

Neuroadvertising study to create emotional and cognitive responses in recipients to improve advertising strategies and effectiveness

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Abstract

Neuroadvertising relates specifically to the application of neuromarketing in advertising practices and employs principles from neuroscience. Recently researchers have depicted neuroadvertising or neurobranding as the 'third wave' of advertising, focusing on marketing across television, the internet, or the printer. These theories can help brands develop stories, pictures, and messages in an attractive way favorable to the emotions and thoughts of the brand's recipients.

Neuroadvertising or cognitive branding is becoming an increasingly relevant field due to the integration of neuroscience and advertising aimed at understanding the fundamental features of recipient behaviors. With the assistance of these insights, advertisers can improve the engagement level, the emotional bond, and the sales of the product.

This research will study and attempt to understand what neuroadvertising and neuromarketing are, how to measure them, how to use them in advertising to get the most out of advertising campaigns and what are the strategies for applying this type of advertising.

The research includes the applied part, which is collecting information and analyzing some advertisements made by companies that used and applied neuroadvertising and neuromarketing, with an explanation and analysis of each advertisement and how it was applied.

Keywords

Neuroadvertising,
Neuromarketing,
Emotional and
Cognitive
Responses,
Advertising
Strategies and
Effectiveness

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Introduction

Similarly, neuromarketing encompasses neuromarketing as well as neuroadvertising, distinguishing itself through the integration of neuroscience and marketing strategies, allowing recipient's behavior to be understood at a deeper level. These disciplines investigate, for instance, responses of the customers to different advertising stimuli using brain imaging, and other techniques like biometrics. This aspect of the work allows marketers to reveal the emotional triggers of a recipient's subconscious, and therefore construct much more suitable and effective advertisements. Thus, neuromarketing and neuroadvertising focus on developing techniques that engage the recipient and create a lasting brand-customer relationship.

Theoretical Framework:

Neuroadvertising

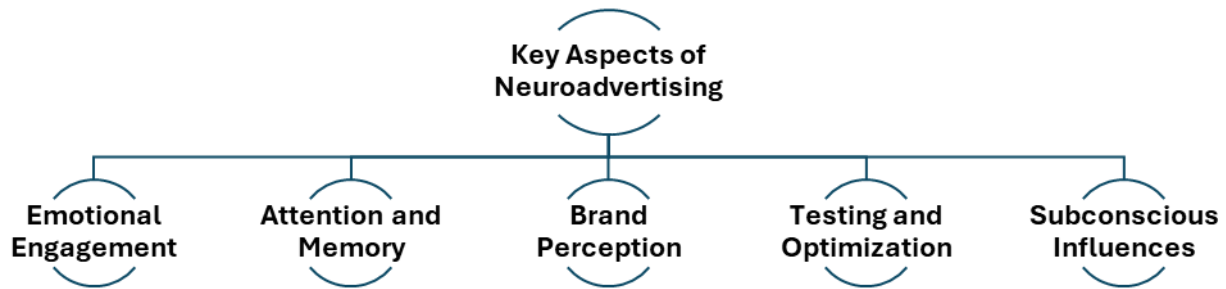
Neuro advertising is a unique field in marketing that deals with applying knowledge and techniques about the human brain to improve advertising. It uses tools such as fMRI, eye trackers, or biometric measurement to examine what recipients are likely to feel when they are exposed to an advertisement.

Within the scope of neuroadvertising, the authors seek the responses of the audience to emotionally or intellectually stimulating components of a marketing campaign. Upon understanding what causes attention or attraction, what makes one emotionally respond to an announcement, or what prompts one to take certain action, marketers create ads that work much better than others. To put it differently, the end's goal of neuroadvertising is to increase engagement and create a more effective advertising campaign for the brand. ⁽¹⁾

CITATION

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Key Aspects of Neuroadvertising ⁽²⁾



1- Emotional Engagement:

According to neuroadvertising, strong feelings are an essential component of advertising, especially of ads. Use of emotional appeal in advertising has been shown to improve brand recall and the likelihood to purchase the product which is being advertised.

2- Attention and Memory:

Inevitably, knowing how to get and keep the attention of recipients will be paramount to succeeding. Neuroadvertising incorporates such methods as eye tracking and EEG as means of evaluating which highlights in the ad grab attention and which remain the longest in memory.

3- Brand Perception:

As explained, neuroadvertising has a role of assisting brands in understanding how products, and messaging, are perceived from the recipients' **Neuroadvertising Techniques** ⁽³⁾

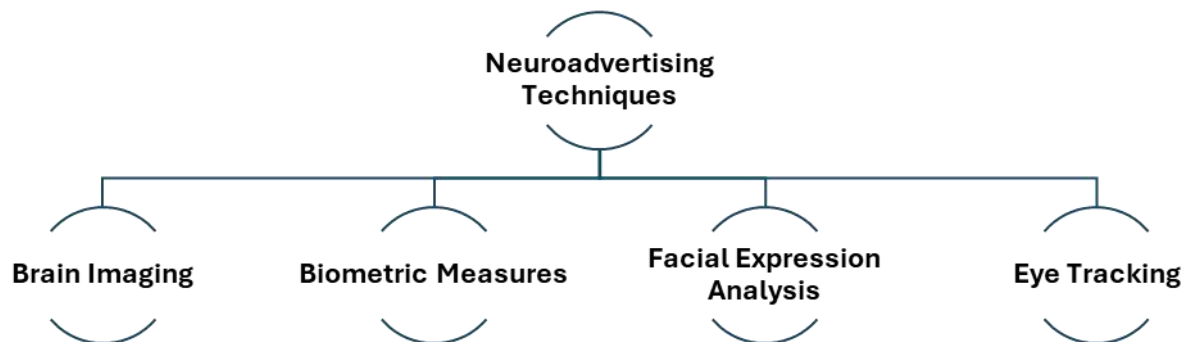
point of view. As such, this information is critical in assisting brands to know how to position themselves in the market and how to disseminate their core values, beliefs, and mission.

4- Testing and Optimization:

With the aid of neuroadvertising, it becomes possible to experiment with different advertising format, images and messages in order to determine what best suits the targeted audience. A/B testing with neuroimaging can also be utilized to better understand recipients' preferences than A/B testing alone.

