

Neuromarketing as a Tool for Data Acquisition in Consumer Behaviour

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Abstract: Technological progress brings several benefits in different areas. It allows us to look at the consumer and his behaviour in a completely different way than before. For a long time now, it has not just been about examining purchasing decisions, today it is about finding out the reasons why consumers have done so. This paper deals with the interpretation of the term neuromarketing, which applies various neuroscientific methods to analyse and understand human behaviour. The ambition of the presented paper is also the evaluation of consumer opinions on the neuromarketing research itself using neuromarketing tools. In the next part, the paper also deals with selected ethical dilemmas that may arise during the research. Neuromarketing seems to be an ideal tool for obtaining data on consumer behaviour, so it is necessary to get thoroughly acquainted with it and this paper will offer the reader a suitable tool to use neuromarketing research to effectively obtain data in consumer behaviour.

Keywords: Neuromarketing, Neuromarketing methods, Eye-tracking, Electroencephalogram, Functional magnetic resonance

JEL Classification codes: M39

INTRODUCTION

Marketing and advertising have the task of convincing the consumer to buy the desired product. At the same time, rational decision-making makes up only 10% of the consumer's final decision. Therefore, examining consumer behaviour, for example through group interviews, does not have the desired effect, as consumers respond as if they were making rational decisions. Neuromarketing therefore offers us more benefits than we could make our activities more attractive to customers based on their personal preferences. The question therefore remains how to obtain this information. We will describe the methods we can use in this article and the reader will get a basic overview of all available methods that he can use in his research. Of course, the subject of research in this case is humans - living beings, and their rights and privacy must be respected.

Neuromarketing could also be a marketing communication tool that allows you to monitor consumer behaviour through the application of neuropsychology to marketing research. But better said, neuromarketing is a kind of window in the mind of the consumer, thanks to which companies can estimate the shopping behaviour of their customers

Obtaining information in this case is a real challenge from a scientific point of view. These surveys are very costly, but the value of the information obtained is enormous. In the following section, we characterize the individual neuromarketing methods and provide an overview of what data we can obtain from them.

1. LITERATURE REVIEW

Techniques and methodologies for examining consumer behaviour through neuromarketing are very important to know, which has prompted companies to look for new effective methods to better understand and predict consumer behaviour. Thus, researchers have explored how marketing research can use these techniques to develop marketing practices and advertising research. At the same time, the fMRI investigation showed that most consumer behaviour and decisions are made unconscious, which has significantly contributed to purchasing decisions (Agarwal & Dutta, 2015; Alsharif, Salleh, Baharun and Effandi, 2021; Brierley, 2017). This study was the threshold for a new approach to the study of consumer behaviour using neuroscience technologies in business research, called "neuromarketing". Thus, we can state that neuromarketing is on the border of marketing, neuroscience, and psychology (Alsharif et al., 2021a; Alvino et al., 2020).

According to several authors, neuromarketing is the application of neuroimaging and physiological tools to record the neural correlates of consumer behavior (eg decision-making, emotions, attention and memory) against marketing incentives such as various brands and advertisements. (Alsharif, Salleh, Baharun, 2021)

Fogašová and Oláh (2013) state that neuromarketing seeks to examine the impact of marketing incentives on customer and consumer reactions at the same time. These are cognitive, affective and sensorimotor stimuli. Neuromarketing examines the functions of the brain when making purchasing decisions. With this tool, companies try to find out the real preferences of people. Some see neuromarketing as a market research tool.

Lucaci (2012) states that neuromarketing is a new form of market research that uses neuroscience tools to measure the emotional impact of communication across all media and uses the results to make marketing recommendations.

Kozel (2011) states that neuromarketing is one of the new areas of research methods, which is based on the so-called neuroscience, loosely translated as neuroscience.

According to Lindstrom (2009), it is also a tool "used to help us decipher what we already think as consumers when we come across a product or brand — and sometimes it even helps us uncover dubious methods that traders use. to deceive and deceive us, without any idea.

