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Neuromarketing impact on buying behavior of customers

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Abstract
Neuromarketing is a field that integrates consumer behavior research with neurology to better understand the intricate relationship between what people say they will do and what they actually do. Traditional approaches, including as surveys and focus groups, are frequently ineffective at forecasting actual consumer behavior because the subconscious mind influences up to 90% of behavior. Neuromarketing use tools such as fMRI and EEG to quantify and comprehend the unconscious processes that drive a consumer to make a purchase choice. Understanding these significant elements allows organizations to customize their marketing messaging to a consumer's self-image, boosting the likelihood of a sale. Neuromarketing tries to predict purchasing decisions more accurately than traditional market research and is an important technique for analyzing buying behavior.

Keywords: Neuromarketing, consumer behavior, buying behavior

1. Introduction

Neuromarketing is an emerging field that bridges the study of consumer behavior with neuroscience. Over the past 10 years, the field of neuromarketing has become a common practice through companies to understand the complex relationship between what consumers say they are going to do and what they actually do. Researchers in the field of consumer behavior have shown that many traditional methodologies (e.g. surveys, focus groups) asking consumers about their purchase behavior are flawed. This is not to say that consumers are deliberately being untruthful – but it has been shown that up to 90% of our behavior is irrational and is heavily influenced by the subconscious. Traditional market research methods often fail to recognize and understand such influential factors on purchase behavior.

Responding to up to $20 billion U.S. companies have spent on market research tools which often fail to predict actual consumer behavior, neuromarketing offers an alternative means (e.g. using fMRI, EEG) to measure and understand the non-conscious processes that drive a consumer to make a purchase decision. By understanding what is really driving purchase behavior, companies can gain valuable insight as to how to best tailor a marketing message in a way that will be congruent with a consumer's self-image and thus more likely to result in a sale. (Martinez-Levy *et al*.2022) [1] (Kalaganis *et al*.2021) [2] (Misra, 2023) [3] (Russo *et al*.2022) [4] (Gorgiev, 2020) [5] (Bojić *et al*., 2022) [6] (Baños-González *et al*. 2020) [7] (Jayadatta & Ramanjaneyalu, 2021) [8] (Peedikayil, 2023) [9] (Sevic *et al*.2022) [10].

1.1. Definition of Neuromarketing

Neuromarketing is a new and emerging discipline that aims to explain all human behavior in consumption to practical marketing. The main goal of neuromarketing is to know the neurophysiology of why consumers buy and how advertising affects them. If the neuromarketer can understand how the decisions are made in the brain of the consumer, they can predict buying decisions far better than traditional market research, which usually asks the consumer why they made a decision after the fact, which is inaccurate due to the fact that most thought goes into a decision unconsciously. This is studying the consumer in the most accurate way because using data mining from fMRIs, EEGs, and other mind monitoring technology, a consumer does not have to articulate why they are making a decision, they just make it. This data is what the marketer is desiring because one way or

another, most products are bought as an impulse buy.
This "Aha!" data is the goldmine for selling and it will be the primary focus of future neuromarketing research.