Subconscious Influences:

By knowing the appropriate subconscious cues and connections, recipients can be easy to influence and campaigns can be able to be more persuasive even when recipients do not know they are being persuaded.



- **Brain Imaging:** Methods such as fMRI and EEG provide researchers with images of how different parts of the brain react during the presentation of ads, identifying where both emotional and cognitive engagement occur.

- **Biometric Measures:** Physiological responses, such as heart rate and skin conductance, monitor emotional arousal and therefore engagement.

- **Facial Expression Analysis:** Such subtle signals of viewers will help research their emotions when watching advertisements.

- **Eye Tracking:** It helps to identify the most attention-provoking parts of an ad to help drive

design decisions that increase engagement.

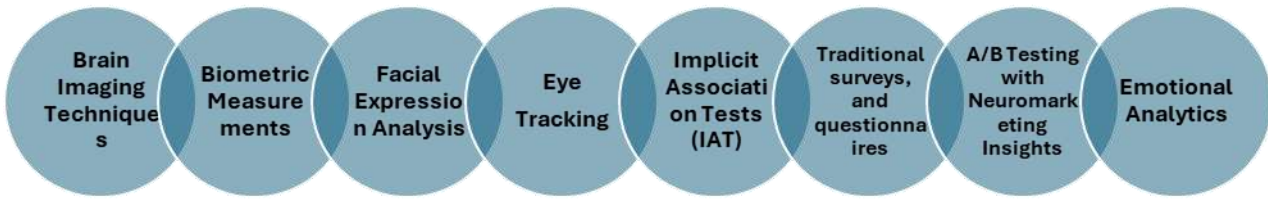
Neuromarketing ⁽⁴⁾

Neuromarketing is a novel interdisciplinary area integrating neuro-biologic science, psychology, and marketing. In other words, it is the study of how the brain reacts to Marketing stimuli, which would, therefore enable brands to create far better advertising strategies.

1. Definition:

Neuromarketing studies the responses of recipients' brains to marketing messages, products, and experiences. It uses techniques from neuroscience to analyze emotional responses, decision-making processes, and cognitive functions. ⁽⁴⁾

2. Methods:



1. Brain Imaging Techniques

• **fMRI-Functional Magnetic Resonance Imaging:** It measures the activity of the brain by detecting the change in blood flow. It helps the researchers to understand which parts of the brain get activated for the particular advertisement or marketing stimulus. ⁽⁵⁾

Ex: When you're taking a test or enjoying a cup of coffee, certain parts of your brain are extra busy. An fMRI allows us to capture some of this activity.

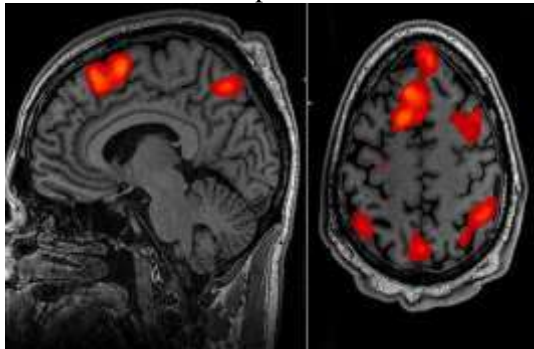


Figure (1): fMRI-Functional Magnetic Resonance Imaging ⁽²⁶⁾

• **Electroencephalogram (EEG):** This measures the electrical activity of the brain through electrodes placed on the head. It is useful for tracking responses to advertisements in real time, thus helping identify emotional engagement and attention levels. ⁽⁶⁾

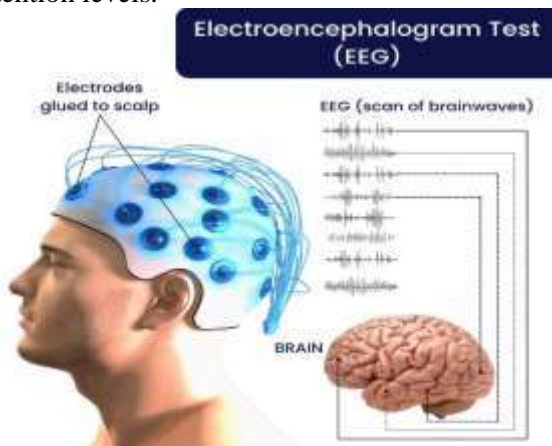


Figure (2): Electroencephalogram (EEG) ⁽²⁷⁾

2. Biometric Measurements

• **Heart Rate Monitoring:** Changes in heart rate can indicate emotional arousal. By measuring heart rate during ad exposure, researchers can assess how emotionally engaging an ad is. ⁽⁷⁾



Figure (3): Heart Rate Monitoring ⁽²⁸⁾

• **Skin Conductance Response (GSR):** Measures sweat gland activity, which correlates with emotional arousal. Increased skin conductance can indicate heightened interest or emotional response to advertising stimuli and it is also called Galvanic Skin Response. ⁽⁸⁾



Figure (4): Skin Conductance Response (GSR) ⁽²⁹⁾

3. Facial Expression Analysis

• **Facial Coding:** Analyzing facial expressions through video to evaluate emotional responses to ads. This technique helps identify specific emotions elicited by the advertising content. ⁽⁹⁾



Figure (5): Facial Coding ⁽³⁰⁾

• **Emotion Recognition Software:** Uses computer vision to assess facial expressions and determine the emotions conveyed by viewers while watching ads. ⁽¹⁰⁾

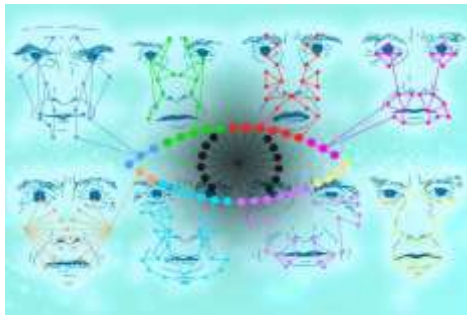


Figure (5): Emotion Recognition Software (31)

4. Eye Tracking

• Eye Tracking Technology: This technology follows where viewers look on a screen to see which elements of an ad attract the most attention. This data helps in optimizing ad design for better engagement. (11)