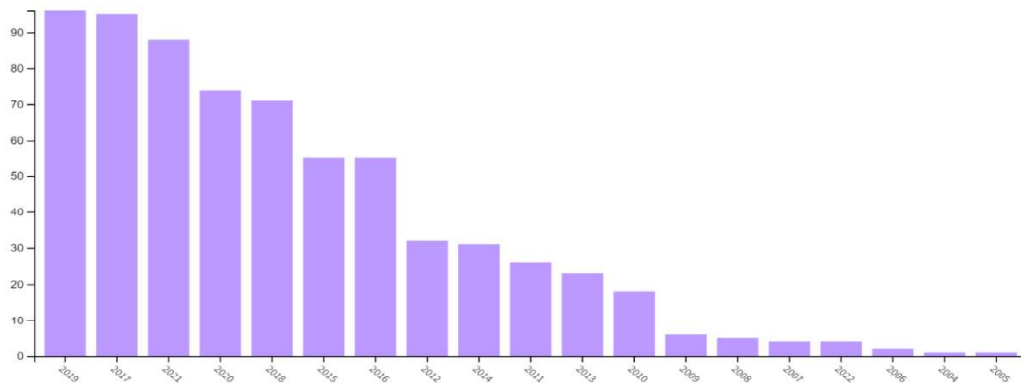
According to Vysekalová (2011), neuromarketing is the application of neurological knowledge in any area of marketing, e.g. into packaging, research and development of new products and services, marketing communication, etc.

Traditional research methods have been widely used as self-reports (e.g., surveys, focus groups) to study consumer responses (e.g., decision-making) to marketing incentives such as advertising and brands (J. Harris et al., 2018). Self-assessment relies on awareness of consumer behavior and overlooks unconsciousness; thus, a discrepancy between what the consumer says and does. Traditional research methods therefore provide inaccurate and unreliable information on consumer behavior (Alsharif et al., 2021b; Alsharif, Salleh, Baharun, and Effandi, 2021), leading to the conclusion that most products and advertisements failed in the first year (Jordao et al., 2017; Vecchiato et al., 2015). Therefore, most consumer behavior (e.g., decision-making, perception) is unconscious, which cannot be predicted by traditional research methods (Alsharif, Salleh, Baharun, Hashem, et al., 2021; Alsharif, Salleh, Baharun, & Effandi, 2021).

In order to define the boundaries of neuromarketing, we collected the necessary material for analysis in the Web of Science and Scopus databases. In the first step, we needed to collect the necessary literature, which was the subject of the analysis itself. As part of the analysis, we performed an empirical overview in two databases, namely Scopus and Web of Science.

We entered 603 results in Scopus database after entering keywords - consumer neuroscience. As not all articles are always available in full text, we used only abstracts of the articles in question for our analysis purposes. In the Web of Science database, we entered 941 results of scientific publications after entering the same keywords.

Fig. 1 Availability of publications during the years 1984 - 2022 for the keywords neuromarketing



Source: Web of Science, available online (02.02.2022):
<https://www.webofscience.com/wos/woscc/analyze-results/c9b6eba6-5d96-402d-ab79-3b657ffefb2-220bcbb2>

We can see from the graph that the number of publications has been growing rapidly since 2009. For our analysis, we have decided to filter publications from 2007 to the present. During this period, the publications also cite previous works, and before 2007 the essential ideas were included in the abstracts of publications after 2007. For our research needs, we collected the most cited publications from each database, gradually one by one from 2007 to 2021 inclusive. Since we have two databases from which we draw, we further filtered according to the number of citations by year - with the result that we eliminated the article from both databases that had fewer citations in a given year. We have reached the final number of 15 articles. The Web of Science database offers us, after entering keywords for the subject analysis of the subject areas, the Tree Map Chart, which characterizes the areas and the number of these areas in the subject search. Figure 2. describes these areas - neuromarketing, which is in the search in the largest number of publications in the number of 318, followed by business, multidisciplinary psychology, economics, sociology, psychology, management, applied psychology, communication, experimental psychology, food processing technology, clinical neurology, psychiatry and biopsychology, which examines psychological changes in connection with biological changes in the body. Based on this partial analysis, we have a good overview of potential concepts that we can obtain after performing an empirical overview and defining the boundaries of neuromarketing.

