunteers stated that they strongly disagree, 9 (25.0%) disagree and stated that advertisements would not create a purchase request, 5 (13.9%) were undecided, 11 (30.6%) agreed, and 3 (8.3%) strongly agreed and stated that advertisements would create a purchase request.

**Table-4**

*Findings Related to Advertising Informing the Consumer to Make the Right Choice*

| Advertising informs the consumer about the product/service and enables them to make the right choice. | Frequency | Percentage |
|---|---|---|
| I strongly disagree | 3 | 8,3 |
| I do not agree | 7 | 19,4 |
| I am undecided | 9 | 25,0 |
| I agree | 11 | 30,6 |
| I absolutely agree | 6 | 16,7 |
| **Total** | **36** | **100,0** |

The opinions of the volunteers participating in the research on how the advertisements inform the consumer about the product/service and enable them to make the right choice are

given in Table-4. According to the table, 3 (8.3%) of the volunteers stated that they strongly disagree, 7 (19.4%) disagree and stated that the advertisements would not enable them to make the right choice, 9 (25.0%) were undecided, 11 (% 30.6 agree and 6 (16.7%) answered as I strongly agree and stated that the advertisements would enable them to make the right choice.

*5.2. Findings of the second questionnaire made after EEG recording*

This questionnaire was administered to the volunteers immediately after the EEG was taken and the volunteers left the shooting room. In this survey, volunteers were asked about their opinions about the advertisement they watched.

**Table-5**

*Findings on the Impressiveness of the Celebrity Acting in the Advertisement*

| Celebrity starring in the ad impressed me | Frequency | Percentage |
|---|---|---|
| I strongly disagree | 5 | 13,9 |
| I do not agree | 5 | 13,9 |
| I am undecided | 3 | 8,3 |
| I agree | 10 | 27,8 |
| I absolutely agree | 13 | 36,1 |
| **Total** | **36** | **100,0** |

The data regarding the influence of the volunteers participating in the research by the celebrity taking part in the advertisement are given in Table 5. According to the table, it is seen that 23 (63.9%) of the volunteers were influenced by the celebrity taking part in the advertisement, 10 (27.8%) were not, and 3 (8.3%) were undecided.

**Table-6**

*Findings Regarding the Impressiveness of Ad Music*

| Ad music impressed me | Frequency | Percentage |
|---|---|---|
| I strongly disagree | 5 | 13,9 |
| I do not agree | 5 | 13,9 |
| I am undecided | 2 | 5,6 |

| Ad music impressed me | Frequency | Percentage |
|---|---|---|
| I agree | 14 | 38,9 |
| I absolutely agree | 10 | 27,8 |
| **Total** | **36** | **100,0** |

The data regarding the liking of the advertisement music of the volunteers participating in the research are given in Table 6. According to the table, it is seen that 24 (66.7%) of the volunteers found the advertisement music impressive, 2 (5.6%) were undecided, and 10 (27.8%) found it boring.

**Table-7**

*Findings Regarding Ad Admiration*

| I like the ad. | Frequency | Percentage |
|---|---|---|
| I strongly disagree | 6 | 16,7 |
| I do not agree | 1 | 2,8 |
| I am undecided | 7 | 19,4 |
| I agree | 14 | 38,9 |
| I absolutely agree | 8 | 22,2 |
| **Total** | **36** | **100,0** |

Table 7 shows the data regarding the volunteers participating in the research finding the advertisements boring. According to the table, it is seen that 22 (61.1%) of the volunteers liked the advertisement, 7 (19.4%) were undecided, and 7 (19.4%) did not like the advertisement.

**Table-8**

*Findings Related to Finding Advertising Entertaining*

| The ad was fun | Frequency | Percentage |
|---|---|---|
| I strongly disagree | 4 | 11,1 |
| I do not agree | 3 | 8,3 |
| I am undecided | 6 | 16,7 |
| I agree | 14 | 38,9 |
| I absolutely agree | 9 | 25,0 |
| **Total** | **36** | **100,0** |

The data on the volunteers participating in the research finding the advertisements boring are given in Table 8. According to the table, it is seen that 23 (63.9%) of the volunteers found the ad amusing, 6 (16.7%) were undecided, and 7 (19.4%) did not find the ad amusing.

**Table 9**

*Findings Related to Finding Advertising Disturbing*

| Advertising was annoying | Frequency | Percentage |
|---|---|---|
| I strongly disagree | 17 | 47,2 |
| I do not agree | 13 | 36,1 |
| I am undecided | 4 | 11,1 |
| I agree | 1 | 2,8 |
| I absolutely agree | 1 | 2,8 |
| **Total** | **36** | **100,0** |

The data on the volunteers participating in the study that they find the advertisement disturbing are given in Table 9. According to the table, it is seen that 30 (83.3%) of the volunteers did not find the advertisement boring, 4 (11.1%) were undecided, and 2 (5.6%) found it boring.