1.2. Importance of understanding buying behavior

Neuromarketing is the field that stems from traditional marketing and takes help from neuroscience. It is the science or study of exploration that uses various techniques of brain imaging to understand consumer behavior. That how and why they tend to buy for which a product or a service of a specific branding. It is basically the research of revealing the patterns of the people that they use for decision making, the patterns that usually are not revealed by the consumers when you ask them in person. The patterns to be found are usually hard for the consumer to explain, this intuition of why they want a particular product is backed by the emotional response from that product. In simple words, it can be said that the decisions that are made by the people for buying a particular product or buying into a specific branding have emotions attached to it and are a result of the unconscious mind. The emotions and the unconscious activity of the brain happen to be the best part of the decision-making process, so this means that there is potential to understand the decision-making behavior of the people and this understanding can be used to predict the buying behavior or to influence it.
Understanding the buying behavior of the consumers is very important for a simple company to survive in today's world. In a world of competition today, it is very difficult for a company to locate a customer, draw attention to a product, and make the customer buy the product. This is also a matter of fact that there is always a difference between what the customer wants to buy and what he ends up buying. This difference can be lead to the change in the preferences of the customer due to the change in the financial conditions or it can be due to the influence of the persuasion from the other people and stating the opinions of others the change can also be due to the fear. Now it can be difficult for a company to locate a customer who changes his preferences. So if a company knows why a person wants to buy a product and understands the pattern decision-making behavior, it is highly probable that the company can influence the customer to again buy the same product that he wanted to buy at first. This can save both the time and money of the customer and the company. So the understanding of the pattern of the decision-making is good enough for the customer as well as for the company. But the best part is that if a company is capable of predicting the behavior, it can alter the marketing strategy in such a way that it is best for the specific group of people. This can increase the chances of profitability. High profitability is a result of cost-effective spending and it is the life of the company in a competitive world. Buying behavior can be understood using the traditional marketing tools but the best results can be obtained from neuromarketing. This is because the knowledge of consumer behavior is linked with the consumer memory and many of the traditional methods like surveys and interviews provide the information that is quite different from the actual behavior and it confuses with the consumer memory. So using various neuroscience methods, more in-depth information can be retrieved. This information can be ultimately used to increase the effectiveness of the marketing strategy. (Gill & Singh, 2022) [11] (Alsharif *et al*., 2021) [12] (Halkiopoulos *et al*.2022) [13] (Alsharif *et al*.2021) [14] (Misra, 2023) [3] (Alsmadi and Hailat 2021) [15] (Nilashi *et al*. 2020) [16] (Singh, 2020) [17] (Kiran & Prabhakar, 2021) [18] (Ismajli *et al*.2022) [19].

2. The Science behind Neuromarketing

Figure 1 is based on the premise that buyer behaviour is largely unconscious and emotions play a central role in this process. It accurately depicts the role of neuroscience in consumer behaviour research, and although the timeframe is somewhat optimistic in terms of how quickly the gap will be closed, narrow disciplines such as neuromarketing are making steady progress. Neuroscientists have shown that up to 95% of our decisions are made subconsciously and only then rationalized consciously, if at all. Emotions are processed in the brain in the limbic system and are responsible for human behaviour, which in turn strongly dictates consumer decision making. Traditional methods such as surveys and focus groups are limited in their effectiveness as they rely on one's ability to articulate their preferences, and in the context of consumer behaviour, these preferences are based mainly on subconscious judgement. Neuromarketing adopts methods from neuroscience to measure areas of the brain related to the decision-making process. The use of EEG technology can measure electrical activity in the brain, transcranial magnetic stimulation can be used to temporarily disable certain brain regions to evaluate their function, and fMRI can measure blood flow indicating brain activity in specific regions. As discussed by Lee *et al*., brain imaging techniques are vastly more effective than traditional methods as they enable researchers to ascertain real-time information about consumer preferences and the relative cognitive effort related to the decision in question. Such information is thus invaluable to marketing firms. (Bayle-Tourtoulou & Badoc, 2020) [20] (Sutil-Martín & Rienda-Gómez, 2020) [21] (Kalaganis *et al*.2021) [2] (Halkiopoulos *et al*. 2022) [13] (TURNA and BABUS2021) (Delnatte *et al*., 2023) [23] (Rodríguez *et al*.2023) [24] (Sevic *et al*.2022) [10] (Royo-Vela & Varga, 2022) [25] (Berčík *et al*., 2021) [26].

2.1. Neuroscience and consumer behavior

A comprehensive understanding of consumer behaviour and decision making probably requires an integration of information derived from various methods and levels of consumer insight. The one best seller in a consumer society will no longer be the firm that understands what consumers want and gives it to them, but rather the one that understands what consumerism is and seeks to reverse an image to link on to current definition of self. This article has provided evidence of the discrepancy between conscious and unconscious processes involved in consumer decision-making and the considerable role of emotion which is also often unconscious. It is apparent that research in cognitive neuroscience and affective psychology has the huge potential to inform consumer research and can only benefit a more thorough understanding of how marketing and advertising affect consumer behaviour. (Alsmadi and Hailat 2021) [15] (Alsharif *et al*.2021) [55] (Gurgu *et al*. 2020) [27] (Ismajli *et al*.2022) [19] (Singh, 2020) [17] (Amin *et al*. 2020) [28] (Halkiopoulos *et al*.2022) [13] (Kajla *et al*. 2024) [29] (Bočková *et al*. 2021) [30] (Kiran & Prabhakar, 2021) [18].
In the recent come first of neuroscientific techniques for understanding consumer decision-making, the role of neuroscientific current idea on typical consumer behaviours need to be reassuring by a lot a of enlarged research. However move to date has established beyond doubt the fact that many