Figure 2 defines the boundaries at which we can characterize neuromarketing. Neuromarketing balances on the border of business and management and, to put it bluntly, is a good tool to enhance business activities. We can state that it also analyses marketing communication, which is the largest source of information. Of course, neuromarketing is based on a science that researches and is based on the knowledge of the brain and its influence on shopping behaviour, and it does not lead. Last but not least, on the basis of efficiency and its application, it also contributes to the economic result of each company, whether positively or negatively - we mentioned the high initial costs of procuring, for example, functional magnetic resonance

imaging. It is not just about instrumentation, we must also count on qualified staff, specially created facilities for instruments, financial rewards for research respondents and others. Based on the graph and the connections with the researched term, we also perceive the connection between the relationship and research ethics. We will comment on the ethics of research in the part of the results where they suggested an ethical approach.

Fig. 2 Tree map chart - neuromarketing



Source: Web of Science, available (01.01.2021) online from: <https://www.webofscience.com/wos/woscc/analyze-results/f0255c57-7226-4029-b6e1-96cf2357d569-123f3f1e>

Neuromarketing tools are divided into several categories. We will deal with this division in more detail in the results of this work. According to Ramsøy (Ramsøy, 2015), neuromarketing tools have been divided into four categories:

- neuroimaging tools such as functional magnetic resonance imaging (fMRI), positron emission tomography (PET), electroencephalography (EEG), magnetoencephalography (MEG), steady state topography (SST), functional near-infrared spectroscopy (fNIRS) and single photon emission (SP);
- Physiological techniques such as electrocardiogram (ECG), eye tracking (ET), electromyography (EMG), galvanic skin response (GSR) (Isabella et al., 2015);
- Self-administration, such as questionnaires, interviews and target groups;
- Behaviour measurement such as the Implicit Association Test (IAT). For example, physiological tools may record the physiological functions of consumers (e.g., respiration, heart rate, pupil dilation, saccade, fixation, eye movements, sweating, and facial muscle movements) during exposure to advertising (Hamelin et al., 2017).

Meanwhile, neuroimaging tools make it possible to record the dimensions of emotions, attention, and memory of advertisements (Alsharif, Salleh, Baharun, Hashem et al., 2021). According to the literature, EEG and fMRI are the most popular neuroimaging tools in research to obtain data (Alsharif, Salleh, Baharun, Hashem, et al., 2021; Alsharif, Salleh, Baharun, & Safaei, 2020), while eye-tracking is the most popular physiological tool. This tool is the most affordable in terms of financial possibilities. In our research, we plan to start working with this tool continuously. It allows you to evaluate several advertising options such as tracking the movement of the pupils on websites and e-shops, tracking and tracing the

movement of eyes on websites, as well as tracking and moving eyes in brick-and-mortar stores under category management conditions - i.e. placing products on store shelves.

In academia, the number of publications in the field of neuromarketing has risen sharply (Alsharif, Salleh and Baharun, 2020). As a result, neuromarketing research has attracted companies and scientists to use tools in their research to overcome / limitations of orthodox methods and solutions to marketing problems (Alsharif, Salleh, Baharun and Safaei, 2020; Morin, 2011; Sebastian, 2014). As a result, the benefits of neuroscientific methods have become significant in enriching consumer behavior research in the new millennium of marketing, leading several authors to talk about the benefits of neuromarketing (Lee et al., 2017; Ramsay, 2015; Songsamoe et al., 2019)).

With neuromarketing, you find answers to the questions of what part of the brain results in a customer's response to an advertisement and how customers respond to an advertising stimulus. The final choice to buy a product is largely the result of the influence of the environment - family, friends, neighbours - or authorities (seller, dealer). In many cases, neuromarketing is used to understand how this digital interaction occurs and how brands can improve the usability and user experience of digital elements such as websites, applications or digital services / products, on computers, mobile devices, etc. (Šášiková, 2013). Thanks to its comprehensive view of the minds of customers and potential customers, it can help companies with the effective design of marketing campaigns or the creation of e-shops. Some examples of the use of neuromarketing in the digital environment are: (Kozel et al., 2011)

- Landing page or microsite evaluation - neuromarketing evaluates how a user behaves when navigating this site, helps us to understand which zones attract the user's attention, what emotions are evoked in a given consumer, or whether there are problems with the usability of the site;
- Usability studies - neuromarketing evaluates the usability of a digital element (website, application, digital product / service) from key tasks that the user must perform;
- Brand building - neuromarketing through PRE and POST tests assesses whether the consumer's perception of the brand has changed after exposure to a specific digital element.