Figure (7): Eye Tracking Technology (32)

• Heatmaps: These are visual representations of eye tracking data that highlight areas of interest by

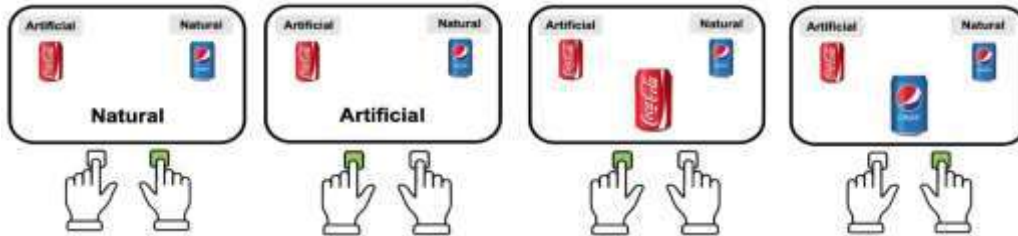


Figure (9): Implicit Association Tests (IAT) (34)

6- Traditional surveys, and questionnaires

though not pure neuromarketing methods, can be combined with biometric and neural data to provide a fuller picture of recipient responses. Questions can be designed to explore emotion, brand perception, and ad effectiveness. (14)



Figure (10): 6. Traditional surveys, and questionnaires (35)

showing where viewers focus their attention during ad exposure. (12)



Figure (8): Heatmaps (33)

5. Implicit Association Tests (IAT)

These tests measure the strength of automatic associations between concepts, such as a brand and its attributes. They can uncover recipients' subconscious feelings about a brand or product, which might not be apparent through surveys. (13)

Ex: IAT Example: In the IAT, participants sort words or images that appear in the center of the screen to one of two axes at the top. The words or images appear in random order repeatedly over the course of several minutes.

7. A/B Testing with Neuromarketing Insights

• Advertisers can use the insights provided by neuromarketing to develop variations of ads in order to test different elements-such as visuals, messaging, and design-while measuring neural and physiological responses in pursuit of performance optimization. (15)

Ex: A/B testing is comparing two ideas to see which one works better for a specific goal.



Figure (11): A/B Testing with Neuromarketing Insights (36)

8. Emotional Analytics

Emotion-testing tools and software can test voice tone analysis or written response sentiment analysis

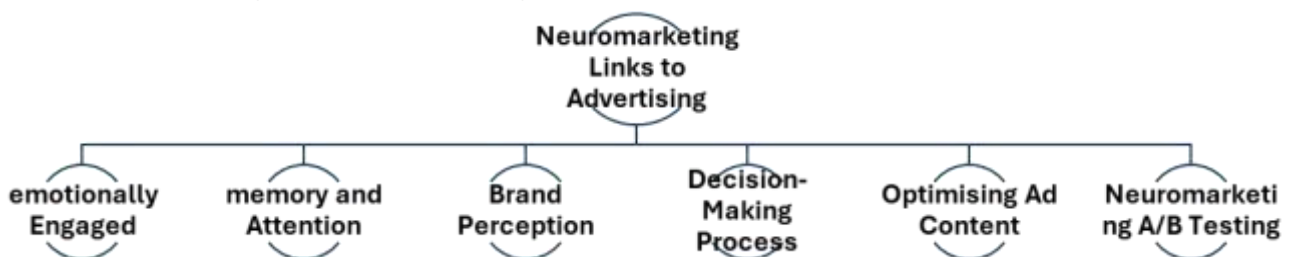
about an ad to understand the exact feelings of recipients. (16)

Measuring and Quantifying Emotions



Figure (12): Emotional Analytics (37)

How Neuromarketing Links to Advertising (17)



1. emotionally Engaged:

Neuromarketing studies evidence that emotions play a very important role in recipient decisions. Hence, advertisements evoking strong emotional responses—for example, happiness, nostalgia, or surprise—are likely to be more effective at driving engagement and purchase intention.

2. memory and Attention:

Understand what draws attention, brands can create advertisements that stand out. For example, strange elements or striking graphics enhance memorability so that buyers are more likely to remember the brand afterwards.

3. Brand Perception:

Neuromarketing helps identify how recipients perceive a brand or product. This may guide how a brand positions itself and communicates its values to create a more compelling narrative.

4. Decision-Making Process:

By understanding the cognitive processes underlying decision-making, brands can create their messages to align with recipients when making a choice. For instance, highlighting simplicity and clarity can help recipients make quicker purchasing decisions.

5. Optimising Ad Content:

Neuromarketing may be used to create ads by testing various ad elements—visuals, music, and language—to determine what works best with the target audience. In this process, one could develop more compelling campaigns.

6. Neuromarketing A/B Testing:

Combining traditional A/B testing with neuromarketing insights can lead to more refined experiments. In other words, Brands can test variations of ads while monitoring neural and physiological responses to optimize performance.

Ethical Considerations

While neuromarketing offers valuable insight, there are ethical questions regarding its implications for recipient manipulation and privacy. Brands should balance the leveraging of such techniques with respect for recipient autonomy and transparency.

Are Using Neuromarketing and Neuroadvertising Legally Prohibited? ⁽¹⁸⁾

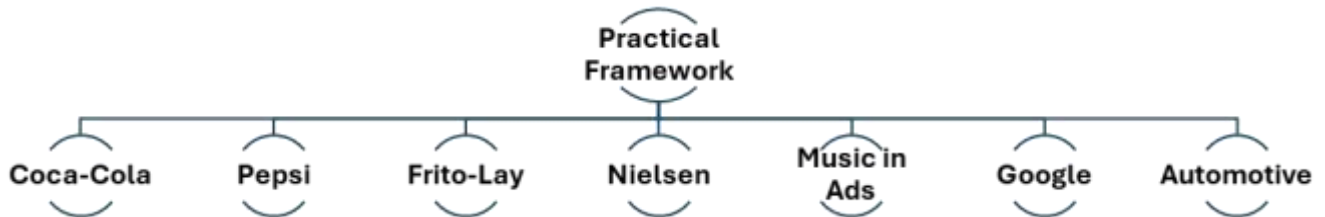
- **Legality:** there is no overarching legal prohibition against the use of neuromarketing and neuroadvertising. In any case, their use techniques must be subjected to various laws and ethical guidelines, particularly about recipient privacy and protection.
- **Privacy Concerns:** Neuromarketing and neuroadvertising also more often than not demand sensitive data be collected on the emotional and physiological responses of recipients. This very well brings serious questions of consent, data security, and transparency into play. Laws such as the GDPR in Europe, among several regulations for privacy in other jurisdictions, require that recipients be informed about how their data is being collected and used.