aspect of sophisticated consumer decision-making are apt to be outside conscious awareness and control. Although consumers are able to report what they think and how they feel about a product, these reports may differ from the particular processes and emotion that take place during product assessments and purchase decision. Primarily because of restriction in verbal expression, there are likely to be phenomena that the consumer does not wish to report because they are perceived to be too personal or socially uncomfortable. The standard approaches uses structured verbal interview techniques for deriving information from the consumer may not probe and access these deeper unconscious or emotionally based consumer response and purchase motivation. (Klein & Sharma, 2022) [31] (Zhang & Watson IV, 2020) [136] (Sharma, 2021) [33] (Birtus & Lăzăroiu, 2021) [34] (Lakshika & Ahzan, 2021) [35] (Tabesh & Vera, 2020) [36] (Saini *et al*.2024) [37] (Diaz *et al*.2021) [38] (Marabelli *et al*.2021) [3] (Bajaj *et al*., 2024) [40]

2.2. Brain imaging techniques in Neuromarketing

EEG has been used as a measure of consumer learning and memory towards specific products and ideas, with a view to assessing changes in consumer perception after the implementation of specific marketing strategies. This has included investigation of purchasing and consumption habits of cigarette smokers and non-smokers towards smoking-related health information, changes in consumer perception towards drinking bottled water as opposed to tap water, and the effects of anti-drug campaigns on youth attitudes. The ability to adapt double-blind randomized experimental designs and use of precise statistical analysis can provide these studies with high internal validity and the potential for practical applications towards marketing and public policy. (Baldo *et al*.2022) [41] (McInnes *et al*.2023) [43] (Bazzani *et al*., 2020) [44] (Byrne *et al*., 2022) [45] (Aldayel *et al*., 2020) [46] (Aldayel *et al*., 2021) [47] (Antiopi *et al*., 2024) [48] (Khurana *et al*. 2021) [49] (Kalaganis *et al*.2021) [2].

Functional magnetic resonance imaging (fMRI) has become the standard method for investigating which parts of the brain are involved in a given mental process. It has been used as the main method to investigate neural systems underlying consumer behaviour, preferences, and choice. This method measures activity in terms of the blood oxygenation level dependent (BOLD contrast), which is an indirect measure of neural activity. This has been successfully used in a variety of marketing experiments ranging from investigation of branding effects, affect of viewing TV advertisements, consumer preferences and choice, and the impact of in-store sensory marketing cues on consumer behaviour. Due to the cost and availability of fMRI, many researchers have begun looking to adapt the use of EEG and fNIRS as more cost-effective measures to assess consumer decision making. Specifically, both EEG and fNIRS have been used to identify consumer preference and choice measures with a high degree of accuracy. (Hay *et al*., 2022) [50] (Alsmadi and Hailat 2021) [15] (He *et al*. 2021) (Casado-Aranda *et al*. 2022) [52] (Jai *et al*.2021) [53].

Since the 1990s, consumer and advertising research has gained a "neural" dimension with the use of neuroimaging. While the first studies were mostly American-based, nowadays research using neuroimaging for applied business and consumer purposes is conducted all around the world. This usage is based on the principle that marketing stimuli is processed and stored in memory over a period of time. What happens during this learning process can be investigated using measures of memory. Furthermore, it is commonly held that consumers buy products because of the way they make them feel. This is often true, but in other cases affective or emotional associations with certain products may serve as a justification for a purchase that was based on other factors. For these reasons, it is crucial to examine the neural systems underlying consumer preference and decision making.

2.3. Understanding emotional responses

It has been argued that ethical issues surround the use of emotional advertising with neuromarketing. This is due to the fact that emotions are known to cloud judgment, and by advertising in this way, it is believed that consumers may be influenced to purchase a product that they would not have purchased under usual circumstances. The counter argument sees emotional advertising as providing stronger and more relevant brand associations in memory that can have positive effects on product sales.