Neuroimaging methods allow researchers to gather signals and interpret psychological processes in the brain while people perform tasks or experience marketing incentives to clarify the relationship between consumer behaviour and the nervous system. Furthermore, it is possible to use automatic technologies to predict customer preferences, provided that this technology is suitable for marketing purposes. In this way, we can reveal the motives and reasons for consumers' purchasing decisions.

2. METHODOLOGY

In preparing this paper, we used the method of abstraction, mainly from Internet sources and online databases. We also used the method of comparison, where we analysed various surveys and identified penetrations in characterizing consumer behaviour and consumer attitudes. We supplemented the consumer analysis with selected neuromarketing tools - functional magnetic resonance imaging, electroencephalography, eye-tracking, measurement of physiological reactions, monitoring of facial expressions and their description. The ambition of this paper is to identify neuromarketing as a suitable tool for obtaining information on consumer behaviour. The aim is not only to describe neuromarketing as a tool for efficient data acquisition, but also to evaluate consumer attitudes towards neuromarketing tools in the context of marketing research.

To prepare the paper, we used the basic methods for a general understanding of the topic and the subject matter, namely the analysis, which we used to process systematically collected empirical material on the issue. We have therefore defined the basic concepts using the method of analysis, synthesis and abstraction. We used the comparison method to evaluate neuromarketing tools. To evaluate consumers' attitudes toward neuromarketing tools in analysing their consumer behaviour and obtaining information, we conducted an online survey on a sample of 1080 respondents. To verify the assumption, we used Pearson's chi-square test of independence, using the chi-square formula to determine chi-square statistics, degrees of freedom, and the level of significance, and comparing the results with a chi-square distribution table. For this data, we were able to use a chi-square test to see if men are in higher directions in your neuromarketing marketing research tools. These respondents represented a non-random selection from all regions of the Slovak Republic. The information were founded about their perception of neuromarketing and neuromarketing tools and we analysed them thanks to the chi square test in Microsoft Excel. We have established the following hypotheses:

H0: Gender does not influence the promotion of the use of neuromarketing tools in consumer behaviour marketing research.

H1: Gender has a major impact on promoting the use of neuromarketing tools in consumer behaviour marketing research.

3. RESULTS AND DISCUSSION

In the first part of our work we provide an overview of neuromarketing tools. Our focus is on the three main ones that we will use in our conditions in the Slovak Republic in the future. According to the ideal scenario, we will start using the eye-tracking method and later focus on the combination of eye-tracking and EEG, and in the final phase we plan to use the possibilities offered by functional magnetic resonance imaging - fMRI.

In the next part, we will try to find out, based on an online survey of a sample of 1080 respondents from the Slovak Republic, whether there is a relationship between gender and the support of neuromarketing tools for obtaining information, in the analysis of consumer behaviour.