- **Ethical Guidelines:** Various organizations advocate ethical standards for neuromarketing and neuroadvertising research practices, emphasizing the respect of recipient autonomy and that marketing practices should not manipulate or deceive recipients.
- **Consent:** In neuromarketing and neuroadvertising studies that involve data acquisition from test participants, such as EEG

or biometric data, it is necessary to take informed consent in regard to ethical considerations.

Practical Framework:

Analysis of certain examples that utilized neuroadvertising for the functionality of advertising campaigns:



1. Coca-Cola⁽¹⁹⁾

Coca-Cola used neuromarketing to research recipient emotional responses to its ads. Using fMRI, for instance, it learned that nostalgic and happy memories associated with their brand activated specific brain regions linked to pleasure. That insight helped it create campaigns that evoke those emotions, reinforcing brand loyalty.

Coca-Cola has used fMRI as a way to determine how recipients respond emotionally and cognitively to all its advertisements and branding efforts. The process used for this purpose, along with some of its applications, is explained below.

1-1 How Coca-Cola Used fMRI⁽¹⁹⁾

1. Objective:

The objective was to study the recipients' emotional and cognitive responses to Coca-Cola's branding and advertising. They wanted to know what makes their brand appealing and what kind of marketing messages work most effectively for the recipients.

2. FMRI Process:

- **Participant Selection:** A group of recipients is selected to participate in the study.
- **Set up:** Participants would then lie in an fMRI scanner that measures activity in the brain by detecting changes in blood flow. This process uses the general principle that active regions of the brain require more oxygenated blood.
- **Stimuli Exposure:** In the scanner, the participant is exposed to various advertisements, branding elements, and packaging of Coca-Cola, such as iconic ads or different visual designs.
- **Data Collection:** As the participant sees these stimuli through the experiment, fMRI measures the brain activity to show researchers which parts of the brain became active.

3. Analysis:

- After the data collection is complete, brain activity patterns are analyzed for emotional

responses. For instance, regions responsible for feelings of pleasure, reward, and memory may illuminate when participants watch advertisements that give them good feelings.

- This helps Coca-Cola gauge which aspects of its branding most successfully elicit an emotional response.

1-2 Location of the Technique⁽¹⁹⁾

- **Research Facilities:** These studies are normally conducted in a research facility or at an academic institution that has the fMRI machines. The facilities may be associated with universities or private research organizations that carry out neuroscience-related studies.
- **Controlled Environment:** The environment is controlled so that participants can have better concentration on the stimuli rather than being distracted by environmental disturbances, thus providing more accurate measures of responses.

1-3 Coca-Cola Implications

These insights provided by fMRI studies have helped Coca-Cola develop focused marketing campaigns in the following ways:

- **Emphasize Emotional Connections:** By knowing exactly what emotional components are associated with their brand, they can create better advertising and make deeper connections with the audience.
- **Ensure Campaigns Match Brain Responses:** By knowing which ads trigger positive responses in the brain, Coca-Cola can focus on delivering such messages.

In all, the application of fMRI to recipient behavior gives Coca-Cola several scientific ways in which it can improve its branding and advertising.

2. Pepsi vs. Coke⁽²⁰⁾

One of the most famous studies by researchers examined the reaction of recipients to Pepsi and Coke through blind taste tests and branded contexts.

Neuroimaging showed that participants preferred Pepsi in blind conditions but preferred Coke when they knew the brand. This underlined a powerful influence of branding on taste perception and recipient choice.

The Pepsi vs. Coke study using fMRI is a well-documented example of how neuromarketing techniques can uncover recipient preference and brand perceptions. Here's how the process worked and where it usually takes place:

2-1 How the Study Worked ⁽²⁰⁾

1. Objective:

- The idea was to explore how brand awareness would influence taste preferences and choice. Researchers wanted to understand if knowing the brand of a beverage would affect the participants' taste perception.

2. FMRI Process:

- **Participant Selection:** Subjects selected, usually based on the common consumption of the soft drink beverages, were recruited for this experiment.
 - **Setup:** The participants lay inside an fMRI scanner and were presented with various beverage samples. They were initially presented in a blindfolded manner to avoid brand bias and allowed researchers to see their reactions to taste without brand influence.
- **Exposure to Stimuli:** Subjects were exposed to a blind taste of Pepsi and Coke. Subsequently, they were allowed to taste the drinks once more this time with the brand labels exposed.
- **Data Collection:** During these tastings, the fMRI measured the activity in their brains, especially those areas which govern the functions of taste, reward, and memory.

3. Analysis:

- Researchers analyzed the brain activity to assess how participants reacted to drinks both with and without brand knowledge, examining patterns of brain activation associated with pleasure and reward.
- It seemed that, without knowing the brand, many liked Pepsi for its taste. But then, when the brand was shown, they changed their preference to Coke. Arguably, this is perhaps the power of brand recognition at work.

2-2 Location of the Technique ⁽²⁰⁾

- **Research Facilities:** fMRI studies are mostly carried out in specific research facilities or academic settings where the equipment, such as an fMRI machine, is available. These can be affiliated with universities or even dedicated research units, targeting neuromarketing and recipient behavior.
- **Controlled Environment:** As much as possible,

this setting is controlled to minimize distraction, allowing the respondents' reactions to be measured as accurately as possible during the taste tests.

2-3 Implications for Pepsi and Coke ⁽²⁰⁾

The following were some of the key insights derived from this study:

- **Brand Influence:** The study was able to show that brand identity can weigh heavily in recipient preference, even outperforming taste when the recipient knows the brand.
- **Marketing Strategies:** Knowing how branding affects recipient perception helps the company fine-tune its marketing strategies and ad campaigns to build on brand loyalty.

