

# MARKETING SCIENCE & INSPIRATIONS

Marketing and Marketing Management Journal

msijournal.com Printed on February 10, 2022

## A REVIEW OF NEUROMARKETING ORIGINS AS A NEW MARKETING RESEARCH METHOD

### MARKETING SCIENCE & INSPIRATIONS

Mouammine, Y., & Azdimousa, H. (2021). A review of neuromarketing origins as a new marketing research method. *Marketing Science & Inspirations*, 16(4), 34–50. <https://doi.org/10.46286/msi.2021.16.4.5>



**We give a literature review of neuromarketing and the origins of its emergence as a new marketing research method. We attempted to establish a general descriptive summary of relevant literature that stresses the definition of neuromarketing as a new marketing discipline and retraces its origins and foundations since and before the advent of neuroeconomics, as the latter is considered to be a precursor. The purpose of this paper is to define what neuromarketing is from the point of view of academics and practitioners, how and when it started to chart its path into academia and the business world, by drawing attention to the ever first attempts to use uncommon neuroscience tools to assess consumer's behavior. This paper draws a timeline of neuromarketing origins and a summary of the first attempts of consumer's behavior observations, which relied on neural and physiological responses.**

## INTRODUCTION

The human being tends to resist change, and any change is difficult at first, as writer Robin

Sharma points out: „all change is hard at the beginning, complicate in the middle, and beautiful at the end.” In this way was the path of neuroscience to unite with marketing and create neuromarketing. Neuroscience, like any new and controversial field, has struggled for the past 18 years to pave its way into marketing and consumer studies, and to achieve a certain degree of credibility and acceptance (Harris et al. 2018). This period was characterized by a relentless effort to achieve a better understanding of human behavior, an effort which resulted in the emergence of a symbiosis between the biological and social sciences. This unique and controversial marriage has gradually contributed to generating valuable insights relating to marketing and consumer behavior studies (Agarwal and Dutta 2015; Plassmann et al. 2015). This emergence of neuroscience to marketing was imminent because of the limitations and drawbacks of traditional methods used in the study and observation of consumer behavior, based mainly on oral information and self-assessments' declared by respondents, researchers had therefore yielded to the need for a more effective way to work around these limits, and which could offer a better understanding of consumer behavior. Indeed, neuroscience is a field that seeks to understand the structure and function of the human brain, how it encodes and represents the environment around it, and how it controls the body and provides theoretical frameworks to assess the correlations between the brain and behavioral states, in order to understand the causal links between the stimulus and the response (Perrachione and Perrachione 2008). Cognitive neuroscience studies consumer behavior, with the aim of achieving a better understanding of brain mechanisms underlying certain functions such as: reasoning, decision-making, emotion and memory, these brain functions go hand in hand with marketing concepts like ad response and brand loyalty. Thus, neuroscience has made a place in marketing to study with much more precision, the neural mechanisms of individuals exposed to marketing actions and stimuli.

From an academic point of view, studying and knowing history is very important. History is mirrored with dimensional roots that provides the memory of the past and retrace the meaning of a given phenomenon over time (Black and MacRaild 2017). This traceability that historical studies offer allows researchers to establish patterns from the past and provides them with data to create the future. And in marketing, it is always crucial to keep an eye on that „rearview mirror” for a better understanding of the current and the future marketing issues/novelties, to add up a vigorous quality to the field, and permits its scholars as well as society as a whole, to build up an understanding of its origins and its patterns of change and form the discipline identity.

As there is a lack of research/studies about the origins and history of neuromarketing (by executing simple research in Google Scholar using the key words „history of neuromarketing”, „neuromarketing origins” it gives evidence of lack and absence of publications that address the

history of neuromarketing as the main research objective, not in a concise and peripheral way), in this paper, we will try to retrace the literature review and the origins of neuromarketing, as drawing a timeline of the early first attempts of studying consumer's behavior relying on tools and methods, previously and uniquely used in neuroscience.

## METHODOLOGY

The field of neuromarketing is considered to be still in the state of infancy and of great interest to marketing and business researchers. This article is the result of an exploratory research, and we used the technique of content analysis to deliver it. This technique is known to be used among other procedures to deliver description of the messages' content. We mainly based our analysis on peer-reviewed academic articles and books. Google Scholar and PoP (Publish or Perish) were used to find and access the books and the articles (primary and secondary data), and it allowed us to easily classify the peer-reviewed articles according to the number of citations, in order to have more consistent and valid data. The following key words were used: neuromarketing, neuroeconomics, neuroscience, marketing research, origins, history, consumer behaviour. As the main purpose of the article is to draw a timeline of the development of neuromarketing as a new marketing method throughout history, we pushed our research in Google Scholar and PoP as way in the past as possible in order to be sure of collecting all the works that addressed the advent of neuromarketing and the use of neuroscience to solve marketing problems. Primary and secondary data that retrace the definition of neuromarketing, its origins and the first attempts of unifying neuroscience and psychology with marketing, were selected. In total, 33 publications were read and analysed.

## 1 WHAT IS NEUROMARKETING?

### 1.1 DEFINITION OF NEUROMARKETING

The structure of the word „neuromarketing” itself suggests that it is an intersection, a mixture of two fields: marketing and neurosciences. In fact, we can define neuromarketing as the application of neuroscience methods and knowledge in marketing and its traditional approaches (Lee et al. 2007), bringing to it more novel and uncommon tools and technics, and it is considered to be an interdisciplinary field linking psychology, neuroscience and economy (Chatterjee 2015). In their 1106 times cites article What is „neuromarketing”? A discussion and agenda for future research (2007) the authors stress that applying neuroscience along with cognitive psychology can be challenging and intimidating for marketing scholars due to the lack of knowledge of the tools used in both fields, although neuroimaging technology should not be