3.1 Classification of neuromarketing methods

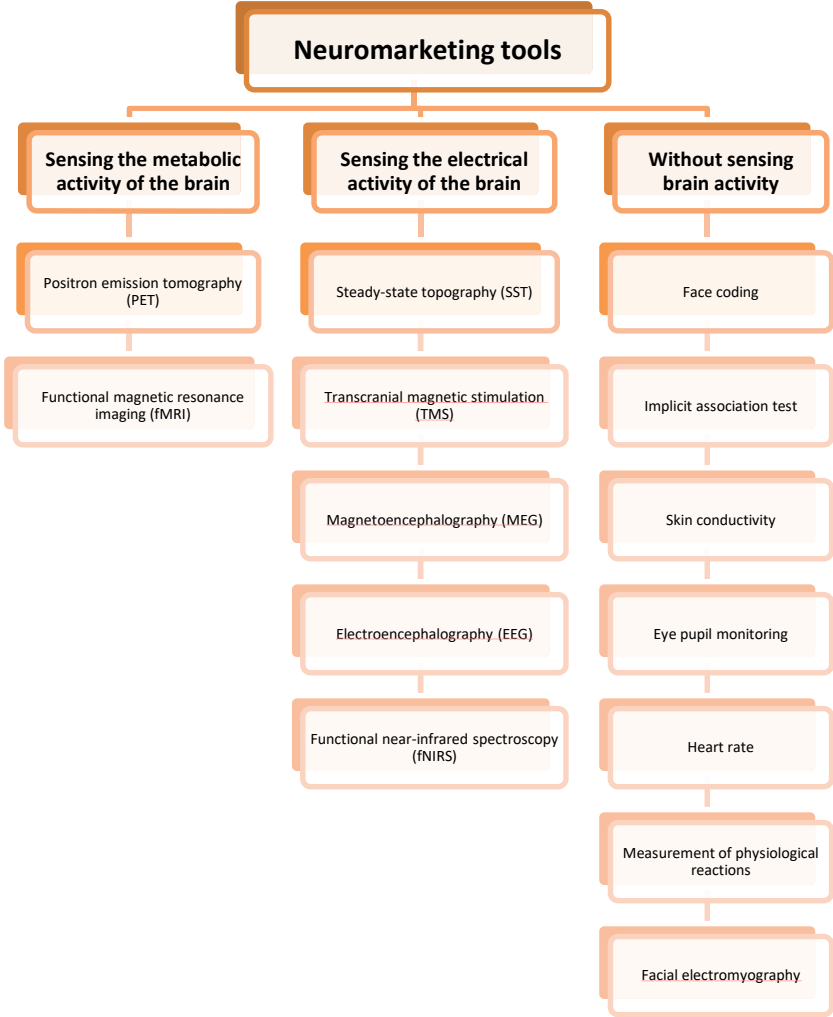
In Figure 3 and in the following section, we identify neuromarketing methods useful in consumer research.

Neuromarketing methods are based on the knowledge of medical neuroscience and neurology. We distinguish these three basic groups of methods by whether they sense brain metabolic activity, which includes methods such as positron emission tomography and functional magnetic resonance imaging, or by brain electrical activity, where we classify steady-state topography, transcranial magnetic stimulation, magnetoencephalography, electroencephalography, or functional non-infrared spectroscopy, or do not capture brain activity at all, and this group includes methods such as facial coding - we also know the English term "facial coding", implicit association test, skin conductivity measurement, eye pupil monitoring - a method known in English nomenclature - eye-tracking, heart rate heart rate, measurement of physiological reactions and facial electromyography.

In our next work, we will consider all the factors that affect our research, not only financially, we have chosen a sequence of eye-tracking, where we will examine the respondents based on the movement of their eyelids. In the next part, we would expand our research with the

device that is closest to the EEG method and thus use a special helmet to examine specific brain reactions - which can already tell us about the respondent's positive or negative affection for the subject matter. The highest degree we plan to examine the respondent in the future is through functional magnetic resonance imaging, which with its potential can reveal the real reasons and motives for consumer decisions. In each method presented, we discussed how and how this method works and what types of data we can expect about consumer behaviour. Of course, we supplement this interpretation with information about the process of these methods and what areas in the brain they activate.

Fig. 3 Classification of neuromarketing methods



Source: Quantitative versus Qualitative in Neuromarketing Research (Bercea, 2013)

3.2 Eye-tracking – eye pupil monitoring

An eye tracking device can also be used to measure changes in pupil size, which is also used to track the direction of vision in consumer research. Modern eye-tracking devices use specialized sensors to derive the direction of tracking from patterns of infrared light reflected by the cornea during normal eye movements. These sensors can be placed on a table top or in a pair of specialized glasses that allow mobile eye tracking outside the laboratory. The basic premise of eye tracking is that the individual visually and mentally processes any stimuli to which his gaze is directed. Eye tracking is thus a good tool for assessing visual attention.