Fundamentally, this application of fMRI in the Pepsi-Coke study underlines the importance of knowing the underlying psychological and neurobiological factors driving recipient behavior so that the brand can devise strategies accordingly.

3. Frito-Lay ⁽²¹⁾

Frito-Lay used eye-tracking technology to study how variations in snack packaging design draw recipient attention. Results from the studies led redesigns in packaging, which boosted shelf impact and helped promote sales by highlighting elements that would most resonate with recipients.

Frito-Lay has used eye-tracking technology in a very creative way to learn about recipient behavior and improve its packaging. Here's how it works and typically where:

3-1 How Frito-Lay Used Eye-Tracking Technology ⁽²¹⁾

1. Objective:

The objective was rather to understand how recipients view different packaging designs of snacks and which design elements create attention and drive purchases.

2. Eye-Tracking Process

1. Participant Selection

- A pool of participants is recruited who generally can be a group of snack recipients. In many instances they may be selected to represent the demographics of the target market.

2. Setup:

- Participants are put in a controlled environment where they can see snack packaging. They wear eye-tracking glasses or are positioned in front of a screen equipped with eye-tracking technology. This setup records their eye movements and gaze patterns as they look at the packaging.

3. Exposure to Stimuli:

- New packaging designs for snacks are exposed to the respondents. These may include some existing products, as well as some new designs

that might be under consideration by Frito-Lay. The subjects may be asked to freely explore the packaging or perform specific tasks, such as choosing their favorite design.

4. Data Collection:

- Utilization of eye-tracking technology: This records where a participant is looking at, what they focus on for longer periods of time, and general gaze patterns. This would further outline which parts of the packaging are most eye-catching and which parts are often missed.

5. Analysis:

- Researchers will study the data collected to establish which of the designs drew the most attention and what specific features intrigued them enough to engage. This is often accompanied by the construction of heatmaps that visually display the hotspots of high and low interest for easier understanding.

3-2 Location of the Technique ⁽²¹⁾

1. Research Facilities:

- Eye-tracking studies take place in special research facilities or laboratories with the device, possibly part of Frito-Lay's internal research team or subcontracted to external market research firms.

2. Controlled Environment:

- The testing environment is carefully controlled to limit outside distractions that may interfere with the participant's attention to the packaging. In this way, their visual engagement can be more precisely measured.

3-3 Implications for Frito-Lay ⁽²¹⁾

Eye-tracking studies have helped Frito-Lay to better:

- Eye-tracking helps one understand what packaging design elements really catch recipients' attention; hence, enhancing appeal for more engaging packaging on the shelf.
- Improved packaging design keeps the recipient in mind and will drive up sales by making a product catch more eyes and become top of mind for brands.
- Customize Marketing Strategies: Fully comprehending how recipients engage with packaging, Frito-Lay is able to more accurately target marketing campaigns.

The benefit of using this eye-tracking technology was that Frito-Lay got some highly valuable data on recipient preference to enhance the manner in which its products are packaged and marketed.

4. Nielsen's Emotional Analytics ⁽²²⁾

Nielsen used facial coding and other biometric measures to test the emotional responses of several ads. As a matter of fact, its results showed that

advertisements that evoked higher emotional activity turned out to be much more effective at influencing recipient engagement and purchase intent.

Nielsen has applied both facial coding and biometric measures in gauging emotional responses to ads in its effort to provide insight into recipient reactions. The following describes how this is done and where it is done.

How Nielsen Applied Facial Coding and Biometric Measures (22)

1 Objective:

The key objective was to determine how different advertisements are emotionally engaged by audiences. By identifying the emotional responses of viewers, Nielsen aimed at ascertaining which messages hit hardest with recipients to help advertisers more effectively and poignantly develop their approach.

2. Process Overview

1. Participant Selection:

- Nielsen selects a group of participants that are demographically representative of the intended target audience of the advertisement.

2. Setup:

- Participants are put in a controlled environment, sometimes in front of a screen on which advertisements will appear. They can also be fitted with cameras for facial coding and biometric sensors to record physiological responses.

3. Facial Coding:

- Video Analysis: The participants' facial expressions are recorded with cameras while they are watching the advertisements. Trained analysts or software then look for expressions that indicate emotions like joy, surprise, anger, or disgust.
- Emotion Recognition Software: It works by utilizing algorithms that analyze facial movements and classify them into discrete emotional responses; these can then be used to determine the quantitative measure of how viewers feel toward the advertisement.

4. Biometric Measurements

- Heart Rate Monitoring: Sensors detect alterations in heart rate, which can reflect emotional excitation. A higher heart rate may indicate that one is more excited or involved.
- Skin Conductance Response (GSR): This measures the electrical conductance of the skin, which increases with sweating when a person is emotionally aroused. It helps to provide the intensity of emotional responses.

5. Data Collection:

- During ad exposure, facial coding data and biometric measurements are collected simultaneously for every participant, which helps in a complete analysis of emotional involvement.

6. Analysis:

- Researchers draw on the collected data to highlight patterns and correspondences between specific emotional reactions with advertisement effectiveness. The key emotional responses that drive viewer engagement and drive purchasing intentions are looked upon.

4-2 Location of the Technique (22)

1. Research Facilities:

These studies usually take place in special research facilities or labs equipped with the necessary technology for facial coding and biometric measurement. They may be independently owned by Nielsen's research teams or partnered with either academic institutions or private research organizations.

2. Controlled Environment:

The testing environment is made as distraction-free as possible to ensure participants focus on the ads completely. This allows for a controlled measurement of facial expressions and physiological responses.

3. Advertiser Implications

By accurately uncovering emotional signals for explicit ad reactions through Nielsen's studies in facial coding and biometric measures, advertisers can do the following:

- **Optimize Ads:** Understanding the exact emotional responses that are triggered by specific ads helps brands refine their messaging and creative strategies.
- **Drive Better Engagement:** Emotional triggers, which advertisers concentrate on, resonate with audiences in a bid to bring across more compelling campaigns that capture attention and drive action.
- **Effectiveness Measurement:** These means go beyond the simple survey methods of the past to give a brand a true understanding of the ad's actual emotional impact.

Overall, Nielsen's use of facial coding and biometric measures provides valuable insights into recipient emotions, helping brands enhance their advertising strategies and ultimately improve their effectiveness in the marketplace.