Emotional advertising has also been shown to be more effective on long-term memory. This is crucial for the purpose of advertising a product because the customer is more likely then to make a purchase when the memory is retrieved at the time of sale. fMRI has been used to compare levels of brain activity when exposed to an emotional advertisement against a rational advertisement. The results showed increased activity in the amygdala and hippocampal regions of the brain, confirming that greater emotional processing does occur with emotional advertisements. This increased activity leads to stronger encoding and subsequent retrieval of these memories. (Beard *et al*., 2024) [54] (Alsharif *et al*.2021) [12] (Vrtana & Krizanova, 2023) [56] (Otamendi & Sutil Martín, 2020) [57] (Carstensen and Hershfield 2021) [58] (Harris *et al*., 2021) [59] (Wu & Chen, 2022) (Sari, 2022) [61].

Humans make decisions based on their emotions and often post-rationalize those decisions. Understanding the emotional rewards of the customer is key to product sales. If a product does not incite an emotional response in a consumer, it is likely that the product will not be purchased. Emotional conditioning is one way that is used to attempt purchase through the use of neuromarketing. This involves the pairing of a product with a positive stimulus with the objective of linking the product with the positive stimulus. After this link has been established, it is hopeful that the product will then act as the positive stimulus.

3. Factors influencing buying behavior

A large number of factors influence our behaviour, and if the marketer is able to understand the factors that affect customers' buying decisions, they can leverage this knowledge to boost sales. There are internal and external factors. Internal factors include perception, which is the process by which people select, organize, and interpret information to create a meaningful picture of the world. Perception affects not only the way an objective stimulus is perceived but also the way people act based on their perception. Marketers can take into consideration the selective distortion and retention factors in perception when they develop their promotional strategies. Changing an unclear picture or message that creates a wrong perception in the consumer's mind can be a difficult task. Companies like Malaysian Airlines and Proton have been trying to change the perception of people in relation to their brands, but their selective retention and distortion of messages by consumers

over the years have remained a challenge. An understanding of perception can help the marketer develop and promote a product with a strong image. Learning is the change in an individual's behaviour arising from experience and occurs through the interplay of drives, stimuli, cues, responses, and reinforcement. Consumers can learn about a product on their own initiative or through advertisements and other information sources. If the learning is driven by positive motivation, satisfaction is reached when the desired response is obtained. Learning is important in the success of a product, and companies can use learned needs as a base for building positioning strategies. A new learning can produce changes in beliefs and attitudes, and marketers must understand that consumers can have different beliefs about their products. Changing a strongly held belief can be difficult, and showing a superior product benefit on an important buying determinant is a popular strategy. Attitude consists of a cognitive, affective, and conative response to a stimulus, and it usually influences the action of consumers. Changes in consumer attitudes toward a company's brand can have significant effects on buying behaviour. The belief that attitude holds certain positive benefits leads to the consumer developing a preference towards a brand, leading to purchase. This can be beneficial in the case of complex buying behaviour where the consumer is required to invest time in searching, comparing, and evaluating. Post-purchase attitude can be important in differentiating satisfied and unsatisfied customers and can affect repeat purchase behaviour. A high involvement purchase often has a high risk associated with it, and a negative post-purchase attitude can cause cognitive dissonance for the buyer. He or she will be unsure of whether they made the right decision, and the feeling of dissonance will ensure they don't repeat the buying process. Marketing strategies for lower involvement products will try to create a liking for the brand so the consumer's habitual buying behaviour is reinforced. This repeat buying is based on a simple learning model. (Bag *et al*., 2021) [62] (Venciute *et al*. 2023) [63] (Huang *et al*. 2022) [64] (Mariam *et al*. 2023) [65] (Júnior *et al*. 2023) [66] (Haleem *et al*.2022) [67] (Apasrawirote & Yawised, 2022) [68].

3.1. Psychological Factors

Perception and attitudes of a consumer also need to be looked at considering the strong interdependence of these two elements. The consumer's attitude toward a product and the corresponding attributes of that product usually come from the perceptions of the product. With changes in a consumer's attitudes often occurring through cognitive dissonance or affect toward a desirable change. This usually occurs when the consumer's attitude does not coincide with the purchase behavior – an uncommon behavior with low involvement purchases. With beliefs and attitudes differing and no reinforcement occurring from direct experience with the product, the stand of the previous attitude may result. If the consumer is satisfied beyond the belief of their own expectations from the product, it is likely that a positive post-purchase evaluation will result. The actual learning of a belief/attitude change may vary considering the level of consumer commitment with the change being stronger with high involvement and significant brand difference. (Rodríguez-Bermúdez *et al*.2020) [69] (Costa *et al*.2021) [70] (Kurdi *et al*.2022) [71] (Theben *et al*.2020) [72].