**Table 10**

*Findings Regarding Advertising Boring*

| Advertising was boring | Frequency | Percentage |
|---|---|---|
| I strongly disagree | 11 | 30,6 |
| I do not agree | 14 | 38,9 |
| I am undecided | 5 | 13,9 |
| I agree | 4 | 11,1 |
| I absolutely agree | 2 | 5,6 |
| **Total** | **36** | **100,0** |

Table 10 shows the data on the volunteers participating in the study that they find the advertisements boring. According to the table, it is seen that 25 (69.5%) of the volunteers did not find the advertisement boring, 5 (13.9%) were undecided, and 6 (16.6%) found it boring.

**Table 11**

*Findings Regarding the Opinion Created by the Advertisement About the Brand*

| Advertising made me think negatively about the brand | Frequency | Percentage |
|---|---|---|
| I strongly disagree | 17 | 47,2 |
| I do not agree | 13 | 36,1 |
| I am undecided | 4 | 11,1 |
| I agree | 1 | 2,8 |
| I absolutely agree | 1 | 2,8 |
| **Total** | **36** | **100,0** |

The data regarding the thoughts of the volunteers participating in the research about the brand after watching the advertisement are given in Table 11. According to the table, it is seen that 30 (83.3%) of the volunteers did not have a negative opinion about the brand after watching the advertisement, 4 (11.1%) were undecided, and 2 (5.6%) had negative thoughts about the brand.

*5.3. Findings regarding EEG recording results*

Theta activities in the brains of the volunteers while watching the advertisement were interpreted by clearing them of artifacts. The region of the brain and the duration of the activities are given in Table-11.

**Table 11**

*Electrode Based Time Distribution of Brain Activities of Volunteers*

| | LEFT HEMISPHERE (Response Time in Seconds) | | | | | | | RIGHT HEMISPHERE (Response Time in Seconds) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Volunteer** | **AF3** | **F3** | **F7** | **FC5** | **P7** | **O1** | **T7** | **AF4** | **F4** | **F8** | **FC6** | **P8** | **O2** | **T8** |
| **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,10 | 0 | 0,15 | 0 | 0 | 0 |
| **2** | 0 | 0 | 0 | 0 | 0,15 | 0 | 0 | 0 | 0 | 0 | 0,06 | 0,07 | 0 | 0 |
| **3** | 0,06 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,10 | 0,08 | 0 |
| **4** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,11 | 0 | 0 | 0,11 |

| | LEFT HEMISPHERE (Response Time in Seconds) | | | | | | | RIGHT HEMISPHERE (Response Time in Seconds) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Volunteer** | **AF3** | **F3** | **F7** | **FC5** | **P7** | **O1** | **T7** | **AF4** | **F4** | **F8** | **FC6** | **P8** | **O2** | **T8** |
| **5** | 0,13 | 0 | 0,12 | 0 | 0,10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,09 | 0 |
| **6** | 0 | 0 | 0,45 | 0 | 0 | 0 | 0 | 0,23 | 0 | 0 | 0 | 0 | 0 | 0 |
| **7** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,19 | 0,13 | 0 | 0 | 0 |
| **8** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **9** | 0,23 | 0 | 0,08 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **10** | 0 | 0,06 | 0 | 0 | 0 | 0 | 0 | 0 | 0,12 | 0,12 | 0 | 0 | 0,19 | 0 |
| **11** | 0 | 0 | 0,43 | 0,08 | 0 | 0,26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **12** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,07 | 0 | 0 | 0 | 0 | 0 |
| **13** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,10 | 0 | 0 | 0 | 0 | 0 |
| **14** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,14 | 0 | 0 | 0 | 0 |
| **15** | 0 | 0 | 0 | 0 | 0 | 0,34 | 0 | 0 | 0 | 0 | 0 | 0 | 0,07 | 0 |
| **16** | 0 | 0 | 0 | 0,06 | 0 | 0,24 | 0,15 | 0 | 0 | 0,10 | 0 | 0 | 0 | 0 |
| **17** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,12 | 0 | 0 | 0 |
| **18** | 0 | 0 | 0,13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **19** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,36 | 0 | 0 | 0 | 0,16 | 0 | 0 |
| **20** | 0 | 0 | 0 | 0 | 0,12 | 0 | 0 | 0 | 0 | 0 | 0,07 | 0,11 | 0 | 0 |
| **21** | 0,05 | 0,05 | 0,12 | 0 | 0 | 0 | 0 | 0 | 0 | 0,10 | 0,11 | 0 | 0 | 0 |
| **22** | 0 | 0 | 0,13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,08 | 0,09 | 0 | 0 |
| **23** | 0 | 0 | 0,08 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,22 | 0 |
| **24** | 0 | 0 | 0 | 0 | 0 | 0,09 | 0 | 0 | 0,11 | 0 | 0 | 0 | 0 | 0 |
| **25** | 0,18 | 0,18 | 0 | 0 | 0 | 0 | 0 | 0,18 | 0 | 0 | 0 | 0 | 0 | 0 |
| **26** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,05 | 0 | 0 | 0,08 | 0 | 0 | 0 |
| **27** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **28** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **29** | 0 | 0,31 | 0 | 0 | 0 | 0 | 0 | 0,07 | 0 | 0 | 0,12 | 0 | 0 | 0 |
| **30** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,13 | 0 | 0 | 0 | 0,07 |
| **31** | 0,16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,13 | 0 | 0,07 | 0 | 0 |
| **32** | 0,11 | 0,14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