5. The Role of Music in Ads ⁽²³⁾

Research has shown that the background music used in advertisements can significantly influence emotional responses and brand recall. Companies have leveraged these insights to select music that aligns with the desired emotional tone of their campaigns.

It has been proved that through background music, advertisements importantly affect the emotional responses and improve brand recall. Here is how this influence works and where such research generally takes place:

5-1 How Music Influences Emotional Responses and Brand Recall ⁽²³⁾

1. Emotive Resonance:

- **Mood Induction:** Background music may be used to induce specific feelings relevant to setting the mood of the advertisement. Examples could include uptempo music, which can elicit feelings of happiness and energy, and slower, softer music that evokes nostalgia or calmness. This emotional resonance can have a great impact on how viewers view the advertisement and the brand.
- **Associative Memory:** Music associated with a brand or product can build a strong associative memory in the mind of the viewer. When a song appears frequently in an advertisement, it gets attached to positive feelings toward the brand. Thus, recipients strengthen brand recall once the music is heard later on.

2. Attention and Engagement:

- **Attention Getter:** Music will make viewers notice an ad. An interesting tune or catchy melodies will hold the viewer's attention and make them interested in the ad, hence making them remember the brand easily.
- **Recall:** When music makes sense to the meaning of a brand or the brand image, there is higher recall from advertisements featuring music. For example, a high-end brand can use classical music to communicate class and may therefore be remembered more effectively.

3. Cognitive Processing:

- **Processing Style:** Tempo and style might influence the processing style of the viewers; for instance, fast music can result in more heuristic or affectively-based processing whereas slow music may introduce more analytical thought that will influence how the viewer will judge the ad.

5-2 Research Locations (23)

1- Academic Institutions:

- Researches on the effects of music in advertising are conducted most often at universities and colleges. Many psychologists, marketers, and neuroscientists seek to understand how specific musical elements drive the behavior of recipients.

2. Market Research Firms:

- Sub-contracting market research firms, like Nielsen, conduct research that actually stipulates just how much background music can change

the rate of response of recipients. These may include groups, questionnaires, or even biometric measurements that pertain to emotional responses.

3. Advertising Agencies:

- Agencies can run tests to comprehend the impact of music on their campaigns. They frequently conduct research on the recipient response of two different selections of music used in test ads to choose the best reactions.

4. Customer Behavior Laboratories:

- Specialized laboratories that are equipped to conduct research on psychology and neurology often test the effect of background music on emotional responses. These facilities may use techniques such as fMRI or EEG to monitor subjects' brain activity as they watch ads with different musical backgrounds.

The integration of background music in advertisements isn't simply an aesthetic decision but has great impacts on both emotional engagement and brand recall. For that reason, through music selection, advertisers can consciously pick tracks that complement their messaging to better the potential of their campaign and lay down long-term connections with recipients.

6. Google User Experience Testing (24)

Google has implemented neurofeedback methods, including the EEG, to learn how users are using its ads and platforms. With a deep knowledge of cognitive and emotional reactions, Google has adjusted advertising to increase user satisfaction and engagement.

Google has integrated neurofeedback methods, including EEG, in order to study how users use its ads and platforms. This works by:

6-1 How Google Uses EEG to Analyze User Interaction - Objective (24)

The main focus is to comprehend the cognitive and emotional states of users while they interact with Google's ads and platforms, allowing improvement in user experience, ad effectiveness, and overall engagement.

6-2 Overview of Process: (24)

1. Participant Selection

- Google enlists a mixed group of participants to represent their user base, including individuals from all walks of life and eclectic backgrounds.

2. Setup

- Participants are placed under the study's control, mostly with EEG caps on to observe the electrical activity in the brain. These contain electrodes, picking up a pattern of brain waves for every user when looking at ads or using Google platforms.

3. Exposure to Stimuli:

- Participants are shown various advertisements or prompted to use Google services while their brain activity is recorded. This can include browsing through search results, watching video ads, or interacting with different app features.

4. Data Collection:

- The EEG technology collects real-time data on participants' brainwaves. This data provides insights into cognitive states such as attention, focus, and emotional responses (like excitement or frustration).

5. Analysis:

- Researchers study the waveforms present in the EEG data for patterns that are associated with either a positive or negative user experience. For example, they may look for increases in activity within those parts of the brain associated with reward and engagement when users like an ad.
- They could also find periods of disengagement or frustration, helping Google understand which elements of an ad or interface don't work quite as well.

6-3 Implications for Google (24)

1. Enhanced User Experience:

- Insights from the EEG study will aid Google in refining its platforms and ads toward responding to the needs of its users. What catches one's attention and brings about positive emotions is key to creating more engaging content.

2. Optimizing Ad Strategies:

- Google can identify which ads resonate with users on a neurological level and help the advertisers craft messages that are more likely to elicit favorable responses.

3. Personalization:

- Neurofeedback can be useful in planning effective personalized advertising strategies. By studying the cognitive and emotional responses of recipients, Google will be better equipped to create ads matching individual tastes and preferences.

6-4 Places Practiced (24)

Research Facilities:

- These studies are conducted in a specialized research lab having equipment for EEG. Google might have in-house research or possibly collaborate with several academic facilities, which have the required expertise and technological resources.

Controlled Environment:

- The testing environment will minimize distractions, so the participants can give their full attention to the tasks at hand; this would provide for a real and as-accurate-as-possible

measurement of their cognitive and emotional responses.

By using EEG and neurofeedback methods, Google will be able to understand how users interact with their ads or its platforms. It helps them to enhance the experience for better engagement and satisfaction of the end users of a platform.

7. Automotive Advertising ⁽²⁵⁾

Many vehicle manufacturers have employed neuroadvertising to test recipient reactions toward various ad elements, including sights, sounds, and messages. The result was enabling firms to create better-suited campaigns to target groups and appeal to the customers to improve sales figures.

Several car manufacturers have used neuroadvertising techniques in place to dig deeper into recipient reactions over their advertising elements such as visuals, sounds, and messages. Here is how this process usually works and where: How Car Manufacturers Use Neuroadvertising Objectives:

The primary goal of automakers is to learn what parts of the ad connect most strongly with the prospective buyer. They want to understand how to best use their ad campaigns by considering emotional and cognitive responses, which lead to higher levels of engagement and, hopefully, sales.