unreachable for marketing departments as, generally, most business academics work in larger universities with substantial neuroscience tools. The availability of sophisticated technologies and the readiness of interdepartmental collaboration within a university is not a worldwide fact, especially in developing countries, where scientific research is suffering from, lack of funding resources and quasi-absent collaboration between departments and disciplines. What makes neuromarketing a novelty that aroused the curiosity of academics and practitioners, is the fact that it uses clinical and scientific information about brain functions and mechanisms, as an attempt to explain what's happening inside the consumer's brain, the so called „black box” (Fugate 2007). Such enthralling and interesting definition gave rise to many ethical considerations around neuromarketing, some academics think and are afraid it would allow marketers to reveal the „buy button” inside the consumer's mind, while there is no scientific evidence for such speculation, and we strongly believe that neuromarketing's purpose is to better understand the consumer behavior and do better marketing research, and if finding the mystical buy button would be of great interest for marketers, so would be discovering the love button for psychological researchers (Lee et al. 2007). For Droulers and Roulet (2007), neuromarketing is the study of explicit and implicit mental processes, and of consumer behaviors, in various marketing contexts relating to evaluation, decision making, memorization and consumption activities, which is based on paradigms and knowledge of neuroscience. In fact, it is considered to add a layer of theory to marketing research, and its popular perception as being unethical should not be applied to scholarly marketing research, it should be instead considered as a legitimate discipline for future research on consumer's behavior. Patrick Georges and Michael Badoc (2010) in their book „Le Neuromarketing En Action” argue that current and future marketing specialists need to understand what can explain the difference between declarative behavior and the real buying behavior, which is often an emotional and not a rational perception, as Jacques Séguéla (note ) points out: „When you ask a coworker what happens to melting snow, the answer to getting a good IQ score is „water”, while to get good EQ scores a better answer would be „spring””. The authors of the book insist on the limits of traditional methods of market research, these studies being essentially based on oral and declarative information; what the respondents say which may be different from their actual thinking.

The neuromarketer Dr. A. K. Pradeep (2010) in his book „The buying brain: Secrets for selling to the subconscious mind”, explains how advances and improvement in brain monitoring tools and digital technologies allow scientists to expand their knowledge of how the human brain works. As a neuromarketing specialist, he provides insights into brain functions and technological advancements that allow marketers to directly call for the thoughts and feelings of the consumer. His work is recommended to products developers, designers and marketers that are

looking for ideas to innovate in their marketing strategies.

Neuromarketing as an expression, its origins go to professor Ale Smidts (note ) (2002) as he provided the first description of this new field: „The goal of neuromarketing is to better understand the customer and its response to marketing stimuli, by directly measuring the processes in the brain and involving them in the theory and stimuli development. While the main emphasis is on better understanding the customer through theorizing, it should ultimately also help the manager design more effective marketing incentives. In short, neuromarketing is aimed at increasing the effectiveness of marketing activities by studying brain responses.”

By observing the behavior of consumers, one can see how their buying process and their appreciation of the persuasive message are not 100% rational, the hold of emotion, memory and attention is very important, hence marketers need to „see” what is going on in the consumer’s mind, to have a clearer understanding of the elements that interact in the process and the buying decision. Neuroscience is „the key” to accessing the consumer’s brain.

## 1.2 NEUROECONOMICS AS PRECURSOR

As we have previously mentioned, neuromarketing has a precursor: Neuroeconomics, which birth goes to cognitive neurosciences in the field of behavioral economy. Georges Loewenstein (Loewenstein et al., 2008) (note ) points out that „... given the increasing prominence of neuroscience within the field of psychology and the openness of behavioral economics to new methods and ideas, it was only a matter of time before behavioral economics would embrace neuroscience. When that happened, in the late 1990s, the new field of neuroeconomics was born. Neuroeconomics, we argue, has further bridged the once disparate fields of economics and psychology.”

Douglas L. Fugate (2007) in his widely cited article Neuromarketing: a layman’s look at neurosciences and its potential application to marketing practice pointed out that neuroeconomics is the precursor of neuromarketing, they both use clinical information about brain functions and mechanisms in order to help explore what is happening inside the human brain, ore the so called „black box”. Neuroeconomics helped researchers achieving some interesting findings that form the basic frameworks for neuromarketing disciples, findings such as the consumer uses the rational prefrontal cortex to make decisions, and the usage of immediate reward or punishment stimuli activates the limbic system which generates rash and irrational choices, and also, the important role emotions play in the decision-making process, spotted later with the advancement of technologies and computational systems.

Neuroeconomics as a precursor came with major implications to the marketing field. The introduction of neurosciences tools and technologies of brain imaging (e.g., fMRI) to marketing research may change the picture of the field and motivate marketers to abandon the endless

expensive research focus groups and interviews where the consumer is not really telling what she/he actually feels and thinks, where subconscious motives are unlikely to be accurately articulated (Fugate 2007; Ruanguttamanun 2014; Venkatraman et al. 2012). While these implications are to revolutionize marketing research, we think it's too early to consider neuromarketing a takeover, although it is a powerful complementary method to the conventional marketing research methods and techniques, it has the potential to provide insights that somehow overcome the subconscious biases that the traditional methods don't, and to measure and analyze the consumer's emotional response to marketing stimuli. Economics, psychology and neurosciences were once dissimilar fields, but within decades of hesitations, temptation and experiments, they are now cooperative fields that have converged into one unified discipline, with the crucial goal of contributing in the construction of a general theory of human behavior (Glimcher and Rustichini 2004). In other terms, neuroeconomics can be defined as the study of the interactions between the brain and the external environment around it, in order to produce economic behavior (McCabe 2008), and it uses neurosciences tools and knowledge to predict that behavior. By analogical reasoning we could hence say the following in a marketing context: neuromarketing uses neurosciences tools and knowledge to predict marketing behavior.

### **1.3 LIMITS OF TRADITIONAL METHODS AND THE ROLE OF EMOTIONS**

Over time, the effectiveness of traditional marketing research has been challenged and called into question. This claim is based on the observation of the failure rate of new products and services at launch, a very high rate as shown in studies carried out by Nielsen on the launch of thousands of FMCG (note ), and companies prioritize strategic innovation in a market that has become saturated, in order to face fierce competition, but above all a consumer who is not always rational in his purchases. However, there is a very popular belief that the failure rate of new products and services is approximately valued around 80%, which is very exaggerated and with no empirical evidence (Crawford 1979), and many empirical studies since the early 1960s found the failure rate to be ranged between 35% and 49% (Castellion and Markham 2013). All the same we shouldn't misread these data, it should be taken into consideration given the actual texture of the marketplace, where the consumer is stifled by an array of products and services at his fingertips offering almost the same characteristics, which makes the competitiveness more tenacious.