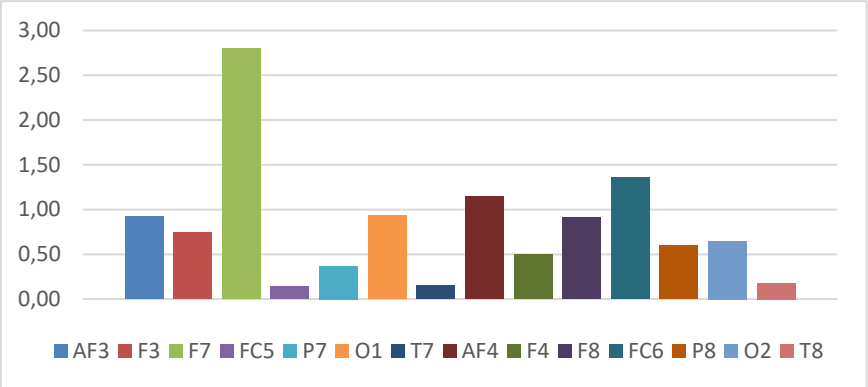
CC BY NC SA

| | LEFT HEMISPHERE (Response Time in Seconds) | | | | | | | RIGHT HEMISPHERE (Response Time in Seconds) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Volunteer** | **AF3** | **F3** | **F7** | **FC5** | **P7** | **O1** | **T7** | **AF4** | **F4** | **F8** | **FC6** | **P8** | **O2** | **T8** |
| **33** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **34** | 0 | 0 | 0,17 | 0 | 0 | 0 | 0 | 0,08 | 0 | 0 | 0,08 | 0 | 0 | 0 |
| **35** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,18 | 0 | 0 | 0 | 0 | 0 | 0 |
| **36** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,25 | 0 | 0 | 0 |

When the EEG results of the volunteers participating in the study were examined collectively, theta activity could not be detected in four of the volunteers. Activation in the left hemisphere of other volunteers is higher than the activation in the right hemisphere. Volunteers whose response could not be detected were not included in the evaluation. The total activation times of the electrodes are shown in Figure-1.

**Figure 3**

*Distribution of Electrodes to which Volunteers Reacted to Advertisement*




The intensity of activation occurring in the frontal and prefrontal and occipital lobe regions of the left hemisphere is more intense than the activation occurring in the frontal and prefrontal and occipital regions of the right hemisphere. However, the intensity of activation in the parietal and temporal regions of the right hemisphere is more intense than the activation in the parietal lobe and temporal lobe regions of the left hemisphere.

Although the activity intensity occurring in the left hemisphere (x= 0.0244, SD= 0.083) is higher than the activity intensity occurring in the right hemisphere (x= 0.0212, SD= 0.053),

no statistically significant difference was found between hemispheres (*t(502)= 0.516, p=0.606*).

Although the activity intensity occurring in the left frontal region (x= 0.032, SD= 0.099) was higher than the activity intensity occurring in the right hemisphere (x= 0.027, SD= 0.060), no statistically significant difference was found between the hemispheres (*(286)= 0.563, p=0.574*).

In the second questionnaire administered after the EEG recording, which we think that brain activations can produce more distinctive signals, we also examined whether there were differences in activation in the left and right hemispheres, and in the left frontal lobe and right frontal lobe of the volunteers who expressed their positive attitudes towards advertising by giving positive answers to all questions (Table 5, Table 6, Table 7, Table 8) and negative attitudes towards advertising by answering all questions negatively (Table 9, Table 10, Table 11).

Although the activity intensity (x= 0.026, SD= 0.102) in the left hemisphere of the volunteers for whom the advertisement created positive emotions was higher than the activity intensity in the right hemisphere (x= 0.022, SD= 0.048), no statistically significant difference was found between the hemispheres *(t(222)= 0.735, p= 0.463)*.

Although the activity intensity in the left frontal region of the volunteers (x= 0.044, SD= 0.128) was higher than the activity intensity in the right hemisphere (x= 0.025, SD= 0.048), no statistically significant difference was found between the hemispheres *(t(80,632) = 1.128, p=0.263)*.

