# The neuroconsumer: a narrative review of the literature in light of mental and emotional patterns

## El neuroconsumidor: una revisión narrativa de la bibliografía a la luz de los patrones mentales y emocionales

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**ABSTRACT**

**Introduction:** the innovations that occur at the technological level have caused various transformations in which the evolution of scientific work has been creating various areas of knowledge that address the problems of human beings from different angles. In the organizational field, the studies have stood out in what concerns innovation of products and services without detracting from the arguments in favor of knowing the real needs of the consumer, as mental processes that significantly support the various behaviors of this. **Methodology:** Narrative review of the literature on the neuroconsumer, to reveal the sense of the mental patterns of this one, based diachronically on the neuroscientific knowledge. A scientific mapping of documents on the neuroconsumer, brain dynamics, and emotions, period 2017-2022 in high-impact indexed journals: Scopus and Web of Science, was performed. The referenced structurally describes the bibliography, finding thematic axes. **Results:** The review evidences the link between marketing which is part of neuroeconomics and neuroscience as a novel vision that addresses the analysis of consumer behavior more deeply in the purchase decision process. **Discussion and Conclusions:** Two clusters were identified from the networked understanding: consumer behavior and emotions created in the brain. The interpretation of the findings highlighted the relevance of brain dynamics to the "hidden psychological traps" in making a decision and in the choice of a product or service. There is no evidence of research in this regard, only those linked to neuromarketing.

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**Keywords:** Neuromarketing; Neuroscience; Neuroconsumer; Emotions; Biases; Decision-making; Behavior.

**RESUMEN**

**Introducción:** las innovaciones que a nivel tecnológico ocurren han ocasionado diversas transformaciones en las cuales, la evolución del hacer científico viene creando variadas áreas del saber que abordan los problemas del ser humano desde diferentes aristas. En el ámbito organizacional, los estudios se han destacado en lo que atañe a innovación de productos y servicios sin desmerecer los argumentos a favor de conocer las verdaderas necesidades del consumidor, a manera de procesos mentales que sustentan significativamente los diversos comportamientos de este. **Metodología:** Revisión narrativa de la literatura sobre el neuroconsumidor, para **revelar** el sentido de los patrones mentales de este, fundamentado diacrónicamente en el saber neurocientífico. Se realizó un mapeo científico de documentos sobre el neuroconsumidor, la dinámica cerebral, y las emociones, **periodo 2017-2022** en revistas indixadas de alto impacto: Scopus y Web of Science. Lo referenciado describe estructuralmente la bibliografía, encontrándose ejes temáticos. **Resultados:** La revisión evidencia el vínculo entre el marketing que forma parte de la neuroeconomía y la neurociencia como una novedosa visión que aborda el análisis del comportamiento del consumidor de manera más profunda en el proceso de decisión de compra. **Discusión y Conclusiones:** De la comprensión en red se identificaron dos clústeres: el comportamiento del consumidor y las emociones creadas en el cerebro. La interpretación de los hallazgos destacó la relevancia de la dinámica cerebral las "trampas psicológicas ocultas" al tomarse una decisión y en la elección de un producto o servicio. No se evidencian investigaciones al respecto, solo las vinculadas al neuromarketing.

**Palabras clave:** Neuromarketing; Neurociencia; Neuroconsumidor; Emociones; Sesgos; Toma de decisiones; Comportamiento.

Translation by **Paula González** (Universidad Católica Andrés Bello, Venezuela)

## 1. Introduction

Neuromarketing is cataloged as the discipline in charge of studying and researching the aspects related to the behavior of the brain when faced with different stimuli, the consumer's memory, their emotions, the way they behave at the point of purchase, and how the senses affect decisions. It is worth noting that this methodology makes this discipline better known at a scientific level and in the economic field in which brands and business organizations try to incorporate and retain their customers.

Nowadays, there are more and more stimuli coming from the consumer market, so people are facing a constant challenge to make the best decision when it comes to choosing a brand, a product, or even a service. Considering the number of stimuli that are presented in daily life, the need to know the consumer's mind, their deepest desires to satisfy, as well as the link between the 5 senses and their behavior at the time of making a decision and recognize those factors that generate a consumer decision (Illusion, Emotion, Trust in the brand, etc.) is born.

