Neuroscience Research Instruments Used In Neuromarketing

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Abstract

In the field of neuroscience, there is a multitude of research instruments of the human brain which make neuronal mechanisms identification possible. This research is setting its objective to identify which are the main neuronal research tools and to see which is the level of their applicability in fields like neuroscience and neuromarketing. Starting from the concept that a neuronal research instrument can offer an advantage in a marketing campaign, a set of specific objectives has been created: identifying the main research tools in neuroscience (SO1); the applicability of these tools in neuromarketing research (SO2). These specific objectives have the mission to confirm or refute some working hypotheses which have the purpose to determine the importance of using these tools: the efficiency of marketing campaigns is higher by using these tools (H1); neuromarketing campaigns are more efficient when they are realized in a controlled environment (H2). Neuroscience is a vast and captivating study field, with many implications for both researchers and marketers. For sure it has provided a great understanding of how marketing campaigns should be created, but also how to understand consumer behavior, needs, and attitudes of individuals. During this research, it is now clearer than ever that neuroscience instruments are the core of not only future neuronal research but present ones too.

Keywords: neuroscience, neuromarketing, tools, EEG

1. Introduction

In the main text, the mirror-type neuronal system has dominated the understanding of observational learning from the perspective of cognitive neuroscience. Regardless of the action one person manages to learn, the process is always the same, of succeeding in mirroring the action made by another person. Because learning has different processes than inventing, which has its core in imagination, it's important to understand that the activity of mirror-type neurons is very important. This type of learning is very beneficial in most social cases where active participation is not possible. Therefore, observational learning has become an interesting factor for researchers to study in a variety of fields like social psychology and personal development, comparative biology, and robotics.

Most times, in cognitive research, learning through observation processes in cognitive neuroscience has concentrated more on the role of specific brain functions, like mirror-type neuronal systems. This type of study has had incredible importance in the research of learning concepts and memory regarding external factors by realizing specific actions. It has also affected the understanding of what was known and considered as the interaction function and its implications in human behavior (Kaplan, Ramsey, & Cross, 2021).

When it comes to understanding the human brain and consumer behavior, technology has a very important role and is being used more often in recent times. This is exactly how neuroscience is implicated directly because medical instruments, with a psychological approach, are the missing link between human brain theory and marketing concepts.

2. Research instruments in neuroscience: characteristics and importance

Quantitative research which is using the electroencephalogram (EEG)[1] technique can differentiate significantly from clinic EEG analysis by applying mathematical approaches and by scientifical methods supported by computerized technology. Most definitely, processing digital signals has created a new world for all cognitive neuroscience researchers.

This concept of quantitative research using the electroencephalogram characteristics allows the precise measurement in time from where the cognitive process starts to where they end. Analyzing the similitudes between the quantitative signals allows data extraction regarding the creation of information patterns and especially the exchange of neuronal messages. Cognitive research in psychology and especially in the fields with neurobiology applicability take advantage of classical methods.

One of the classical methods regarding quantitative research by using EEG in cognitive neuroscience is represented by the technique of common potential (ERP)[2]. The results of such research are obtained through repeating the same stimuli and measuring the brain response which is blocked, locked, and focused over that specific external factor or stimuli. The computerized interface of the human brain has its base in P300, an ERP component that reacts very fast now in which the external factor is activated to capture attention.

Electroencephalogram (EEG), as a research method, represents a set of specific work advantages. The first one is represented by its design, the fact that is portable has incredible applicability. However, market research could be better conducted by using other

[1] EEG represents a test that detects electric brain activity. On top of the human scalp is attached a set of electrodes that can detect the communication between the electric impulses of brain cells. This type of communication is represented graphically through lines in waves

[2] ERP represents the measurement of human brain answer potential which is directly resulted from specific events of sensorial, cognitive or motor type

technologies which use magnetic functional imagistic (fMRI)[3] or through magnetoencephalography (MEG)[4]. Even so, the EEG devices have been often criticized for not offering clear images when the experiments were conducted in uncontrolled environments.