Although the activity intensity (x= 0.032, SD= 0.066) in the right hemisphere of the volunteers for whom the advertisement creates negative emotions is higher than the activity intensity in the left hemisphere (x= 0.011, SD= 0.040), no statistically significant difference was found between the hemispheres *(t(44,680)= -1.447, p= 0.147)*.

Although the activity intensity occurring in the right frontal region of the volunteers (x=0.041, SD= 0.081) was higher than the activity intensity occurring in the left hemisphere (x=0.010, SD= 0.081), no statistically significant difference was found between the groups *(t(21.769) = -1.399, p= 0.176)*.

We comparatively examined the activities occurring in the left and right hemispheres of the volunteers in whom the advertisement evoked negative emotions. It was found that the activation intensity in the left hemisphere of the volunteers expressing their positive feelings (x= 0.029, SD= 0.102) was higher than the activation intensity in the left hemisphere of the

volunteers who gave a negative response (x= 0.011, SD= 0.040), but no statistically significant difference was found between the groups *(t(139)= 0.954, p= 0.342)* , when the activity intensity in the frontal lobes was examined, altough the activation intensity in the left frontal lobe (x= 0.044, SD= 0.128) in the volunteers with positive emotions was more intense than the left frontal activities of the volunteers with negative emotions (x= 0.010, SD= 0.040) no statistically significant difference was found between the groups *(t(78)= 1.067, p= 0.289)*.

When the activity intensity in the right hemispheres of the volunteers was compared, it was observed that the activation intensity in the right hemisphere of the volunteers who expressed their negative emotions (x= 0.329, SD= 0.066) was higher than the activation intensity in the right hemisphere of the volunteers who responded positively (x= 0.221, SD= 0.048) but there was no statistically significant difference between the groups *(t(138)=-0.977, p=0.330)*, when the activity intensity in the frontal lobes is examined, although the intensity of activation in the right frontal lobe in volunteers with negative emotions (x= 0.041, SD= 0.081) was higher than the right frontal activities of volunteers with positive emotions (x=0.025, SD= 0.048), there was no statistically significant difference between the groups *(t(17.720)=-0.768, p=0.453)*.

## 6 Discussion

In this study, the EEG method was used to examine how the use of celebrities in advertisements affects brain activity. A Coca Cola advertisement featuring Turkish movie actor Kıvanç TATLITUĞ was used as the stimulus. Theta wave was examined in EEG measurement. The response times of the volunteers detected in the theta wave while watching the commercial were examined in the Independent-Samples T test. The answers given by the volunteers to the questionnaires and the volunteers' EEG recording results of the advertisement were compared.

In this study, in which the use of celebrities in advertisements is determined by the EEG method, how the use of celebrities creates changes in brain activities, a Coca Cola advertisement starring Turkish movie actor Kıvanç TATLITUĞ was used. The answers given by the volunteers to the questionnaires and the volunteers' EEG recording results of the advertisement are compared.

77% of the volunteers participating in our study are university graduates and 86% are individuals under the age of thirty. Volunteers stated that 55% of the advertisements can cause a change in their attitude, and 47 of them stated that the advertisements will fulfill the informative duty and enable the consumer to make the right choice. These responses show that

the consumer has a positive attitude towards advertisements. 39% of the volunteers stated that the celebrities taking part in the advertisements would make them want to buy and stated that they had a positive attitude towards the use of celebrities in advertisements.

64% of the volunteers who participated in the study stated that they were influenced by the celebrity who took part in the advertisement they watched, 67% were influenced by the advertisement music, 61% liked the advertisement, 64% found the advertisement entertaining, 83% stated that the advertisement did not create a negative thought about the brand and they also stated that they had a positive attitude towards the advertisement they watched.

6% of the volunteers stated that they found the advertisement disturbing and 17% boring and stated that they had a negative attitude towards the advertisement.

Theta activity could not be obtained in 4 of the volunteers. These volunteers were not included in the analyses. When the brain activities of the volunteers were examined, it was observed that the activation intensity in the left hemisphere, left frontal and occipital lobes was higher than the activity intensity in the right hemisphere. Regarding the $H_1$ hypothesis, it was observed that theta activity produced by watching TV commercials in the left hemisphere is higher than in the right hemisphere. Although this difference was not statistically significant, Appel et al. (1979) consistent with their findings .

Regarding the $H_2$ hypothesis, it was observed that the activation intensity in both the left hemisphere and the left frontal lobe of the subjects in whom the TV commercial generated positive emotions such as liking, being affected, and finding fun was higher than the activity intensity in the right hemisphere and the right frontal lobe, but this difference was not statistically significant.

Regarding the $H_3$ hypothesis, it was observed that the activation intensity in both the right hemisphere and the right frontal lobe of the subjects in whom the TV commercial created negative emotions such as dislike, boredom, and negative thinking was higher than the activity intensity in the left hemisphere and the left frontal lobe, but this difference was not statistically significant.