Eye-tracking studies have provided important insights into how consumers process and engage with marketing materials such as advertisements or catalogues, and how these attention patterns relate to consumer choice and behaviour. Eye tracking data revealed that participants noticed most of the large ads, but only a quarter of the simple lists; colour ads were viewed more often and longer than black and white ads, and the ads that were ultimately selected were observed over a longer period of time compared to other ads, suggesting that directing attention is a predictor of choice for the consumer.

Eye tracking allows researchers to understand which features of marketing materials and product information are most important and thus attract consumers' attention, but it can also help them understand how consumers process information and under what conditions all available information is used. However, there are some technical limitations regarding eye tracking; the available technology cannot follow the direction of gaze during blinking and does not work for all participants, such as spectacle wearers, the use of strong makeup, dark lashes or excessive tear fluid.

Eye movements can be considered good behavioural indicators to measure visual attention, as they are closely related to higher-order cognitive processes and eye tracking methodology is widespread in consumer behaviour studies, including food packaging analysis.

3.3 Electroencephalography (EEG) / Magnetoencephalography (MEG)

The EEG measures consumer cortical activation by detecting cortical electrical activity using an electroencephalogram (EEG) with electrodes placed along the scalp surface according to the International System (SI) 10-20. The EEG signal measures the activity of areas of the brain and reveals the state of cortical activation of the subject. EEG is only able to detect surface cortical activity, but the EEG signal has a high time resolution in milliseconds, which allows accurate detection of changes in brain activity due to rapid changes in stimuli. An alternative approach, magneto-encephalography (MEG), detects the magnetic field generated by the same neuronal activations and is therefore based on the same principles as EEG. Electroencephalography techniques can be further divided into two subgroups, either by detecting brainwave oscillations or by detecting event-related potentials (ERPs).

Brain wave oscillations are reflected by rhythmic activity in the EEG signal as groups of neurons synchronize their firing patterns. These oscillations are generally divided into frequency bands (alpha, beta, theta and delta). The EEG has been used in studies aimed at marketing incentives to measure various aspects of consumer responses, such as their involvement, the processing of television commercials and to predict whether advertisements will be remembered. The left part of the frontal cortex is part of the circuit involved in experiencing positive emotions, leading to a tendency to approach stimuli perceived as desirable, while the corresponding area on the right is an important part of the circuit involved in processing negative emotions. and in defensive withdrawal from stimuli. Frontal Asymmetry (FAA) is an indicator of the tendency to approach the product when watching different versions of the same TV commercial, identifying the most emotional scenes, but also aims to examine the attractiveness of the product with a special focus on different olfactory aromas.

Although EEG and neuroimaging techniques are costly and it is not possible to collect data from all populations, only a small number of samples are needed to predict consumer behaviour in an independent population when the sample is carefully selected to represent the target population. importantly, these predictions have also been shown to be more accurate than forecasts based on self-assessment measurements and in some cases more accurate than the actual sample behaviour, as these measurements are often unbiased and therefore provide

a more complete and informative measure for marketers compared to traditional classical marketing methods.

3.4 Functional magnetic resonance imaging (fMRI)

Functional magnetic resonance imaging (fMRI) provides insight into blood-oxygen-level (BOLD) signals in the brain. This method assumes that when neurons in specific areas of the brain are activated, they absorb oxygenated haemoglobin (oxyhaemoglobin), followed by a few seconds increase in oxyhaemoglobin, which can be determined by MRI. A key advantage of fMRI is its high spatial resolution (usually 2-3 mm³), which means that active areas of the brain can be labelled in detail with considerable accuracy. Although it is a non-invasive method, it has an acceptable resolution of approximately 2-5 s. Neuroscientific research allows us to create a map of regions and brain networks that are associated with various mental processes. This technique can be used to elucidate the basic brain mechanisms of consumer behaviour. fMRI is used to study a variety of mental processes that include attention, excitement, affect, reward, decision making, and memory, processes that are highly relevant to consumer behaviour.