According to the above, it is necessary to point out that over time neuromarketing has been the subject of much interest by marketing specialists, however, since its appearance, it has some critical aspects that have been little examined; for example, what it is, what it includes, and how to use. Such is the case that certain alleged dangers of neuromarketing have been made known, among which is the concern that advertisers can get a "buy button" or a "magic spot" in the brain (Blakeslee, 2004; Thompson, 2003). It is worth noting that Neuromarketing appeared as a novel approach that allows consumer

behavior to be analyzed, based on the thorough exploration of the mental processes occurring at the time of decision-making (Tenorio-Vilaña and Mideros-Mora, 2022; Segovia, 2021). Knowing what is wanted, the behavioral patterns, emotions, and the way of reacting to different scenarios shown in traditional marketing have allowed the development, since the 1990s, of research and methods carried out by neuroscience and neuropsychology, allowing an approach to the secret of a successful advertising campaign. Likewise, this discipline finds its foundation in different areas of knowledge, for example, economics, psychology, sociology, exact sciences, and anthropology; due to this union between neurosciences and neuropsychology, Neuromarketing appears (Mejías et al., 2022).

Given the above, it is important to highlight the fact that human beings are faced daily with an endless number of decisions, some of them as trivial as choosing the shoes to wear that day (color, type, etc.), others much more important, for example, whether or not to change jobs. However, what are the brain mechanisms that lead the person to make such decisions? Why is one alternative chosen and not another? Usually, when you ask the person what are the reasons for making a decision, they will explain in a logical and reasoned way the advantages of their decision and/or the disadvantages of not choosing it. Most human beings make decisions in everyday situations instantaneously and justify such decisions a posteriori, based on their beliefs. This does not indicate that they are lying; since this process is normal, this happens because the brain makes decisions in milliseconds without the subject being fully aware of it (Manzano et al., 2018; Sarmiento-Rivera and Ríos-Flórez, 2017; Baños-González et al., 2020). Now, for this to occur, it is necessary that the person's emotions intervene, evidencing how they impact the individual's behavior (Damasio, 2003).

From the consideration that the human being is constituted as an emotional entity capable of reasoning, research on neuromarketing or also known as consumer neuroscience is born (Barrera et al. 2021); it seeks to adjust the theories and methods of neuroscience by combining them with the theories and methods of marketing and related disciplines (such as economics and psychology) in this way generating "neuroscientific explanations of the impact of marketing on the target customer behavior" (Duque-Hurtado et al., 2020; Mañas-Viniegra et al., 2019; Lim, 2018). It also makes it possible to identify the "rational and emotional processes... that affect the neural systems underlying a wide range of human behaviors, from perception and cognition to emotion, social cognition, and decision-making" (Zambrano, 2020); and with its help, it is possible to "understand how the brain works through mental processes"; these enable it to perceive, act, and make decisions, especially when purchasing a product (Palma et al. 2021; González, 2021). These approaches are supported by the assertion that neuroscience, and specifically neuromarketing, seeks to answer how the brain takes in, integrates, and can process any information received (Mejías et al., 2021).

What is important to highlight at this point is that, if there is a mystery that marketers particularly want to know, it is what happens in the brain of each consumer at the moment of choosing one brand over another. Consequently, understanding and analyzing how a consumer behaves would allow them to properly develop a product so that the consumer's real needs and desires are satisfied. In a market where there is a diversity of products, emotions drive decision-making. The more senses that are stimulated by a product, the more emotions will appear in buyers, influencing their purchasing decisions. The American neuroscientist, Joseph Ledoux states:

> The human brain contains about ten billion neurons that are connected in very complex ways. Although the electrical sparks and chemical changes that occur between these cells manage to perform some surprising and complicated functions, the most surprising and complicated feat is the creation of emotions (Ledoux, 1999).

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## 2. Objectives

To theoretically reveal the mental and emotional patterns of the neuroconsumer based on neuroscientific knowledge.

To describe the elements associated with the mental and emotional patterns present in the neuroconsumer.

## 3. Methodology

Based on the qualitative paradigm, an interpretative approach with a documentary design aligned with the purpose of the study leads to the epistemological approach and thus, unveiling the meaning of the mental patterns of the neuroconsumer, based on the neuroscientific knowledge in a diachronic way, from a theoretical review based on the process involving the neuroconsumer, emotions, and brain dynamics, as a phenomenon. The bibliographic method was assumed, which according to Barbosa and Urrea (2018), involves "the construction of knowledge, likewise systematizes objectively and methodically the empirical studies published on a given research topic" (p. 145); in correspondence with the documentary research supported by a review of the theoretical material related to the object of study to locate, identify, and access the documents that safeguarded the research from its epistemethodic relevance.