The differences obtained for hypotheses H2 and H3 were not statistically significant. Vecchiato et al. (2011:582) reported that left frontal and left prefrontal regions are activated by pleasant emotions that relax the viewers, while right frontal and right prefrontal regions are activated by unpleasant emotions. Rejer Jankowski (2018:429) stated that when volunteers are more approach-oriented, it may reflect the growing activity of the left hemisphere; on the other hand, if volunteers are more withdrawal-oriented, it may reflect the increasing activity of the

right hemisphere. Our findings are similar to those of Vecchiato et al. and Rejer Jankowski (Vecchiato et al. 2011:582; Jankowski 2018:429).

As a result, although we obtained important clues in the light of the results obtained from the questions we asked at the beginning, we could not confirm our hypotheses. We believe that it will be useful to repeat the study by increasing the number of volunteers in future studies and to investigate how cultural differences will affect the results.

The low number of electrodes in the EEG device used can be considered as a limitation of the research. Future studies can be extended iteratively by examining other wavelengths.

## References

Aizei, Y. (2017). Televizyon Reklamlarının Ölçülmesi: Ürün Hatırlamaları Üzerine Bir Uygulama. *(Yayınlanmamış Yüksek Lisans Tezi) İstanbul Ticaret Üniversitesi.*

Aktaş, H. & Zengin, M. (2010). Dagmar Modeli: Deterjan Reklamları Örneğinde Görsel Bir Çözümleme. *Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 24, p. 31-43.

Albert, N., Ambrose L. & Valette-Florence, P. (2012). Consumer, Brand, Celebrity: Which Congruency Produces Effective Celebrity Endorsements. *Journal of Business Research*, 81, p. 96-106. https://doi.org/10.1016/j.jbusres.2017.08.002.

Amin, C. R., Hasin, M. F., Leon, T. S., Aurko, A. B., Tamanna, T., Rahman, M. A., & Parvez, M. Z. (2020). Consumer behavior analysis using EEG signals for neuromarketing application. *In 2020 IEEE Symposium Series on Computational Intelligence (SSCI)* (pp. 2061-2066). IEEE. https://doi.org/10.1109/SSCI47803.2020.9308358.

Appel, V., Sidney W. & Weinstein, C. (1979). Brain Activity and Recall of TV Advertising. *Journal of Advertising Research*, Vol. 19, No. 4, p. 7-15.

Armağan, E. & Gürsoy, Ö. (2017). A Research On The Effect of Using Celebrity Endorsement in Advertisements on Purchasing Decisions of Consumer. *Global Business Research Congress (GBRC)*, 24-25 Mayıs 2017, İstanbul, PressAcademia Procedia (PAP) V 3, p. 1043-1057. https://doi.org/10.17261/Pressacademia.2018.777.

Bakır, U. (2013). Reklamda Cinsellik ve Tüketici: Bireysel Ahlaki İdeolojinin Reklamda Cinselliğin Kullanımına Yönelik Tutumlara Etkisi. *Erciyes İletişim Dergisi "akademia"*, 3/1, p. 14-30.

Black, I. & Morton, P. (2017). Appealing to Men and Women Using Sexual Appeals in Advertising: In the Battle of the Sexes, Is a Truce Possible?. *Journal of Marketing Communications*, 23/4, p. 331-350. https://doi.org/10.1080/13527266.2015.1015108.

Bazzani, A., Ravaioli, S., Trieste, L., Faraguna, U., & Turchetti, G. (2020). Is EEG suitable for marketing research? A systematic review. *Frontiers in Neuroscience*, 14, 594566. https://doi.org/10.3389/fnins.2020.594566.

Caneppele, N. R., Serra, F. A. R., Pinochet, L. H. C. & Ribeiro, I. M. R. (2022). Potential and Challenges for Using Neuroscientific Tools in Strategic Management Studies. *Rausp Management Journal*, Vol 57, No.3, p. 235-263. https://doi.org/10.1108/RAUSP-01-2021-0014.

Chang, H.J. (2016). An fMRI Study of Advertising Appeals and Their Relationship to Product Attractiveness and Buying Intentions. Journal of Consumer Behaviour, J. *Consumer Behav.*, 15, p. 538–548. https://doi.org/10.1002/cb.1591.

Cheonga, Y., Kimb, K. & Zheng L. (2010). Advertising Appeals as A Reflection of Culture: A Cross-Cultural Analysis of Food Advertising Appeals in China and the US. *Asian Journal of Communication*, 20/1, p. 1-16. https://doi.org/10.1080/01292980903440848.

Chiou, J. (2002). The Effectiveness of Different Advertising Message Appeals in the Eastern Emerging Society: Using Taiwanese TV Commercials as an Example. *International Journal of Advertising*, 21/2, p. 217-236. https://doi.org/10.1080/02650487.2002.11104927.