### Figure 1: New product failure rate by industry

Source: Castellion et al. (2013)

It is clear that there is a gap between what individuals say and do, and very often they cannot accurately describe what they really feel about a product or advertising, the reason behind this paradox resides in the amazing complexity of the human brain. Traditional methods have shown their weaknesses despite the consistent investment required to conduct them, mainly because their outputs depend on the eagerness and the ability of respondents to accurately describe how they felt after being exposed to marketing stimuli (Burgos-campero 2013; Cruz et al. 2016), and we can assert that many people can't explain in a logical way the reasons behind their decisions, as almost 70% of them are made subconsciously, and it is now an unanimous assumption that people cannot fully explain their preferences when explicitly asked, as the human behavior is mainly driven by processes at a subconscious level (Khushaba et al. 2013; Marichamy and Sathiyavathi 2014). There is another fascinating neurological finding which would make us rethink the way we conduct quantitative and qualitative research: the brain actually is likely to alter the data recorded when asked to recount how it reacted to something (Pradeep 2010), also the ordering of the questions may affect the answers as people tend to answer questions in consistency with the previous ones that may evoke certain memories and attitudes (Mullainathan and Bertrand 2001). It means that the fact of asking the question „how did you feel about that“, may distort the answer, in other words, that surveys are not 100% bias free, as focus groups may be influenced by „ruling“ participants, or deficient because of shy and hesitating ones. Consumers don't tell the truth, and sometime without realizing it, the reason

behind this is that our decision-making process is not totally rational, and emotions play a pivotal role in delivering the decisions we make and in constructing our behavior. Within decades of research, it is now asserted that the purchase decision (act and intention) is a cognitive process where emotion, with all its components and different types, plays the role of indirect or unconscious decision maker.

This is what John O'Shaughnessy and Nicholas Jackson O'Shaughnessy stress in their famous book *The marketing power of emotion* (note ) „...marketing folklore suggests that emotion can stimulate buying interest, guide choices, arouse buying intentions, and influence future buying decisions. All these popular beliefs about the power of emotion have received research support. Thoughts about buying are not listless mental acts. They can be exciting and can involve strong likes and dislikes, anxieties, and aspirations. Just think about the emotional component of buying a new car. Emotions intensify wants and desires and intensify motivation. Even ethical behavior can be suppressed because of a failure to generate the emotion needed to motivate moral action. Emotion is not an aberrant element when making buying decisions but a necessary condition if decisions are not to be continually postponed. The emotional is so paired with making tradeoffs in decision-making that it is impossible to identify situations where deliberated decisions do not have an emotional dimension.” It means that emotions play an essential role in our daily life and communication, thus emotions became an essential element in marketing, and we speak henceforth about emotional marketing as a specific strategy that companies are using in order to make the advertising, packaging and branding emotionally appealing. Marketers are in a constant challenge to communicate directly toward emotional states, needs, wants, beliefs and the emotional aspirations of consumers, and they succeed in doing this by focusing all their attention to the collection and analysis of their consumers' emotion, which we consider a separate data, and should be treated as one, and there is no doubt that the continuous development of brain imaging technology will enable marketing researchers to better assess and understand the role of emotions in the decision-making process, and to learn more effective methods to trigger those emotions in the consumer in order to build a strong brand loyalty and trust and create more persuasive advertising, with no intention to control or manipulate the consumer.

Neuromarketing is a recent discipline, compared to neuroeconomics, is considered to be still in the state of infancy (Morin 2011; Wilson et al. 2008) but is already offering to marketers an array of tools and techniques; although more or less complex; that allow them to measure with more accuracy the advertising effectiveness and overcome the drawbacks of conventional methods by direct brain observation (functional Magnetic Resonance Imaging, Electroencephalography) or measurement of physiological responses in the body (eye movement, skin conductance, facial expressions, heart and respiration rate...).

## 2 A PREVIEW OF THE ORIGINS OF NEUROMARKETING

### 2.1 THE FIRST ATTEMPTS OF BRAIN IMAGING IN MARKETING

It appears that neuromarketing as a discipline has different birthdays before the rise of neuroeconomics in the late 1990's and the rapid improvement of neuroscience. By exploring the literature, we found out that the curiosity and appraisal to start studying brain functions and activities in order to achieve a better understanding of consumer's behavior began almost 20 years ago, as some scholars recommended electroencephalography (EEG, brain waves measures) to study the impact of promotions on the buying behavior (Wilson et al. 2008), and at the time, it was uncommon and difficult at first as it was complicated interpreting and retrieving data from EEG devices (Stewart 1984 and 1985). But decidedly with the continuous advancement of digital technologies, the limitations of EEG measurement are now transcended, especially with the development of noninvasive tools and methods that neurosciences offer, in order to probe and analyze the neural activity of the brain. Since the 1980's neuroscience and cognitive psychology joined forces and created a thoroughly new paradigm for understanding the consumer, in a way that it allows to understand how she/he stores, retrieves and uses information, and some scholars argue that marketers seek to influence the intricate processes of evaluation and decision making of the consumers, and they use tactics and technologies unethically in order to control and redirect their decisions (Wilson et al. 2008), which is a very extreme and exaggerated assumption. We believe the decision-making process is so complex to control and deviate, and there is no such thing as „the buy button“ that neuromarketing advocates are intentioned to unveil. There is no doubt that the continuous development of brain imaging technology will enable marketing researchers to better assess and understand.

The first attempt of unifying marketing and brain imaging took place in the late 1990's and the credit goes to Gerry Zaltman (note ) (Economist 2004; Zaltman 1997), the Harvard marketing guru provided an array of suggestions and insights in order to improve the effectiveness of marketing research. Zaltman stressed that when all the components of marketing research (the subject, managers, consumers, survey designs, sampling techniques...) come to ignore the nature of the human thoughts and behavior, it may lead to bias and a certain degree of subjectivity, as it leaves researchers overly prominent in the research process. This is one of the limits of traditional methods, and neuroscience can help with the endeavor of improving marketing research and overcome the traditional methods limits, and it requires the introduction of cognitive processes to the equation, processes that can be observed, measured and analyzed through neuroscience tools and techniques.

In conclusion of his 1025 cited article Rethinking market research: Putting people back in (1997), Gerald Zaltman made what we can call the announcement of neuromarketing birth, as he

referred to a study he was conducting in collaboration with Stephan M. Kosslyn at Harvard University and the Massachusetts General Hospital where PET Scans were used (Positron Emission Tomography) to evaluate the impact of different marketing stimuli relating to automobile dealerships, with the aim to measure three constructs conveyed in those stimuli: anxiety, trust and comfort. His proposition was to use neuroscience tools and technologies in order to improve marketing research, as the latter is crucially vital and strategic to every company willing to survive and overcome the ferocious competitiveness in today's economy. Zaltman succeeded in identifying some neural „signatures“ that correlate with valence and emotional reactions generated in response to imagined alternative retail environments of cars dealerships.

By reading and examining Zaltman's work, which was crowned by obtaining an US Patent of invention in year 2000 (Zaltman and Kosslyn 2000) we can understand why the credit of „inventing“ neuromarketing as a practical marketing research tool goes undoubtedly to him, because he did what exactly neuromarketing is and should be about: completing qualitative traditional methods in order to assess, measure and validate the data collected via oral and verbal means, and as a result, we can expect to have better and deeper insights of the consumer behavior and predict it with greater precision. Despite the fact that Zaltman's work was innovative and revolutionized marketing research, PET is an invasive method, and less invasive technologies should encourage marketing research to embrace neuroscience (e.g., EEG). This controversial union began then to attract attention when Brithghouse opened a neuromarketing division in 2001, with the ultimate aim to changing the marketing world forever (Fisher et al. 2010; Lee et al. 2007; Morin 2011; Wilson et al. 2008).