An analysis of the power specter of reaction against the cognitive stimuli (number of senses, attention, memory, executive functions) has presented the fact that significant effects can be registered by using any of these techniques, if the surrounding environment is a controlled one, just to be sure that any type of external factors that could affect the person concentration is eliminated.

Another advantage of the EEG is that it can't produce a negative reaction or harm the patient, like in the case where it is used to research the cognitive process of children or infants, where the physical electrodes or helmets could injure the child. Researcher Lang has realized two studies on a group of newborns of age 2-5 weeks. With realizing these studies, he has concluded that brain activity is different when infants hear the maternal voice instead of a stranger's voice. However, prenatal born infants do not present special brain activity in response to the maternal voice. Only after the maternal voice is being repeated for a period, the infant will start the learning process and the new learned maternal voice will become a sound of calmness.

The electroencephalogram research combined with cognitive actions has formed cognitive neuroscience and it has been connected tightly with understanding the decision-making process. With certainty, these are still challenges of quantitative research by using the EEG technique because if it is not invasive, then is inconclusive and if it does get to be invasive then it is not practical to be applied to big groups of people (Holler, 2021).

Software errors represent the biggest problem in data extraction. Regardless of the decades of technology research and advances in software engineering, the number of malfunctions per 1000 EEG products has been quite high. Steve McConnell was signaling the fact that in 2004 it was possible to register around 15 flaws per 100 EEG analyses, a very high deviation standard (Mcconnell, 2004).

However, even by keeping the visible limitations, the electroencephalogram has become a very powerful instrument, while the software bugs and errors have decreased significantly. The complexity of metrics which is generated by the software is represented by a series of codes that allows analyzing and interpreting the results of all the scanning. In all marketing-

[3] Is a non-invasive imagistic technology which can produce three dimensions by creating anatomic images. This technology of scanning and photographing the human brain is also used for detecting illness and tracking an illness

[4] Is a functional neuro-imagistic functional technique for mapping the brain activity by recording the magnetic areas created by the electric currents in the human brain

applied EEG experiments, the technique with electrodes on the top of the human scalp is used. The signals which are recorded here are represented by the activity of the pyramidal neurons which, when activated, are producing waves of microvolts. For interpretation, the EEG signals are often coming under the image of five main band wave frequencies: Delta, Teta, Alpha, Beta, and Gamma. These band waves exist in their simplified form because the Alpha and Teta bands present various subtypes (Medeiros, et al., 2021).

The dynamic evolution of medical, biological, chemical, technological, or psychological sciences has led to the creation of what we now know as cognitive neuroscience which integrates many scientifical problems like cognitive and psychological processes or anatomy. Even if the most popular instruments of cognitive research are the EEG or MRI, in cognitive neuroscience there are other tools like the galvanic skin response (GSR)[5] or electromyography (EMG)[6].

Measurement techniques that are focused on neuroscience are more open to errors which makes them more objective. These tools allow for the information to be gathered, stored, and discovered in the brain region in which the information has been created in the form of opinions or thoughts.

During this research, while studying the core aspects of the two specific objectives, the neuroscience tools are of great importance to both neuromarketing and marketing experiments and market research. The first specific objective has been completed while demonstrating that tools like electroencephalogram exist in neuroscience as the main research instrument. Following this step, the hypotheses have been confirmed fully. While is clear that if a researcher understands the consumer behavior and purchase attitude, the efficiency of a campaign is higher. Also, it has been proven that these instruments work best in a controlled environment. An area that is affected by external factors can produce inaccurate or completely wrong data.

3. Conclusions

Neuroscience is a vast and captivating study field, with many implications for both researchers and marketers. For sure it has provided a great understanding of how marketing campaigns should be created, but also how to understand consumer behavior, needs, and attitudes of individuals. During this research, it is now clearer than ever that neuroscience instruments are the core of not only future neuronal research but present ones too.

[5] GSR is a feedback type of instrument which measures the skin conductivity from the palms or fingers. It is also very sensitive to emotions for some people

[6] EMG measures muscle response or electric activity which comes when a nerve or muscle are stimulated.

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