Choi, S. M. & Rifon, N. J. (2007). Who is The Celebrity in Advertising? Understanding Dimensions of Celebrity İmages. *The Journal of Popular Culture*, 40(2), p. 304-324. https://doi.org/10.1111/j.1540-5931.2007.00380.x.

Çay. D. (2012). Olumsuz Reklam İçeriğinin Hatırlama Üzerinde Etkisi. *(Yayınlanmamış Yüksek Lisans Tezi) Bahçeşehir Üniversitesi.*

Çakar S. (2006). Reklamlarda Korku Çekiciliğinin Kullanılması. *(Yayınlanmamış Yüksek Lisans Tezi) Bahçeşehir Üniversitesi.*

Çakır, V. (2006). Reklam ve Marka Tutumu. *Tablet Yayımları:53, Konya.*

Çakır, V. (2006). Reklamların Beğenilmesinin Tüketicilerin Marka Tutumlarına Etkisi. *Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, p. 663-687.

Çakır, V. (2007). Tüketici İlgilenimini Ölçmek. *Selçuk İletişim,* 4/4, p. 63-180.

Dix, S. & Marchegiani, C. (2013). Advertising Appeals. *Journal of Promotion Management*, 19/4, p. 393-394. https://doi.org/10.1080/10496491.2013.817218.

Eldem Ü. Ğ., & Anar, Ö. (2011). Küreselleşme İçinde Ünlülerin Kullanıldığı Reklamlar; "Yerli Malı Yurdun Malı" Anlayışı ve Pepsi Örneği. *Fırat Üniversitesi İletişim Fakültesi Medya ve Etik Sempozyumu, Bildiriler Kitabı*, p. 63-71.

Eisend, M. (2009). A Meta-Analysis of Humor in Advertising, *Journal of the Academy of Marketing Science*, 37/2, p. 191–203. https://doi.org/10.1007/s11747-008-0096-y.

Ergin, T.Ç., Sert, N.Y. & Salmanova, L. (2018). Reklamlarda Cinsel Çekicilik Kullanımının Tüketiciler Üzerindeki Etkisi: Biscolata Reklamlarının Youtube Kanalı Üzerinden Netnografik Bir İncelemesi. *Uluslararası Sosyal Bilimler Dergisi,* 1/2, p. 211-222.

Fırat, D. (2013). Korkunun Bir Pazarlama Aracı Olarak Uygulanması: İşletmelerin Korku Mesajları ile Tüketicilerin Algısı Arasında Uyum Var Mı?, *Sosyal ve Beşeri Bilimler Dergisi*, 5/1, p. 187 – 197.

Garrido-Morgado, A., González-Benito, O., Campo, K., and Martos-Partal, M. (2015). Improving sales of private labels in store," in Proceedings of the Advances in National Brand and Private Label Marketing. *Springer Proceedings in Business and Economics*, eds F. Martínez-López, J. Gázquez-Abad, and R. Sethuraman (Cham: Springer), 3–7. https://doi.org/10.1007/978-3-319-20182-5_1.

Gülver, N. (2017). Marka ve Maskot Arasındaki Çatışma Seviyesinin Maskotun Beğenilme ve Hatırlanmasına Yer Aldığı Reklama ve Ait Olduğu Markaya Karşı Tutuma Olan Etkileri. *(Yayınlanmamış Yüksek Lisans Tezi) İstanbul Bilgi Üniversitesi.*

Girişken, Y. & Bulut, D. (2014). How Do Consumers Perceive A/An Logotype/Emblem in The Advertisements: An Eyetracking Study. *International Journal on Strategic Innovative Marketing*, 1 (2014), p. 198-209. https://doi.org/10.15556/IJSIM.01.04.002.

İslamoğlu, A.H. & Altunışık, R. (2010). Tüketici Davranışları. *Beta Basım A.Ş.* 3. Baskı, İstanbul.

İsmail, A.R. & Melewar, T.C. (2014). Attitude of Muslim Consumers Toward Sex Appeal in Advertising: A Comparative Study Between Subcultures in Malaysia. *Journal of Promotion Management*, 20/5, p. 553-570. https://doi.org/10.1080/10496491.2014.946204.

Jain, A., Choudhury, T., Singh, R., & Kumar, P. (2018). EEG Signal Classification for Real-Time Neuro Marketing Applications. In 2018 *International Conference on Advances in Computing and Communication Engineering (ICACCE)*, pp. 434-438. IEEE. https://doi.org/10.1109/ICACCE.2018.8441756.

Kazakova, S., Cauberghe, V., Hudders, L. & Labyt, C. (2016). The Impact of Media Multitasking on The Cognitive and Attitudinal Responses to Television Commercials: The Moderating Role of Type of Advertising Appeal. *Journal of Advertising*, 45/4, p. 403-416. https://doi.org/10.1080/00913367.2016.1183244.