A growing number of fMRI studies are examining neural correlates of product preferences. The following areas were found to correlate best with consumer behaviour: insula (I) bilateral, amygdala (A) bilateral, medial orbitofrontal cortex (PFC) bilaterally, frontal middle orbital fold and straight fold (gyrus rectus), hippocampus bilateral, lower frontal fold, dorsomedial prefrontal cortex on both sides, dorsolateral prefrontal cortex (DLPFC) on both sides and nucleus accumbens on both sides. The fMRI data suggest that activity in the nucleus accumbens (NAcc) was associated with product preference, while high prices induced activation in the insula (I) and decreased activity in the medial orbitofrontal cortex (PFC). The decision whether to buy at the recommended price was accompanied by higher activity in NAcc and mOFC and the decision not to buy due to the activity of Insula.

3.5 Data acquisition and consumer rights

We described how we can obtain this data and which parts of the brain are the subject of consumer behaviour research. We already perceive the fact that neuromarketing significantly interferes with consumer privacy and can be said to violate the privacy of respondents. Neuromarketing research is carried out either in marketing agencies and their laboratories or at universities in collaboration with medical staff, which is contrary to what the public expects from academics and doctors. In the US, since 2010, it has been criticized that devices for brain neuroimaging activities should be used primarily for treatment and medical research, not marketing. These devices are not meant to help us sell products that a normal person would not even consider in their consumer behaviour.

We were therefore interested in the views of consumer respondents on the promotion of the use of neuromarketing tools in marketing research on consumer behaviour. We conducted research on a sample of 1080 respondents, across all regions of the Slovak Republic. It was therefore a random selection of all age categories and levels of education. We were interested in the dependence between the sex of the respondents and the support of the use of neuromarketing tools in marketing research of consumer behaviour. In order to determine this dependence, we set the hypotheses that we wanted based on the performed chi square test and p - values to either refute or confirm.

H0: Gender does not influence the promotion of the use of neuromarketing tools in consumer behaviour marketing research.

H1: Gender has a major impact on promoting the use of neuromarketing tools in consumer research.

Tab. 1 The result of the Chi square test sex - support for the use of neuromarketing tools in marketing research

Row labels	yes	I do not care	I can't judge	no	Grand Total
man	80	64	232	136	512
woman	128	40	224	176	568
Grand Total	208	104	456	312	1080

Acquired (fo)	yes	I do not care	I can't judge	no	Grand Total
man	80	64	232	136	512
woman	128	40	224	176	568
Grand Total	208	104	456	312	1080

Expected (fo)	yes	I do not care	I can't judge	no	Grand Total
man	98.60740741	49.3037037	216.1777778	147.9111	512
woman	109.3925926	54.6962963	239.8222222	164.0889	568
Grand Total	208	104	456	312	1080

Chi-square test	yes	I do not care	I can't judge	no	Grand Total
man	3.511253561	4.380626781	1.158040936	0.959188	10.00910931
woman	3.165073633	3.948733999	1.043867886	0.86462	9.022295718
Grand Total					19.03140503

r-1	1
C-1	3
Critical value	7.814727903
p-value	0.000269341

Source: own processing

Based on the processing of the chi-square test, we obtained a critical value of 7.8 and the result of the chi-square test up to 19.03, and this value does not fall within the scope, so we must reject the null hypothesis. The null hypothesis tested in this analysis concerns the significance of the localization constant and the correlation coefficient, with the null hypothesis asserting the insignificance of the relevant coefficient and the alternative hypothesis its significance. The P-value for the localization constant is less than 0.05 (alpha), which indicates that the localization constant is statistically significant. alternative hypothesis H1: Gender has a major impact on promoting the use of neuromarketing tools in consumer behaviour marketing research.

With this test, we were able to demonstrate that gender has a major impact in promoting the use of neuromarketing tools in consumer behaviour research, and that the information obtained could improve the supply of products on the market. In this case, women are more open, where up to 31.5% of female respondents answered in a survey that they would support the use of neuromarketing tools. On the contrary, only 17% of men answered positively to support and up to 36.8% of men have a negative attitude towards the use of neuromarketing tools. For women, this percentage is lower and is at the level of 20.2%. Despite everything and a relatively negative attitude towards neuromarketing tools, we can state that a large

percentage of non-support for neuromarketing tools can stem from several reasons. The main reasons include the following:

- lack of information,
- fears of loss of privacy,
- concerns about the misuse of personal data,
- potential danger to humans,
 - from a physiological point of view (physical damage),
 - from a psychological point of view (mental damage),
- concerns about manipulating purchasing decisions.