„...neuromarketing is the manifestation of the growing value attributed to neuroscience in the scientific and business sphere...“ (Levallois et al. 2019). There is no doubt that a notorious and irrevocable link exists between academic and business versions of neuromarketing, but there is still ambiguity on what „world“ is influencing the other. At the very beginning, the coupling of neuroscience technology and marketing seemed to be odd, although the academic „cradle“ was already ready to welcome it and the environment was very favorable.

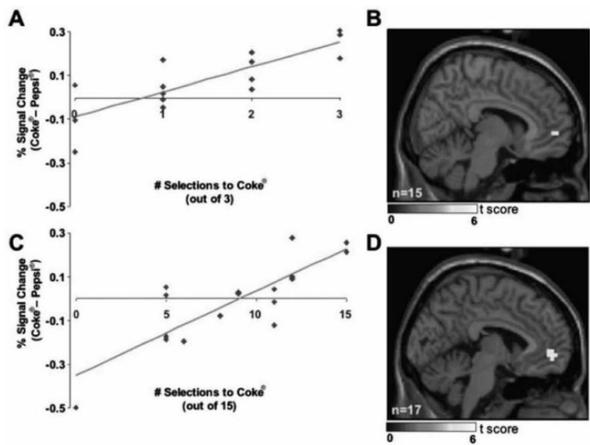
The fMRI was one of the first neuroscience tools that marketing academics have gotten familiar with. It was indeed a matter of time for this to happen given the brisk advancement in technology and the advent of neuropsychology and neuroimaging (Dumit 2004).

As we can see, neuromarketing appeared and developed undoubtedly with the emergence of neuroeconomics, although academics and especially neuroeconomics specialists underline the must of highlighting the distinction between the two: „...a related, although clearly distinct discipline that seems to be emerging alongside neuroeconomics is neuromarketing.

Neuroeconomics is a purely academic discipline concerned with the basic mechanisms of

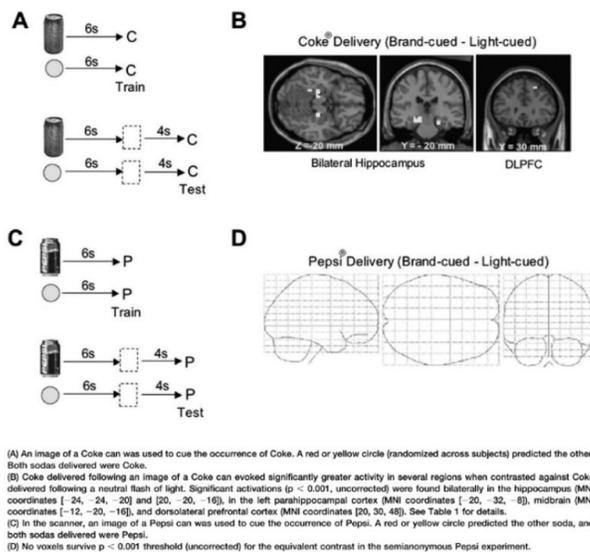
decision making. In contrast, neuromarketing is a more applied field concerned with the application of brain scanning technology to the traditional goals and questions of interest of marketers, both those in academia and those in private industry. While these two disciplines are related, they are also very distinct. This is a distinction often overlooked by popular media.” (Glimcher et al. 2009).

By exploring the roots of neuromarketing as a discipline, we cannot do it without evoking The Pepsi Challenge (note ) case study, which consisted of a blind taste test, where customers were asked to taste cola drinks from two unlabeled white glasses and select the one they preferred the most, and this experiment gave birth to the consensus that Americans preferred Pepsi over Coca-Cola, unconsciously. This famous experiment was taken a step further using fMRI scanner in order to reveal what was happening inside the testers’ brains, with the purpose of highlighting the behavioral and neural response to Pepsi-co and Coca-Cola when consumed anonymously; using fMRI; and analyzing the behavioral and neural influence of knowledge about which drink is being consumed (McClure et al., 2004). Two different taste tests have been carried out to assess the neural responses: a first taste test outside the fMRI scanner, and the second one while inside it in order to simultaneously monitor the brain activity of the 67 individuals recruited to take part of the experiment. The blind tests have shown that Pepsi-co was preferred over Coca-Cola, and that sensory information inputs (taste in this case) play a minor role in determining people’s behavior, and brand knowledge is likely to cause biases in preference decision. The fMRI tests illustrated the activation of the DLPFC and the Hippocampus areas while tasting the drinks, these areas are known to be related to memory and affective information. In fact, it has been demonstrated that DLPFC plays a primary role in processing emotional memory, as for emotional content to influence the memory processes (Ferrari and Balconi 2011), it is also commonly known that DLPFC is implicated in relational memory encoding and in episodic memory retrieval (Blumenfeld et al. 2011; Sandrini et al. 2003). The hippocampus is known to be implicated in processing and recalling affective information and plays a major role in recalling declarative memories (Fortin et al. 2002; Teyler and DiScenna 1985; Tulving and Markowitsch 1998; Voss et al. 2017). As results of the experiment carried out by McClure and his team (McClure et al. 2004), we can assess that the test participants were undoubtedly recalling Coca-Cola ads while actually drinking Pepsi-co.



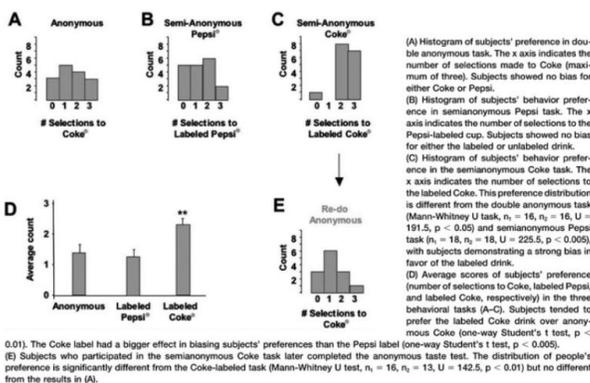
(A) Behavioral preferences expressed in the 3 trial taste test varied linearly with brain responses in the ventromedial prefrontal cortex (group 1). The vertical axis is the contrast (delayed Coke response - delayed Pepsi response) for the voxels shown in (B).  
 (B) SPM of neural correlates of behavior preference shown in (A) (thresholded at  $p < 0.001$ ; uncorrected for multiple comparisons).  
 (C) Correlation between behavioral preferences expressed in the 15 trial taste and brain responses in the ventromedial prefrontal cortex (group 2).  
 (D) SPM of neural correlates of behavior preference shown in (C) (thresholded at  $p < 0.001$ ; uncorrected for multiple comparisons).