Khurana, V., Gahalawat, M., Kumar, P., Roy, P. P., Dogra, D. P., Scheme, E., & Soleymani, M. (2021). A Survey on Neuromarketing Using EEG Signals. *IEEE Transactions on Cognitive and Developmental Systems*, 13(4), 732-749. https://doi.org/10.1109/TCDS.2021.3065200.

Lachance, C.C., Lubitz, A. & Chestnut, R.W. (1977). The Decorative Female Model: Sexual Stimuli and the Recognition of Advertisements. *Journal of Advertising*, 6/4, p. 11-14. https://doi.org/10.1080/00913367.1977.10672719.

Lanseng, E.J. (2009). Relevant Sex Appeals in Advertising: Genderand Commitment Context Differences. *Frontiers in Psychology*, 7, p. 1-11. https://doi.org/10.3389/fpsyg.2016.01456.

Lass, P. & Hart, S. (2004). National Cultures, Values and Lifestyles Influencing Consumers' Perception towards Sexual Imagery in Alcohol Advertising: An Exploratory Study in the UK, Germany and Italy. *Journal of Marketing Management*, 20/5-6, p. 607-623. https://doi.org/10.1362/0267257041323936.

Lin, M. H., Cross, S. N., Jones, W. J., & Childers, T. L. (2018). Applying EEG in Consumer Neuroscience. *European Journal of Marketing*, 52(1/2), 66-91. ISSN: 0309-0566.

Luk, C.L., Chow, C.W.C., Wan, W.W.N., Lai, J.Y.M., Fu, I. & Fong, C.P.S. (2017). An Institutional Perspective on Modernization and Sex-Appeal Advertising. *Asia Pacific Journal of Marketing and Logistics*, 29/2, p. 220-238. ISSN: 1355-5855.

Malär, L., Krohmer, H., Hoyer, W. D., and Nyffenegger, B. (2011). Emotional Brand Attachment and Brand Personality: The Relative İmportance of The Actual and The İdeal Self. *J. Marketing* 75, 35–52. https://doi.org/10.1509/jmkg.75.4.35. ISSN: 1355-5855.

Mashrur, F. R., Miya, M. T. I., Rawnaque, F. S., Rahman, K. M., Vaidyanathan, R., Anwar, S. F., Sarker, F. & Mamun, K. A. (2021). MarketBrain: An EEG Based Intelligent Consumer Preference Prediction System. In 2021 *43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)* pp. 808-811. IEEE. https://doi.org/10.1109/EMBC46164.2021.9629841.

Muda, M., Musa, R., Mohamed, R. N. & Borhan, H. (2014). Celebrity Entrepreneur Endorsement and Advertising Effectiveness. *Procedia-Social and Behavioral Sciences*, 130, p. 11-20. https://doi.org/10.1016/j.sbspro.2014.04.002.

Morgan, C.T. (2011). Psikolojiye Giriş. (Çev: R. Coştur) *Eğitim Akademi Yayınları*. 19. Baskı, Konya, Editörler: Prof.Dr. Sirel KARAKAŞ, Yrd.Doç.Dr. Rükzan Eski, 5. Bölüm.

Morin, C. (2011). Neuromarketing: The New Science of Consumer Behavior. *Symposıum: Consumer Culture in Global Perspectıve.* Soc (2011) 48, p. 131–135, https://doi.org/ 10.1007/s12115-010-9408-1.

Mostafa, M. M. (2018). Neural Correlates of Fear Appeal in Advertising: An fMRI Analysis. *Journal of Marketing Communications*, 24. https://doi.org/ 10.1080/ 13527266.2018.1497680.

Ohme, R. Reykowska, D., Wiener, D. & Choromanska, A. (2010). Application of Frontal EEG Asymmetry to Advertising Research. *Journal of Economic Psychology*, 31, p. 785–793. https://doi.org/10.1016/j.joep.2010.03.008.

Okazaki, S., Mueller, B. & Taylor, C. R. (2010). Measuring Soft-Sell Versus Hard-Sell Advertising Appeals. *Journal of Advertising*, 39/2, p. 5-20. https://doi.org/ 10.2753/JOA0091-3367390201.

Özüpek, M.N., Özer, D. (2018). Sigara Karşıtı Kamu Spotlarının Bireyler Üzerindeki Etkisinin Nörogörüntüleme Yöntemiyle Tespit Edilmesi. *Uluslararası Toplum Araştırmaları Dergisi,* 9/16, p. 183-215. https://doi.org/10.26466/opus.412027.

Panda, T., Panda T. K. & Mishra, K. (2013). Does Emotional Appeal Work in Advertising? The Rationality Behind Using Emotional Appeal to Create Favorable Brand Attitude. *The IUP Journal of Brand Management*, X/2, p. 7-23.

Polat, H. & Özerdem, M.S. (2016). Görsel - İşitsel Uyaranlar Kaynaklı Oluşan Duyguların EEG İşaretleri ile Sınıflandırılması. *Mühendislik Dergisi, Dicle Üniversitesi Mühendislik Fakültesi*, 7/1, p. 33-40.