7-1 Methods Applied: ⁽²⁵⁾

1. Eye Tracking:

- Purpose: To know where exactly viewers are looking in an ad, eye-tracking technology is used.
- Process: Participants are made to view advertisements while monitoring their eye movements. It mainly pinpoints the visuals that catch one's eyes and hence those that are overlooked.

2. Facial Coding:

- Purpose: This method is utilized in analyzing the emotional reactions through facial expressions of people who view automobile advertisements.
- Process: The facial expressions of participants are captured with cameras; these are to be analyzed for surprise, happiness, or confusion regarding different elements of the advertisement.

3. Biometric Measures:

- Physiological measures serve to estimate the emotional arousal of recipients. Manufacturers use heart rate, skin conductance, etc.
- The process involves monitoring participants while they view ads. After that, physical reactions can be related to specific elements of the ad.

4. fMRI (Functional Magnetic Resonance

Imaging):

- Purpose: Some manufacturers use fMRI to monitor brain activity as a result of ads.
- Process: In an fMRI scanner, participants view car ads. A researcher is able to determine which parts of the brain are activated by which stimuli.

5. Neurosurveys and A/B Testing

- Purpose: Neurofeedback together with a regular survey helps validate findings.
- Process: Test participants may be exposed to several versions of an ad (A/B testing) and give responses as to their preferences and feelings toward each one.

7-2 Locations of Research (25)

Research Facilities:

- Neuroadvertising studies are normally designed in leading-edge research facilities or universities that are well equipped with high-end neuroimaging and biometric technology. The facilities may liaise with car manufacturers to provide them insight.

Controlled Settings:

- In controlled environments, the tests are conducted which eliminate any type of distraction, resulting in the subject paying complete attention to the ads.

3. Market Research Firms:

- Car manufacturers can work with market research agencies that employ neuro-advertising techniques. This is the reason why they are capable of getting voluminous insights into recipient responses.

7-3 Implications for Car Manufacturers ⁽²⁵⁾

1. Winning Advertising Strategy:

- Insights from neuro-advertising help them trim their ad messages and visuals into what their recipients feel and like.

2. Improved Brand Positioning:

- By learning about the nature of specific elements that drive perceptions, manufacturers can develop communications campaigns that enhance their brand's equity and connect more meaningfully with target audiences.

3. Driving Sales:

- The ultimate aim is to design more effective advertisements that capture recipient attention, improve brand recall, and increase sales.

By applying neuroadvertising, it is allowed to explain recipient preferences and emotional reactions to advertising. Car manufacturers can use this for improving ad campaigns successfully since ads will connect them emotionally to quite a large pool of potential buyers.

Conclusion and discussion:

1- These examples therefore illustrate how

neuroadvertising can provide valuable insight into recipient behavior and help brands create more effective, emotionally resonant advertising campaigns. By understanding the underlying neurological and psychological responses, companies can connect with their audience more effectively and create higher overall engagement.

- 2- Neuromarketing describes recipient behavior on scientific grounds and therefore helps brands develop more effective advertisement initiatives. Companies can create campaigns with a deeper resonance to make recipients engage and buy their products by leveraging subconscious motivations and emotional triggers. As this area of science continues to evolve, it is also bound to shape the future of advertising.

General conclusion and results:

The following results demonstrate how integrating neuroscience into advertising can significantly enhance ad effectiveness by focusing on the mental and emotional responses of the recipient:

- 1- Enhanced Emotional Engagement: Neuroadvertising techniques can instantly trigger an emotional response in recipients—excitement, happiness, or empathy—giving birth to a much wider emotional engagement with the brand and increasing chances of a purchase.
- 2- Improved Cognitive Processing: Thorough analysis of brain activity can determine which elements of an ad capture attention by improving retention of memory, enabling marketers to produce ads that catch on and are easily recalled by the recipients.
- 3- Optimized Ad Design: These valuable insights on neural responses enable advertisers to optimize their ads' key features—such as pictures, sound, and words—to fit better to recipient preferences, thus increasing their effectiveness in terms of attention span, retention, and brand recognition.
- 4- Increased Brand Recall and Recognition: Neuroadvertising searches for more relevant information on how people process information, leading to the introduction of some strategies that improve brand recall and recognition by tapping in on subconscious decision-making triggers.

Higher ROI of Advertisement: By coordinating advertising strategies with emotional or cognitive triggers specified in neuroanalysis, companies can introduce campaign-oriented tactics focused more on impact by creating higher conversion rates and return on investment (ROI).

References:

- 1- Khayrul Alam, (July 2024), An Overview of Neuromarketing Strategy Applied by Marketers as a Marketing Tool, *Asian Journal of Social Science and Management Technology*, Volume 6, Issue 4.
- 2- Arjun Murti, Rishul Ghosh, (September 2023), The Impact of Emotional Appeals in NeuroMarketing: Analyzing the Brain Responses of Recipients to Emotional Advertising Campaigns, *International Journal of Enhanced Research in Management & Computer Application*, Vol. 12 Issue 9.
- 3- Juan Sánchez-Fernández, Luis-Alberto Casado-Aranda, Ana-Belén Bastidas-Manzano, (February 2021), Recipient Neuroscience Techniques in Advertising Research: A Bibliometric Citation Analysis, *MDPI Open Access Advancing Open Science*, Vol 13 Issue 3
- 4- Neurons, what is Neuromarketing & How to Use It?, <https://www.neuronsinc.com/insights/neuromarketing#toc-0> (accessed on 28\11\2024)
- 5- Traci Pedersen, (December 2021), All About Functional Magnetic Resonance Imaging (fMRI), *Psychcentral*, available online at: <https://psychcentral.com/lib/what-is-functional-magnetic-resonance-imaging-fmri>, (accessed on 27\11\2024)
- 6- Mahsa Soufineyestani, Dale Dowling and Arshia Khan, (January 2020), Electroencephalography (EEG) Technology Applications and Available Devices, *Applied Sciences* published semimonthly online by MDPI. Vol. 10 Issue 21.
- 7- Gregor Strle, Andrej Košir, Urban Burnik, (August 2023), Physiological Signals and Affect as Predictors of Advertising Engagement, This article belongs to the Special Issue Emotion Recognition Based on Sensors (Volume II).
- 8- Laura Dorwart, (June 2023), What Is the Galvanic Skin Response (GSR)?, *Very well health*, available online at <https://www.verywellhealth.com/galvanic-skin-response-6373883> (accessed on 29\11\2024).
- 9- Mahesh Jangid, Pranjul Paharia, Sumit Srivastava, (May 2019), Video-Based Facial Expression Recognition Using a Deep Learning Approach, In book: *Advances in Computer Communication and Computational Sciences*.
- 10- Jonathan Jonathan, Andreas Pangestu Lim, Paoline, Gede Putra Kusuma, Amalia Zahra, (September 2018), Facial Emotion Recognition Using Computer Vision, Conference: 2018 Indonesian Association for Pattern Recognition International Conference (INAPR).
- 11- Irma Puškarević, Uroš Nedeljković, Vladimir