Figure 2: Neural correlates of preference for anonymous Coke and Pepsi delivery in 3-trial and 15-trial anonymous taste tasks  
 Source: McClure et al. (2004)



(A) An image of a Coke can was used to cue the occurrence of Coke. A red or yellow circle (randomized across subjects) predicted the other. Both sodas delivered were Coke.  
 (B) Coke delivered following an image of a Coke can evoked significantly greater activity in several regions when contrasted against Coke delivered following a neutral flash of light. Significant activations ( $p < 0.001$ , uncorrected) were found bilaterally in the Hippocampus (MNI coordinates [-24, -24, -20] and [20, -20, -16]), in the left parahippocampal cortex (MNI coordinates [-20, -32, -8]), midbrain (MNI coordinates [-12, -20, -16]), and dorsolateral prefrontal cortex (MNI coordinates [20, 30, 48]). See Table 1 for details.  
 (C) In the scanner, an image of a Pepsi can was used to cue the occurrence of Pepsi. A red or yellow circle predicted the other soda, and both sodas delivered were Pepsi.  
 (D) No voxels survive  $p < 0.001$  threshold (uncorrected) for the equivalent contrast in the semi-anonymous Pepsi experiment.

Figure 3: Effect of brand knowledge on brain responses in semi anonymous tasks  
 Source: McClure et al. (2004)



(A) Histogram of subjects' preference in double anonymous task. The x axis indicates the number of selections made to Coke (maximum of three). Subjects showed no bias for either Coke or Pepsi.  
 (B) Histogram of subjects' behavior preference in semi-anonymous Pepsi task. The x axis indicates the number of selections to the Pepsi-labeled cup. Subjects showed no bias for either the labeled or unlabeled drink.  
 (C) Histogram of subjects' behavior preference in the semi-anonymous Coke task. The x axis indicates the number of selections to the labeled Coke. This preference distribution is different from the double anonymous task (Mann-Whitney U test,  $n_1 = 16$ ,  $n_2 = 16$ ,  $U = 191.5$ ,  $p < 0.05$ ) and semi-anonymous Pepsi task ( $n_1 = 18$ ,  $n_2 = 18$ ,  $U = 225.5$ ,  $p < 0.005$ ), with subjects demonstrating a strong bias in favor of the labeled drink.  
 (D) Average scores of subjects' preference (number of selections to Coke, labeled Pepsi, and labeled Coke, respectively) in the three behavioral tasks (A-C). Subjects tended to prefer the labeled Coke drink over anonymous Coke (one-way Student's t test,  $p < 0.01$ ). The Coke label had a bigger effect in biasing subjects' preferences than the Pepsi label (one-way Student's t test,  $p < 0.005$ ).  
 (E) Subjects who participated in the semi-anonymous Coke task later completed the anonymous taste test. The distribution of people's preference is significantly different from the Coke-labeled task (Mann-Whitney U test,  $n_1 = 16$ ,  $n_2 = 13$ ,  $U = 142.5$ ,  $p < 0.01$ ) but no different from the results in (A).

Figure 4: Effect of brand knowledge on behavioral preferences

Source: McClure et al. (2004)

Another brain imaging method which is nowadays widely used in neuromarketing studies is EEG. In 1988, an EEG measure was performed on subjects who were viewing TV advertisement, and one of the main findings was that memory correlated significantly with changes in the EEG signals (Rothschild et al. 1988), and today, memory is considered one of the main metrics neuromarketing studies aim to measure.

## 2.2 THE FIRST ATTEMPTS OF BIOMETRICS IN MARKETING

Beside brain waves measures and brain imaging there are biometrics tools and methods as the second component of neuromarketing arsenal. Pupillometry which is a clinical method that measures the spontaneous dilatation of the pupil diameter and the pupillary light reflex (Kirsch and Chervin 2011) is one of the biometrics measures used in neuromarketing among others (eye-tracking, galvanic skin response, facial expressions recognition, etc.). David C. Arch (1979) proposed pupil dilatation measures to study the cognitive response of consumers in a marketing research context, and stressed that at that time, the method shown high scientific potential in measuring consumer's behavior and his/her reactions to persuasive messages. Krugman (1964) wanted to assess the ability of Pupillometry to predict consumer's behavior and compare the data collected from this unorthodox measurement with the traditional one: interviews. To realize this, he conducted two studies involving greeting cards and sterling silver patterns, used as visual stimuli and shown to the subjects taking part of the experiment, pupil dilatation was measured simultaneously and interviews were conducted at the end of stimuli visualization, in order to collect verbal responses from subjects by asking them what stimuli they liked and the ones they liked less. This attempt of merging neuroscience with marketing has demonstrated that there is always a difference between verbal responses and how actually our body reacts to visual stimuli, and pupil dilatation measurement, back at the time, has established its potential as a future neuromarketing tool.



Figure 5: Comparison of sales, pupil responses and verbal ratings for silverware  
Source: Krugman (1964)

Pupil dilatation measurement was not the only neuroscience and clinical „gate“ that awakened the interest and curiosity of marketers regularly looking for more accurate ways to observe, analyze and understand consumer’s behavior. Studies and observations of consumer’s responses to stimuli, relying on eye movement tracing have been carried out years before the first attempt of integrating Pupillometry in marketing research (Behe et al. 2013). Wedel and Pieters in their 524 times cited article „A review of eye-tracking research in marketing“ (Wedel and Pieters 2015) gave us a detailed historical review of the usage of eye movement analysis in marketing research, in fact they draw attention to the first endeavor carried out by Nixon in 1924 (Wedel and Pieters 2006 and 2015) with no technology involved at the time, he observed eye movements of consumers who were browsing through magazines pages with printed ads, and he managed to conduct this experiment by hiding himself in a box behind a curtain. Afterward in 1940, the marketing field witnessed the collection of eye movement data from users paging advertising in newspapers, by means of the Purdue Eye Camera (Kabslake 1940). Wedel and Pieters report that later in 1978, appeared one of the most cited and pioneering article about the usage of eye-tracking technology with the aim to study consumer’s behavior: „Eye-fixation can save the world“ by Russo (Russo 1978), where he suggested that eye fixation methodology offers an array of advantages the verbal methods (interviews, focus groups) don’t, and that both methods should be used in a paired and complementary way for better insights and more detailed and accurate data.