Puto, C.P. & Wells, W.D. (1984). Informational and Transformational Advertising: The Differential Effects of Time. *Advances in Consumer Research*, 11, p. 638-643. http://www.acrwebsite.org/volumes/6323/volumes/v11/NA-11 (28/12/2018).

Rabcan, J. & Kvassay, M. Electroencephalogram Signals Classification by Ordered Fuzzy Decision Tree. http://ceur-ws.org/Vol-1844/10000072.pdf, (08/03/2018).

Reichert, T. & Fosu, I. (2005). Women's Responses to Sex in Advertising. *Journal of Promotion Management*, 11/2-3, p. 143-153. https://doi.org/10.1300/J057v11n02_10

Reichert, T., La Tour, M. S. & Jooyoung, K. (2007). Assessing the Influence of Gender and Sexual Self-Schema on Affective Responses to Sexual Content in Adevertising. *Journal of Current Issues and Research in Advertising*, 29(2), p. 63-76. https://doi.org/10.1080/10641734.2007.10505217.

Rejer, I. & Jankowski, J. (2017). Brain Activity Patterns Induced By Interrupting The Cognitive Processes With Online Advertising. *Cogn Process*, 18, p. 419-430. https://doi.org/ 10.1023/B:NEAB.0000038139.39812.eb.

Shigaki, H. B., Gonçalves, C. A. & Santos, C. P. V. (2017). Consumer Neuroscience and Neuromarketing: Theoretical Adoption Potential With The Application of Methods and Techniques in Neuroscience. *Revista Brasileira De Marketing*. Vol. 16, N. 4, p. 439-453. https://doi.org/10.5585/remark.v16i4.3427.

Shin, S., Ki, E. J. & Griffin, W. G. (2017). The Effectiveness of Fear Appeals in 'Green' Advertising: An Analysis of Creative, Consumer, and Source Variables. *Journal of Marketing Communications*, 23/5, p. 473-492. https://doi.org/10.1080/ 13527266.2017.1290671.

Siefert, C., Gallent, J., Jacobs, D., Levine, B., Stipp, H. & Marci, C. (2008). Biometric and Eye-Tracking Insights Into The Efficiency of Information Processing of Television Advertising During Fast-Forward Viewing. *International Journal of Advertising*, 27/3, p. 425-446. https://doi.org/10.2501/S0265048708080050.

Solak, B. B. (2017). Televizyon Reklamlarında Mizah ve Mizahi Karakter Kullanımı: Banka Reklamlarına Yönelik Analiz. *İnönü Üniversitesi İletişim Fakültesi Elektronik Dergisi (İNİF E-Dergi)*, 1(2), p. 170-190.

Strick, M., Holland, R.W., Baaren, R.B., Knippenberg, A. & Dijksterhuis, A. (2013). Humour in Advertising: An Associative Processing Model. *European Review of Social Psychology*, 24/1, p. 32-69. eBook ISBN9781315094274.

Şen, A.F. & Altın, Ş.Y. (2018). 1980'lerden 2000'lere Reklamın Söylemsel ve Görsel Dönüşümünün Göstergebilimsel Analizi. *Atatürk İletişim Dergisi,* 16, p. 5-30. https://doi.org/10.32952/atauniiletisim.484738.

Teplan, M. (2002). Fundamentals of EEG Measurement. *Measurement Science Review*, 2/2, 1/11.

Ural, T. (2008). Pazarlamada Yeni Yaklaşım: Nöropazarlama Üzerine Kuramsal Bir Değerlendirme. *Ç.Ü. Sosyal Bilimler Enstitüsü Dergisi*, 17/2, p. 421-432.

Vecchiato, G., Toppi, J., Astolfi, L., Fallani, F.D., Cincotti, F., Mattia, D., Bez, F. & Babiloni, F. (2011). Spectral EEG Frontal Asymmetries Correlate With The Experienced Pleasantness of TV Commercial Advertisements. *Med Biol Eng Comput*, 49, p. 579–583. https://doi.org/10.1007/s11517-011-0747-x.

Williams, K.C. (2012). Fear Appeal Theory. *Research in Business and Economics Journal*, 5/1, p. 1-21.

Yücel, A., Orhan, E.B., Yücel, N., Yılmaz, A.S., Şimşek, A.İ. & Çubuk, F. (2015). A Neuropolitic Experiment on State Leaders on the Grounds of Power, Charisma, Trust and Peacebility. *The 2015 WEI International Academic Conference Proceedings*, Harvard, USA.

Zhang, H., Sun, J., Liu, F. & Knight, J.G. (2014). Be rational or Be Emotional: Advertising Appeals, Service Types and Consumer Responses. *European Journal of Marketing*, 48/11-12, p. 2105-2126. ISSN: 0309-0566.