In order for us to minimize these problems, or rather the differences between the negative attitude of the respondents and the willingness or support of the respondents towards neuromarketing tools, we must take a number of measures. Starting with education and awareness-raising, publishing various available materials and information that will be easily accessible to the public up to the actual implementation of research. We introduced how neuromarketing can help us and what kinds of information we can obtain. However, we cannot neglect the protection of research participants in this part either, and it is extremely important to describe the basics of the ethical approach in research.

3.6 Ethical approach

At the beginning of the whole process, it is important that the research respondents are acquainted with the whole research process and are also aware of the possible risks, if it is necessary to undergo some during the research. The basis of the information provided is informed consent. Each research participant should be clearly and comprehensibly informed before entering:

- the objectives of the specific research,
- potential risks,
- the possibility for the participant to withdraw from it freely at any moment without any consequences, possibly not to participate in it at all.

An important part of the strategy of this ethical approach to research is the absence of influence, leading to the subject deciding to participate in the survey arbitrarily. The rules that should guide the ethical approach to neuromarketing research are:

- Nuremberg Code,
- Declaration of Helsinki
- Convention on Human Rights and Biomedicine,
- UNESCO Declaration,
- NMSBA Code of Ethics,
- Code of Ethics of the International Chamber of Commerce.

The main function of the code of ethics is to regulate the behaviour of a group or individual in relation to ethical standards. The Code of Ethics helps resolve conflict, make decisions and assess what is and what is not ethically correct. It ensures that participants and researchers are fully informed about the purpose of the research. It ensures the anonymity of participants and their data or uses only non-invasive measuring tools. Companies can engage in research

activities solely for the overall ethical purpose. The principles of the Code of Ethics include respect for autonomy, the pursuit of justice, the conduct of good and the avoidance of malice. (Carter, 2017). The Code of Ethics should be revised after a period of time to ensure that the value of ethical standards is adequate for the neuromarketing research industry. Our goal is to acquire data, neuromarketing is the perfect tool for us. Therefore, we must take care of him and not abuse his possibilities.

CONCLUSION

With this article, we tried to point out the possibilities that neuromarketing offers and what information can be obtained thanks to it. It is true that today is very challenging in polarizing society. We see how the company is polarizing the Covid-19 vaccine, it would also be interesting to talk publicly about how we can sell products from neuromarketing research that the customer might not even consider voluntarily.

The paper characterizes the individual neuromarketing tools gradually from eye-tracking, through EEG to fMRI and acquaints the reader with how these methods work and what data we can receive. But we cannot forget the rights and obligations we have towards the consumer-respondent. By adhering to an ethical approach, we build the trust that is lacking in this segment, which we have pointed out through research.

By researching a sample of 1080 respondents, we identified the relationship between gender and the promotion of the use of neuromarketing tools in marketing research on consumer behavior. Based on this research, women are more open to research, where the object of research is their own body, with the proviso that this research can help improve the supply of products on the market. Men are more characterized by a greater distrust of neuromarketing tools. We have identified possible concerns as to what this mistrust may stem from:

- lack of information,
- fears of loss of privacy,
- concerns about the misuse of personal data,
- potential danger to humans,
 - from a physiological point of view (physical damage),
 - from a psychological point of view (mental damage),
- concerns about manipulating purchasing decisions.

There is no doubt about how great a tool neuromarketing can be in improving the product offerings in the market. It is a great tool for collecting data on consumer behaviour, but we must be careful when applying it, and this effort will pay off. In future research, we could focus on which factors affect people the most and therefore make it impossible to obtain information. It will be interesting to compare traditional marketing research and neuromarketing research and identify differences.

Our main limits that accompanied our research include a lack of funds that would motivate respondents to participate more in the survey and, on the other hand, the absence of comparison of results with research using neuromarketing methods - such as eye-tracking. This may be an area of our future research.

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