## CONCLUSION

It is clear that the birth of neuromarketing wasn’t precocious; it was long and originated from the seismic shift in neuroeconomics and behavioral neuroscience and many Avant-grade attempts and experiments with the aim to revolutionize marketing research in the early 1920s, starting with Nixon’s endeavor to observe the eyes movement of individuals who were paging through printed ads, to Zaltman’s study of emotional responses and neural signatures using PET scans. And since the first introductions of biometrics to marketing, the business world and academia have embraced technology with the aim to revolutionize marketing research, and now, brain imaging, eye-tracking and other methods are vaguely used in every marketing area: packaging, product development, advertising, e-commerce, in store decision making, etc... But as a discipline, we believe neuromarketing is still to gain momentum, and it requires more intensive research in order to shape its theoretical frameworks and draw conclusions on the causal links connecting consumer’s behavior and the prediction of his/her decision-making process, and also, further research and experiments are necessary in order to confirm neuromarketing as a powerful complementary tool to the conventional methods and end the skepticism around potential intentions and possibilities to manipulate the consumer’s free will.

## POZNÁMKY/NOTES

Jacques Séguéla, co-founder of the RSCG communication agency.

Ale Smidts is a professor of marketing research and director of RSM's Erasmus Center for Neuroeconomics.

Loewenstein, G., Rick, S. and Cohen, J. D., 2008. Neuroeconomics. In: Annual Reviews of Psychology. 2008, 59, 647-672. ISSN 1545-2085. . . Available at: <<https://doi.org/10.1146/annurev.psych.59.103006.093710> (<https://doi.org/10.1146/annurev.psych.59.103006.093710>)>

Nielsen.com, 2021. Break through innovation reports 2011-2015. 2021. . . Available at:

O'Shaughnessy, J. and O'Shaughnessy, J. N., 2003. The marketing power of emotion. Oxford University Press, Inc., 2003. ISBN 0-19-515056-2.

Gerry Zaltman is professor emeritus at Harvard Business School, author of How customers think (2003) and Marketing metaphoria (2008).

The Pepsi Challenge is basically a series of advertised blind taste tests whereby consumers are told to take a sip each from unlabeled glasses of Coke and Pepsi. The Pepsi Challenge was first aired in Texas in May 1975.

## LITERATÚRA/LIST OF REFERENCES

Agarwal, S. and Dutta, T., 2015. Neuromarketing and consumer neuroscience: current understanding and the way forward. In: Decision. 2015, 42(4), 457-462. ISSN 2325- . . Available at: <<https://doi.org/10.1007/s40622-015-0113-1> (<https://doi.org/10.1007/s40622-015-0113-1>)>

Arch, D. C., 1979. Pupil dilation measures in consumer research: Applications and limitations. In: Advances in Consumer Research. 1979, 6, 166-168. ISSN 0093- 5301.

Behe, B. K., Fernandez, R. T., Huddleston, P. T., Minahan, S., Getter, K. L., Sage, L. and Jones, A. M., 2013. Practical field use of eye-tracking devices for consumer research in the retail environment. In: HortTechnology. 2013, 23(4), 517-524. ISSN 1943-7714. . . Available at: <<https://doi.org/https://doi.org/10.21273/HORTTECH.23.4.517> (<https://doi.org/https://doi.org/10.21273/HORTTECH.23.4.517>)>

Black, J. and MacRaild, D., 2017. Studying history. Springer. ISBN 978-1137478597.

Blumenfeld, R. S., Parks, C. M., Yonelinas, A. P. and Ranganath, C., 2011. Putting the pieces together: The role of dorsolateral prefrontal cortex in relational memory encoding. In: Journal of Cognitive Neuroscience. 2011, 23(1), 257-265. ISSN 1530- . . Available at: <<https://doi.org/10.1162/jocn.2010.21459> (<https://doi.org/10.1162/jocn.2010.21459>)>

Burgos-Campero, A. A., 2013. Analytical approach to neuromarketing as a business strategy. In: Procedia – Social and Behavioral Sciences. 2013, 99, 517-525. ISSN 1877-0428. . . Available at:

- <<https://doi.org/10.1016/j.sbspro.2013.10.521> (<https://doi.org/10.1016/j.sbspro.2013.10.521>)>  
Castellion, G. and Markham, S. K., 2013. Perspective: New product failure rates: Influence of of Argumentum ad Populum and Self-Interest. In: Journal of Product Innovation Management. 2013, 30(5), 976-979. . . Available at: <<https://doi.org/10.1111/j.1540-5885.2012.01009.x> (<https://doi.org/10.1111/j.1540-5885.2012.01009.x>)>
- Chatterjee, S., 2015. Neuromarketing – a path breaking approach to understanding consumer behaviour. In: Journal of Management & Research. 2015, 9(5), 1-10. ISSN 0974-455X.
- Crawford, C. M., 1979. New product failure rates – Facts and fallacies new product failure rates. In: Research Management. 1979, 22(5), 9-13. . . Available at: <<https://doi.org/10.1080/00345334.1979.11756557> (<https://doi.org/10.1080/00345334.1979.11756557>)>
- Cruz, C. M. L., De Medeiros, J. F., Hermes, L. C. R., Marcon, A. and Marcon, É., 2016. Neuromarketing and the advances in the consumer behaviour studies: A systematic review of the literature. In: International journal of business and globalisation. In: 17(3), 330-351. ISSN 1753-3635. . . Available at: <<https://doi.org/10.1504/IJBG.2016.078842> (<https://doi.org/10.1504/IJBG.2016.078842>)>
- Droulers, O. and Rouillet, B., 2007. Apports et perspectives pour les praticiens et les chercheurs. In: Décisions Marketing. 2007, 46(46), 9-22. ISSN 0779-7389.
- Dumit, J., 2004. Picturing personhood: Brain scans and biomedical identity. Princeton University Press. ISBN 9780691113982
- Economist, 2004. Inside the mind of the consumer. 2004. . . Available at: <<https://www.economist.com/technologyquarterly/2004/06/12/inside-the-mind-of-the-consumer> (<https://www.economist.com/technologyquarterly/2004/06/12/inside-the-mind-of-the-consumer>)>
- Ferrari, C. and Balconi, M., 2011. DLPFC implication in memory processing of affective information. A look on anxiety trait contribution. In: Neuropsychological Trends. 2011, 9(1), 53-70. ISSN 1970-3201.
- Fisher, C. E., Chin, L. and Klitzman, R., 2010. Defining neuromarketing: Practices and professional challenges. In: Harvard Review of Psychiatry. 2010, 18(4), 230-237. ISSN 1465-7309. . . Available at: <<https://doi.org/10.3109/10673229.2010.496623> (<https://doi.org/10.3109/10673229.2010.496623>)>
- Fortin, N. J., Agster, K. L. and Eichenbaum, H. B., 2002. Critical role of the hippocampus in memory for sequences of events. In: Nature Neuroscience. 2002, 5(5), 458-462. ISSN 1546-1726. . . Available at: <<https://doi.org/10.1038/nn834> (<https://doi.org/10.1038/nn834>)>
- Fugate, D. L., 2007. Neuromarketing: A layman's look at neuroscience and its potential application to marketing practice. In: Journal of Consumer Marketing. 2007, 24(7), 385-394. ISSN 0736-3761. . . Available at: <<https://doi.org/10.1108/07363760710834807> (<https://doi.org/10.1108/07363760710834807>)>