- Dimovski, Klementina Možina, (November 2016), An eye tracking study of attention to print advertisements: Effects of typeface figuration, *Journal of Eye Movement Research*, Vol. 9 issue 5.
- 12-Shanaz Khan, (September 2024), Eye Tracking Heatmap: Front Row Seats To Your Visitor's Worldview, VWO, available online at <https://vwo.com/blog/eye-tracking-heatmap/> (accessed on 30/11/2024)
- 13-Resonio, Implicit Association Test (IAT) Guide with Examples, available online at <https://www.resonio.com/market-research/implicit-association-test/> (accessed on 1\12/2024)
- 14-Rupali Gill, Jaiteg Singh, (November 2022), A study of neuromarketing techniques for proposing cost effective information driven framework for decision making, *Materials Today Proceedings*, Volume 49, issue 8
- 15-David Juarez, Ana Mengual-Recuerda, Juan Camilo Serna Zuluaga, Vincenzo Corvello, (January 2024), Application of Artificial Intelligence in Neuromarketing to Predict Recipient Behaviour Towards Brand Stimuli, *International Journal of Software Science and Computational Intelligence*, Volume 16, issue 1.
- 16-Saif M. Mohammad, (January 2021), Sentiment analysis: Automatically Detecting Valence, Emotions, and Other Affectual States from Text, In book: *Emotion Measurement*, available online at: https://www.researchgate.net/publication/350981895_Sentiment_analysis_Automatically_Detecting_Valence_Emotions_and_Other_Affectual_States_from_Text (accessed on 3/12/2024)
- 17-Sunita Kumar, (December 2015), Neuromarketing: The New Science of Advertising, *Universal Journal of Management*, Volume 3, issue 12.
- 18-Oleksii M. Skriabin Dmytro B. Sanakoiev Natalia D. Sanakoieva Vita V. Berezenko Yuliia V. Liubchenko, (June 2021), Neurotechnologies in the advertising industry: Legal and ethical aspects, *Innovative Marketing Journal*, Volume 17, issue 12.
- 19-Ankooor Dasgupta, (July 2024), Neuromarketing: A Journey Into the Recipient's Mind, CMSWIRE, available online at <https://www.cmswire.com/digital-marketing/neuromarketing-a-journey-into-the-recipients-mind/> (accessed on 4\12\2024)
- 20-Medium, (November 2024), The Pepsi vs. Cola—Cola Experiment, available online at <https://medium.com/@marketinggoal/the-pepsi-vs-cola-cola-experiment-d2234d03dce8> (accessed on 6/12/2024)
- 21-Sam Davis, (November 2023), How Neuroscience Powers Up Packaging Design, available online at <https://www.merca20.com/how-neuroscience-powers-up-packaging-design/> (accessed on 10/12/2024).
- 22-Jennifer Hessler, (November 2011) , From Social Content Ratings to Sentiment Analysis: The cultivation and commodification of affective television engagement, *Journal of Audience & Reception Studies*, Volume 18, Issue 2.
- 23-Sai Prasanna Iyer, Akanksha Aggarwal, (November 2019), The Role of Music in Brand Recall -A Study of Select Two-Wheeler Advertisements, *International Journal of Management, Technology and Engineering*, Volume IX, Issue I.
- 24-Ricardo Faria, (April 2023), The role of neurofeedback in evaluating and improving user experience, *Medium*, available online at <https://medium.com/@faria.faria9/the-role-of-neurofeedback-in-evaluating-and-improving-user-experience-bfcd0d69da18> (accessed on 10/12/2024)
- 25-Qutiba Amjad Abdul Ghafoor, Mohammed Edan Alkhazraje, (January 2024), Neuromarketing Practices and Their Role in Raising the Efficiency of Marketing Performance -: An Applied Study in the General Company for Cars and Machinery Trade/ Al-Waziria, *International Journal of Experiential Learning & Case Studies*, Volume 8, Issue 2.
- 26-<https://psychcentral.com/lib/what-is-functional-magnetic-resonance-imaging-fmri>
- 27-<https://www.neuroinjuryspecialists.com/diagnostic-testing/electroencephalogram-test-eeg/>
- 28-<https://dribbble.com/shots/4545185-Heart-Beat-Rate-Monitor-App>
- 29-<https://bio-medical.com/mindfield-esense-skin-response-gsr-sensor-for-iphone-andriod.html>
- 30-<https://www.mifratech.com/public/blog-page/Facial+Emotion+Recognition+and+Detection>
- 31-<https://www.openglobalrights.org/how-emotion-recognition-software-strengthens-dictatorships-and-threatens-democracies/>
- 32-<https://www.bitbrain.com/blog/eye-tracking-devices>
- 33-<https://www.dreamerux.com/articles/jpmg9emmygy5xpkp4xzg5krskynrl>
- 34-<https://cloud.army/resources/knowledge-center/implicit-association-tests-for-studying-packaging-design>
- 35-<https://www.mentimeter.com/blog/business/best-survey-tools-and-software>
- 36-<https://www.neuronsinc.com/insights/scale-ab-testing-digital-marketing-guide-framework->

examples
37-<https://fastercapital.com/content/Emotional->

analytics--Leveraging-Emotional-Analytics-for-
Customer-Insights.html