Motivation needs to be looked at for its relationship of strength to the buying behaviors. If a lingering behavioral change is to occur, a strong internal motivation has to exist. This motivation can be stirred by product involvement, perceived risk, or self-concept changes. The more personal the product is to a consumer, the stronger the self-concept of that individual identified with the product, the higher the likelihood of a purchase. This changes the personal significance of the product and can result in a purchase for the sake of the consumer's own image, or the image they believe will exist to others through their purchase of the product. Anxiety commonly occurs with the purchase of a product offering a change to the consumer's self-concept. High anxiety purchases usually occur with high-priced items of little to moderate frequency of purchase. If the anxiety is too great, the probability of the consumer postponing or avoiding the purchase altogether is a likely outcome.

3.2. Social Factors

Another social factor that affects brand and product choice is family. Family is a buyer's first organization, and it is a purchase and consumption activity that is learned. Nevertheless, in a fast-changing modern world, family life cycles and the changing needs of the individual can lead to conflict or four decision-making roles. A wife-dominant purchase is rather self-explanatory, and a husband-dominant purchase reflects the cultural norms of the past, although both may now be less common in single-parent families. School-aged children's purchases are either independent, more money-to-pieces based on parents' consumer socialization, and higher education reflects an investment in self-image. In both cases, consumer fuel verb can cycle consumptions.

An advertising platform that is commonly used and now using neuroscientific methods to test its effectiveness is a celebrity endorsement. The aspirational group theory links directly to the success of this type of brand promotion, as does the concept of self-concept and self-image. The aim of an endorsement is that the consumer will purchase the product, fearing that they will be rejected from their group, in this case, a membership group. The self-concept and self-image of that person are said to improve, as they will feel that they are closer to the perceived image of the endorser. This method is a high cost/high-risk one as if it does not work, it can be damaging to the brand in question. However, when successful, it can change the entire brand image. An example of this is the turnaround in sales for the Audi A3. (Lee *et al*., 2022) (Herjanto *et al*., 2020) [74] (Mahmud & Anggraini, 2020) (Parmar & Mann, 2021) [76] (Liu *et al*., 2020)

Consumer behaviour is influenced by many factors, including cultural, social, and personal factors. The most significant social factor is a reference group, which is a group that has direct or indirect influence on a person's attitudes or behaviour. Reference groups can be classified into two categories: membership and aspirational. Membership groups are those that a person is a member of, and aspirational groups are groups that a person wishes to be a member of. These groups can affect product and brand choice. Marketers try to attract opinion leaders or emerging market segments as they have a direct influence on the specific brand and the group's image. The effect of the group can result in five behavioural patterns. The first four are conformity, change in the specific product or brand purchased, change in the kind of product or brand purchased, and the fifth is dissociative behaviour, where the consumer avoids specific brands/products so they aren't associated with a group. (Sheu & Kuo, 2020) [78] (Saunders *et al*.2021) [79] (Qazzafi 2020) [80]

(Liu *et al*., 2020) [77].

4. Neuromarketing Strategies

In 4.1, another term for sense, "sensory marketing," is an effective way to reach the consumer's subconscious. Building long-lasting memories and preferences for a brand depends on the creation of strong associations with that brand in consumers' memory. Studies have shown that the strongest and longest-lasting memories are those tied to emotion and involving multiple senses. So, to create a strong association with a brand, it must stimulate as many senses as possible. A study conducted using fMRI shows that when subjects evaluated consumer reports on VCRs, their brain activity was low and the activity was limited to the verbal working memory systems. This is not an effective way for the consumer to evaluate their preferences and buying behaviors. VCR evaluations were compared to the subjects' actual experiences, and it was found that the consumers' brains had very different reactions to each brand after their actual experiences, but the consumers were unable to clarify their reasons behind the change in preference. This is evidence that consumers' preferences and buying behaviors can be changed without their conscious knowledge, and involving senses in a product is an effective way to do this. (Spence, 2020) [82] (Pina & Dias, 2021) [83] (Mostafa and Kasamani 2021) [84] (Wibowo *et al*.2020) [85] (Hwang *et al*. 2021) [86] (Cachero-Martínez and Vázquez-Casielles 2021) [87] (Coelho *et al*.2020) [88] (de Regt *et al*., 2021) (Moran *et al*.2020) [90]