[/10.1108/07363760710834807](https://doi.org/10.1108/07363760710834807)>

Georges, P. and Badoc, M., 2010. *Le neuromarketing en action*. Paris Cedex: Groupe Eyrolles, 2010. ISBN 978-2-212-54625-5.

Glimcher, P. W., Camerer, C. F., Fehr, E. and Poldrack, R. A., 2009. *Neuroeconomics: Decision making and the brain*. Elsevier Inc., 2009. ISBN 9780080921068.

Glimcher, P. W. and Rustichini, A., 2004. *Neuroeconomics: The consilience of brain and decision*. In: *Science*. 2004, 306, 447-452. ISSN 1095-9203.

Harris, J. M., Ciorciari, J. and Gountas, J., 2018. *Consumer neuroscience for marketing researchers*. In: *Journal of Consumer Behaviour*. 2018, 17(3), 1-14. ISSN 1479-1838. . . Available at: <<https://doi.org/10.1002/cb.1710> (<https://doi.org/10.1002/cb.1710>)>

Kabslake, J. S., 1940. *The perdue eye-camera: A practical apparatus for studying the attention value of advertisements*. In: *Journal of Applied Psychology*. 1940, 24(4), 417-440. ISSN 1939-1854. . . Available at: <<https://doi.org/https://doi.org/10.1037/h0054171> (<https://doi.org/https://doi.org/10.1037/h0054171>)>

Khushaba, R. N., Wise, C., Kodagoda, S., Louviere, J., Kahn, B. E. and Townsend, C., 2013. *Expert systems with applications consumer neuroscience: Assessing the brain response to marketing stimuli using electroencephalogram (EEG) and eye tracking*. In: *Expert Systems With Applications*. 2013, 40(9), 3803-3812. ISSN 0957-4174. . . Available at: <<https://doi.org/10.1016/j.eswa.2012.12.095> (<https://doi.org/10.1016/j.eswa.2012.12.095>)>

Kirsch, D. B. and Chervin, R. D., 2011. *Assessment of daytime sleepiness*. In: *Handbook of Clinical Neurology*. 2011, 98(C), 45-54. ISSN 0072-9752. . . Available at: <<https://doi.org/10.1016/B978-0-444-52006-7.00003-4> (<https://doi.org/10.1016/B978-0-444-52006-7.00003-4>)>

Krugman, H. E., 1964. *Some applications of pupil measurement*. In: *Journal of Marketing Research*. 1964, 1(4), 15-19. ISSN 0022-2437.

Lee, N., Broderick, A. J. and Chamberlain, L., 2007. *What is „neuromarketing“? A discussion and agenda for future research*. In: *International Journal of Psychophysiology*. 2007, 63(2), 199-204. ISSN 0167-8760. . . Available at: <<https://doi.org/10.1016/j.ijpsycho.2006.03.007> (<https://doi.org/10.1016/j.ijpsycho.2006.03.007>)>

Levallois, C., Smidts, A. and Wouters, P., 2021. *The emergence of neuromarketing investigated through online public communications (2002-2008)*. In: *Business History*. 2021, 63(3), 443-466. ISSN 1743-7938. . . Available at: <<https://doi.org/10.1080/00076791.2019.1579194> (<https://doi.org/10.1080/00076791.2019.1579194>)>

Loewenstein, G., Rick, S. and Cohen, J. D., 2008. *Neuroeconomics*. In: *Annual Reviews of Psychology*. 2008, 59, 647-672. ISSN 1545-2085. . . Available at: <<https://doi.org/10.1146/annurev.psych.59.103006.093710> (<https://doi.org/10.1146/annurev.psych.59.103006.093710>)>

Marichamy, K. and Sathiyavathi, K. J., 2014. *Original article neuromarketing: The new science of*

- consumer behavior. In: *Tactful Management Research Journal*. 2014, 2(6), 1-5. ISSN 2319-7943.
- McCabe, K. A., 2008. Neuroeconomics and the economic sciences. In: *Economics & Philosophy*. 2008, 24(3), 345-368. ISSN 1474-0028. . . Available at: <<https://doi.org/10.1017/S0266267108002010> (<https://doi.org/10.1017/S0266267108002010>)>
- McClure, S. M., Li, J., Tomlin, D., Montague, M., Cypert, K. S. and Montague, P. R., 2004. Neural correlates of behavioral preference for culturally familiar drinks. In: *Neuron*. 2004, 44(2), 379-387. ISSN 1097-4199.
- Morin, C., 2011. Neuromarketing: The new science of consumer behavior. In: *Society*. 2011, 48(2), 131-135. ISSN 1936-4725. . . Available at: <<https://doi.org/10.1007/s12115-010-9408-1> (<https://doi.org/10.1007/s12115-010-9408-1>)>
- Mullainathan, S. and Bertrand, M., 2001. Do people mean what they say? Implications for subjective survey data. In: *American Economic Review*. 2001, 91(2), 67-72. ISSN 1944-7981.
- Nielsen.com, 2021. Break through innovation reports 2011-2015. 2021. . . Available at: <[www.nielsen.com](http://www.nielsen.com) ([www.nielsen.com](http://www.nielsen.com))>
- O'Shaughnessy, J. and O'Shaughnessy, N., 2003. *The marketing power of emotion*. Oxford University Press, Inc., 2003. ISBN 0-19-515056-2.
- Perrachione, T. K. and Perrachione, J. R., 2008. Brains and brands: Developing mutually informative research in neuroscience and marketing. In: *Journal of Consumer Behaviour*. 2008, 7(4-5), 303-318. ISSN 1479-1838. . . Available at: <<https://doi.org/10.1002/cb.253> (<https://doi.org/10.1002/cb.253>)>
- Plassmann, H., Venkatraman, V., Huettel, S. and Yoon, C., 2015. Consumer neuroscience: Applications, challenges, and possible Solutions. In: *Journal of Marketing Research*. 2015, 52(4), 427-435. ISSN 1547-7193.
- Pradeep, A. K., 2010. *The buying brain: Secrets for selling to the subconscious mind*. John Wiley & Sons, Inc., 2010. ISBN 978-0-470-60177-8.
- Rothschild, M. L., Hyun, Y. J., Reeves, B., Thorson, E. and Goldstein, R. 1988. Hemispherically lateralized EEG as a response to television commercials. In: *Journal of Consumer Research*. 1988, 15(2), 185-198. ISSN 1537-5277. . . Available at: <<https://doi.org/10.1086/209156> (<https://doi.org/10.1086/209156>)>
- Ruanguttamanun, C., 2014. Neuromarketing: I put myself into a fMRI scanner and realized that I love Louis Vuitton Ads. In: *Procedia – Social and Behavioral Sciences*. 2014, 148, 211-218. ISSN 1877-0428. . . Available at: <<https://doi.org/10.1016/J.SBSPRO.2014.07.036> (<https://doi.org/10.1016/J.SBSPRO.2014.07.036>)>
- Russo, E. J., 1978. Eye fixations can save the world: A critical evaluation and a comparison between eye fixations and other information processing methodologies. In: *Advances in Consumer Research*. 1978, 5, 561-570. ISSN 0098-9258.