Consequently, many organizations are using findings from neuroscience to affect better marketing behavior. There are a number of ways through which companies try to reach the subconscious mind as well as the conscious mind of the consumer. Above the conscious mind, preferences and buying intentions lie the unconscious, and below that lies the body's behavior and molecular activity. Marketers have found that a very large portion of our buying activity is controlled by the subconscious mind. When asked why you bought a certain product, the decision is at the tip of your tongue. You can sense that there exists some kind of reason behind purchasing that product but still are unable to clarify the reason behind your purchase. This is a gap in the conscious and the unconscious mind. Neuromarketers are trying to reach this unconscious mind of the consumer. They try to create strong long-term preferences and buying intentions for their product. (Bayle-Tourtoulou & Badoc, 2020) [20] (Kalaganis *et al*.2021) [2] (Bargh, 2022) [91] (Alsmadi and Hailat2021) [15] (Halkiopoulos *et al*. 2022) [13] (Royo-Vela & Varga, 2022) [25]

4.1. Sensory Marketing

Sensory Marketing is a marketing technique that is a growing importance to marketers, especially as it is subconsciously influencing consumer behaviour. The basic notion of sensory marketing is to create a lasting effect by reaching the consumer below the level of consciousness. This is very suitable in marketing superficial products, which are often purchased on impulse. Neuromarketing researchers intend to identify input factors to the brain that influence consumers' purchase decisions and their resultant brand evaluation. An example of this can be at the point sale. A consumer may purchase a drink that is on promotion and cheaper than the one they had planned to buy. This type of promotion will cause the buyer to forget their original brand and thus lead to a repeat purchase of the cheaper drink on their next purchase. This is a very effective marker as it is a technique that influences future buying patterns. (Irani and Frankel 2020) [92] (ALSALIHI) (Lindblom 2023) [94] (Ene, 2021) (Khanom, 2022) [97]

In today's competitive marketplace, more and more business owners are entering the time for neuroscience so that they can comprehend consumer behaviour and make sure their products and services are the foremost in their marketplace. This growing importance of neuroscience is due to its direct application to consumer behaviour. With the scale of consumer impulses and reasoning being so far of an subconscious activity, there's little ask why increased consumer insight is being sought via neuroscience.

4.2. Emotional Marketing

The study of memory can provide an explanation of why emotional branding is effective. There are two types of memory: short-term and long-term memory. Information from the five human senses is first stored in short-term memory where it will be lost. However, if there is a strong emotional attachment to the information, it will be transferred to long-term memory where it can never be discarded. Next, the decision-making process can be explained by the human brain consisting of the left and right hemispheres. The left hemisphere is a sequential and logical processor, and the right brain is more intuitive. It manages brand relationships and makes consumer decisions about brands concerning themselves. If consumers already have a strong emotional brand connection, they are usually more decided to buy a brand that could fulfill their self-concept. Neuromarketers may utilize these consumers' learning and decision-making processes to gain strategic targeting of consumers to make a purchase by product positioning and improvement. (Yang *et al*., 2020) [98] (Algarni *et al*.2022) [99] (Chowdary *et al*., 2022) [100] (Greene & Naveh-Benjamin, 2022) [101] (Su & Fan, 2021) [102] (Liu *et al*., 2023) [103] (Ferrari *et al*., 2020) [104] (Ghosh *et al*., 2020) [105]

It may be comprehended that neuromarketers may provide aware processing concept by consumers when they focus on rational benefits of products. However, emotional reactions to ads and brands may be more important because they influence the final decision of the consumer. Emotional marketing is a way to make consumers feel something in order to create a relationship between consumers and a brand. Generally, humans are emotional decision-makers. They want to be noticed and valued. The needs of human beings are infinite. Emotional marketing is the most effective way to fulfill customer needs and desires. This is because emotional ads grab consumer attention and do a better job of staying in the mind of the consumer, and it influences consumers' brand attitude and buying intentions. Neuromarketers may take several implications from studies of neuroscience.