- Sandrini, M., Cappa, S. F., Rossi, S., Rossini, P. M. and Miniussi, C., 2003. The role of prefrontal cortex in verbal episodic memory: rTMS evidence. In: *Journal of Cognitive* 2003, 15(6), 855-861. ISSN 1530-8898. . . Available at: <<https://doi.org/10.1162/089892903322370771> (<https://doi.org/10.1162/089892903322370771>)>
- Smidts, A., 2002. *Kijken in het brein over de mogelijkheden van neuromarketing*. Rotterdam: Erasmus University Rotterdam, 2002. ISBN 90-5892-036-4.
- Stewart, D. W., 1984. Physiological measurement of advertising effects. In: *Psychology & Marketing*. 1984, 1(1), 43-48. ISSN 0742-6046.
- Stewart, D. W., 1985. Differences between basic research and the validation of specific measures: A reply to Weinstein, et al. In: *Psychology & Marketing*. 1985, 2(1), 41-49. ISSN 0742-6046.
- Teyler, T. J. and DiScenna, P., 1985. The role of hippocampus in memory: A hypothesis. In: *Neuroscience and Biobehavioral Reviews*. 1985, 9(3), 377-389. ISSN 1873-7528. . . Available at: <[https://doi.org/10.1016/0149-7634\(85\)90016-8](https://doi.org/10.1016/0149-7634(85)90016-8) ([https://doi.org/10.1016/0149-7634\(85\)90016-8](https://doi.org/10.1016/0149-7634(85)90016-8))>
- Tulving, E. and Markowitsch, H. J., 1998. Episodic and declarative memory: Role of the hippocampus. In: *Hippocampus*. 1998, 8(3), 198-204. ISSN 1098-1063.
- Venkatraman, V., Clithero, J. A., Fitzsimons, G. J. and Huettel, S. A., 2012. New scanner data for brand marketers: How neuroscience can help better understand differences in brand preferences. In: *Journal of Consumer Psychology*. 2012, 22(1), 143-153. ISSN 1532-7663. . . Available at: <<https://doi.org/https://doi.org/10.1016/j.jcps.2011.11.008> (<https://doi.org/https://doi.org/10.1016/j.jcps.2011.11.008>)>
- Voss, J. L., Bridge, D. J., Cohen, N. J. and Walker, J. A., 2017. A closer look at the hippocampus and memory. In: *Trends in Cognitive Sciences*. 2017, 21(8), 577-588. ISSN 1364-6613. . . Available at: <<https://doi.org/10.1016/j.tics.2017.05.008> (<https://doi.org/10.1016/j.tics.2017.05.008>)>
- Wedel, M. and Pieters, R., 2006. Eye tracking for visual marketing. In: *Foundations and Trends in Marketing*. 2006, 1(4), 231-320. ISSN 1555-0761.
- Wedel, M. and Pieters, R., 2015. A review of eye-tracking research in marketing. In: *Review of Marketing Research*. 2015, 4, 123-147. ISSN 1548-6435.
- Wilson, R. M., Gaines, J. and Hill, R. P., 2008. Neuromarketing and consumer free will author. In: *The Journal of Consumer Affairs*. 2008, 42(3), 389-410. ISSN 1745-6606.
- Zaltman, G., 1997. Rethinking market research: Putting people back In. *Journal of Marketing Research*. 1997, 34(4), 424-437. ISSN 0022-2437.
- Zaltman, G. and Kosslyn, S. M., 2000. Neuroimaging as a marketing tool (Patent No. US006099319A). The United States Patent and Trademark Office (USPTO). . . Available at: <<https://patents.google.com/patent/US6099319A/en> (<https://patents.google.com/patent/US6099319A/en>)>

## KLÍČOVÉ SLOVÁ/KEY WORDS

neuromarketing, neuroeconomics, neuroscience, marketing research, consumer behavior  
neuromarketing, neuroekonómia, neuroveda, marketingový výskum, spotrebiteľské správanie

## JEL KLASIFIKÁCIA/JEL CLASSIFICATION

D87, M31

## RÉSUMÉ

### **Prehľad pôvodu neuromarketingu ako novej metódy marketingového výskumu**

Príspevok poskytuje prehľad literatúry o neuromarketingu a počiatkoch jeho vzniku ako novej metódy marketingového výskumu. Pokúsili sme sa vytvoriť všeobecný popisný súhrn relevantnej literatúry, ktorý zdôrazňuje definíciu neuromarketingu ako novej marketingovej disciplíny a sleduje jeho počiatky a základy od a pred príchodom neuroekonómie, keďže tá sa považuje za jeho predchodcu. Účelom tohto príspevku je definovať, čo je neuromarketing z pohľadu akademikov a odborníkov z praxe, ako a kedy si začal nachádzať svoju cestu do akademickej sféry a sveta obchodu, a to upozornením na vôbec prvé pokusy o využitie nezvyčajných neurovedeckých nástrojov na posúdenie spotrebiteľského správania. Tento príspevok vykresľuje časovú os pôvodu neuromarketingu a zahŕňa prvé pokusy o pozorovanie správania spotrebiteľov, ktoré sa spoliehali na nervové a fyziologické reakcie.

## RECENZOVANÉ/REVIEWED

29. November 2021 / 10. December 2021