4.3. Personalization and Targeting

Personalization and targeting is the process through which a marketer can use the information that is obtained from various marketing research tools and serve the customer in a more specific manner. This allows the marketer or the organization to gear different products to different customers. For instance, Amazon.com has a featured products link which is targeted towards an individual user. This product is based on an algorithm which takes the Amazon purchase history by the user and matches it to the purchase histories of other customers who have purchased the same item, to generate a

list of products that are purchased by customers with similar purchase history. This can lead to increased probability of purchasing a product. This approach will help Amazon to provide a more accurate product for the user over time as it builds a recommendation database for the user. With the use of tracking and cookies, the user can be identified on his next visit. This will allow Amazon to allocate more specific products for this user. (Doval & Skreta, 2021) [106] (Laussel & Resende, 2022) [108] (Alves and Meisen 2023) [109]

The ultimate goal for a marketer is to be able to put the right product in front of the right person at the right time. With advancements in the field of technology, organizations have a new way to achieve this goal. Personalization and targeting allows the marketer to get the right product in front of the right person at the right time (pay-per-click link advertising). The product and customer-focused organizations are constantly looking for ways to enhance their relationship with customers. In the process of doing so, they are always looking for ways to build mechanisms that would help them identify the needs of the customer so as to serve them better. For this, organizations take the help of information regarding the consumer which is obtained by marketing research. Various tools and techniques are being used these days to identify the potential customers and the needs of the customer. Techniques include online surveys, mobile data collection or social media listening, which can attract customers to provide information directly to a marketer through an incentive such as a sweepstakes entry or loyalty program points. Though these techniques are being used since a long time, however, their degree of success is limited. (Li 2020) (Hasan *et al*. 2022) [111] (Gemino *et al*. 2021) [112] (Cichosz *et al*. 2020) [113] (Fraccastoro *et al*., 2021) [114] (Rohn *et al*.2021) [115]

5. Ethical Considerations in Neuromarketing

In terms of the marketplace for neuromarketing services, there is an ethical decision to be made as to whether self-regulation would be sufficient or if government intervention would be required to monitor and control the uses of neuromarketing to ensure that it is not having harmful effects on the consumer. Additional concerns involve the transparency of neuromarketing methods and the extent to which it should be revealed to the public, which ties into consumer knowledge and rights.

With the potential to greatly influence consumers' buying habits and patterns, there is a fear that the knowledge gained through neuromarketing could be used to exploit individuals who are unaware of the significance of the influence the marketing is having on them. This could apply to people who have addictions and generally people who are considered vulnerable, such as children or the elderly. Exploitation can come in many forms, such as raising the price of products for irrational buyers or using subliminal messaging to influence impulsive buying on certain products. While this could be considered as a positive for companies in generating more sales, in an ethical view, it is not socially responsible to manipulate these individuals when the long-term consequences may be detrimental to their well-being. (Spence2020) [82] (Singh, 2020) [17] (ŞAHİN 2023) [117] (Alsharif *et al*.2021) [14] (Kalaganis *et al*.2021) [2] (Bhardwaj *et al*.2023) [118] (Clark, 2020) [119] (Wiederhold, 2020) [120] (Gill & Singh, 2022) [11] (Kiran & Prabhakar, 2021) [18].

Various researchers and organizations have noticed that there are ethical and societal concerns associated with the field of neuromarketing. These revolve around the consumer and the extent to which their data will be protected, as well as how the knowledge garnered from neuromarketing will be used to influence them. Concerns about the ethics of neuromarketing are not directly paralleled with an absolute dichotomy between right and wrong, but involve a lot of decision-making in regards to what is acceptable and what is not.

5.1. Consumer privacy and consent

It is important to realize that there is a very lengthy process between raw neuro data and actual consumer predictions based off of that data. Nonetheless, the possibility still exists and it is important that social policy and consumer protection measures be enacted before the situation has a chance to materialize. At the very least, action should be taken to be sure that the customer can give more implied consent than is currently possible. The implied consent referred to here is simply the assumption of consent because of lack of action to the contrary. An example of this can be seen in internet browsers' use of cookies for which more and more websites are now required to expressly ask permission from the user. A more extreme case of obtaining implied consent can be found in the last US presidential election when it was discovered that a certain candidate's political party was attempting to use subliminal messaging to obtain support for their candidate. (Rosca & Madan, 2020) [121] (Zdravkovska *et al*. 2021) [122] (Mercier, 2021) [123] (Madan *et al*. 2021) [124] (Ercan, 2021) [125] (Spennemann, 2021) [126] (Hsu & Chen, 2020) (Marlan, 2023) [128] (Bakir, 2020) [129].

The current status of neuromarketing does not collect sufficient data to accurately portray the consumers. For instance, data about ethnicity, educational background, occupation, and social background are to some extent improbable with today's technologies. However, the very nature of neuromarketing possesses the possibility of obtaining such information that consumers may want to keep private. If neuromarketing advances to a state in which it can accurately predict the aforementioned demographics of an individual, there is great possibility that the data obtained may be used to discriminate against or exclude certain individuals or groups. This can take the form of higher prices for certain individuals, or disqualification from certain product or service offerings.

5.2. Manipulation and Deception

Fisher and Dovidio (2000) define social influence as an attempt to change a person's attitudes, behaviors, or beliefs, using various forms of pressure. They identify the difference between legitimate persuasion and compliance gaining tactics and techniques that exploit consumers and are not in their best interests. Legitimate persuasion may well be to the benefit of the consumer if it results in the consumer making a choice which improves their life. An example of this could be a public health campaign designed to get people to stop smoking and take up exercise. The campaign could use knowledge of consumer behavior to design messages that more effectively get the target audience to change their habits, resulting in quality of life improvements for those consumers. The problem arises when marketers use the knowledge of consumer behavior to get consumers to purchase products which they know will not benefit the consumer or are below the consumer's best interest. This could result in the consumer developing buyer's remorse due to cognitive dissonance between their true values and the product that they have been manipulated into purchasing.

(Machová *et al*., 2022) [130] (Chopra *et al*.2021) [131] (Aripin *et al*.2023) [132] (Halkiopoulos *et al*.2022) [13] (Wibowo *et al*.2020) [85] (Palalic *et al*.2021) [134] (Sima *et al*., 2020) [135].

Marketing has always been seen as an attempt to get people to part with their money, and advertisers have often been accused of being manipulative and promoting products that are not in the best interest of consumers. It is no surprise that an advertising technique which claims to have found the 'buy button in the brain' has caused concern amongst consumer groups and has prompted calls for government regulation. Many fear that with the level of detail in consumer knowledge that neuromarketing research can provide, it is likely that consumers could be easily manipulated into making a purchasing decision.

5.3. Responsibility of Marketers

At present, there seems to be no substantial evidence to suggest that neuromarketing can and will be harmful to consumers. Co-regulation and self-regulation would seem like the ideal approach, and this has already begun. In 2003, the Advertising Standards Authority advised several companies involved in market research for children to think more carefully about the ethics of their research. Children are often cited as a group which could be potentially exploited with modern-day advertising and thus would be a prime target for neuromarketing. This was not a form of hard law, more a nudge in the right direction with very little public awareness of the situation pointing towards self-regulation.

In light of the potential influence neuromarketing could bring to consumer behaviour, it is important to consider how marketers should tread the fine line between ethical and unethical practices. This would prove critical for the successful implementation of neuromarketing techniques and its long-term acceptance by the public and various regulatory bodies. There are three possible controls that can be placed on marketers: soft laws and self-regulation, where marketers will be given rules to follow backed up by a threat of state intervention. Alternatively, a hard law approach can be taken with a total ban on certain marketing practices shown to have a strong influence on consumer behaviour that could potentially be harmful to the consumer. This said, it is often difficult to ascertain what is harmful to the consumer without substantial evidence and more often than not it's too late. (Nilashi *et al*.2020) [16] (Fontanillo Lopez *et al*., 2020) [130] (Srivastava & Bag, 2024) [62] (Bhardwaj *et al*.2023) [118] (Attié *et al*.2021) [138] (Aslaner, 2021) [139]

In conclusion, the results of our study provide valuable insights into the field of Physical Science, and our findings have significant implications for future research and practical applications.

"Future Scope" section: The future scope of this research lies in exploring the potential applications of our findings in various fields, as well as investigating the impact of our study on related research areas in Physical Science.

Conclusion

Consumer behavior through the lens of neuromarketing underscores the powerful role of subconscious processes in shaping purchasing decisions. By leveraging insights from neuroscience, marketers can influence consumer behavior in ways that go beyond conscious awareness, tapping into emotions and sensory experiences to create lasting brand preferences. However, ethical considerations loom large, particularly regarding consumer privacy, manipulation risks, and the need for responsible marketing practices. As the field evolves, striking a balance between innovation and consumer protection will be crucial for fostering trust and ensuring sustainable market practices.

6. References

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