Given the above, as a research technique, it was based on the documentation with relevant and updated content regarding the subject matter, as well as orienting the research aligned with its scientific essence, the documentary support, and, likewise, the information contained in the text (Rojas, 2011). As a documentary exploration technique, the background review, bibliographic or documentary research was assumed (Martín and Lafuente 2017). Similarly, scientific articles related to the topic from the literature review and their affinity with the object of study were considered units of analysis. Also, concerning the procedure, digital documentary archives were collected to examine the content for the preparation of the article and the construction of a theoretical corpus on the addressed phenomenon. For this purpose, a scientific mapping was performed, which according to Zupic and Cater (2015) involves five bibliometric strategies to carry out the study of production, co-authorship, co-occurrence of words, co-citations, bibliographic coupling, and citations; for which only what refers to the co-occurrence of words and citations was estimated. Likewise, books, sources such as articles from indexed journals, located at first through electronic platforms in the Scopus, Scielo, and WOS databases, selected with defined criteria of inclusion and exclusion, were evaluated, using a filtering technique, with inclusion referring to the language (Spanish and English), and exclusion of articles for which there was no access to the full text. A total of 150 articles were obtained from the following databases: Scopus and Web of Science; in a time frame that covers a period from 2017 to 2022. This is because a greater number of articles were found on the aforementioned subject, 30 of them being considered representative in percentage terms. Regarding the topic, 66.66% were located in English and 33.33% in Spanish (Figure 1), from which it is deduced that journals and researchers publish in these languages so that a better visualization is generated (Vera et al., 2019). Seen in this way, regarding the legitimacy of documentary analysis understood as the main method for obtaining information, Sandoval (2002) comments "it is appropriate to point out that documents are a reliable and practical source for revealing interests and perspectives for understanding reality" (p.138). The search criteria are shown in Table 1.

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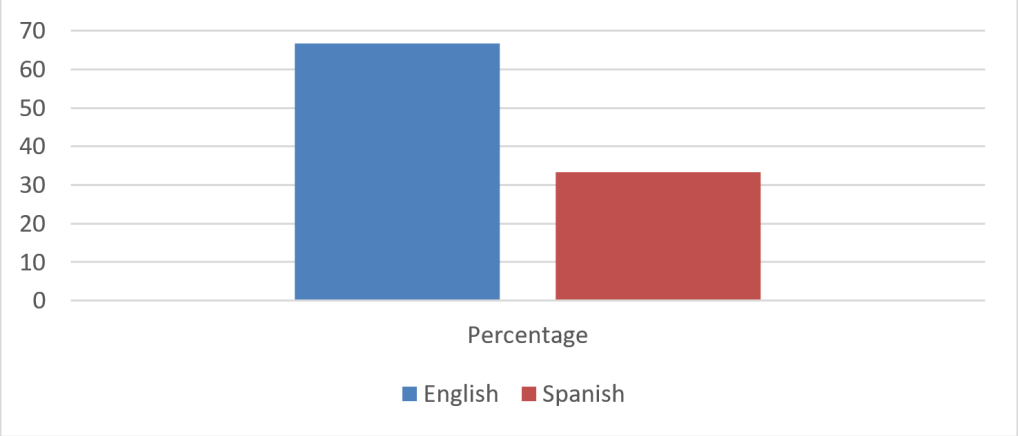
**Figure 1.** *Reviewed articles.*




**Source:** Own elaboration.

**Table 1.** *Search criteria.*

| Filters | Database | |
|---|---|---|
| | **WOS** | **Scopus** |
| **Search** | Title, abstract, author's keywords | Title, abstract, keywords |
| **Period** | 2017-2022 | |
| **Type of document** | Articles | |
| **Journal type** | **Q1, Q2 & Q3** | |
| **Languajes** | **Spanish and English** | |
| **Total per database** | **150** | |
| **Total number of documents** | **30** | |

**Source:** Adapted from Duque-Hurtado et al., 2020.

## 4. Results

### 4.1. Neuroscience: a complementarity perspective

Current neurobiological research on behavior encompasses the existing boundaries between the mind and neurons. There is a natural interest in how the molecules responsible for the activity of nerve cells are related and thus, the complexity of each mental process (Posner and DiGirolamo., 2000). Such

studies of the brain, the nervous system, neuronal circuits, and the intervention of limbic-thalamic activities have helped to understand the cognitive processes of human beings. As a result of such research, it was discovered that the psychological characteristics and the mental processes generated could be understood by studying the brain, which produces higher functions and generates knowledge.

From the above, it follows that neurosciences make up a group of sciences and scientific and academic disciplines responsible for studying the nervous system, focusing on the brain and its link with behavior (Gago and Elgier, 2018). Likewise, it represents a very new area as it originated beginning in the 1960s, examining behavior and its neurobiological elements; all based on cognitive psychology, linguistics, anthropology, and artificial intelligence, among others. Similarly, from this, various areas of knowledge linked to "neurobiology, neurophysiology, neuropsychology, neurochemistry, neuroanatomy, neuromarketing, neuro leadership, neuroeconomics, neuromanagement, neurogenetics, computational neuroscience, among others" can be identified (Leopoldo and Joselevitch, 2018).

This is how this science highlights that curiosity is maintained by emotions and that these, in turn, when positive, enable memory and learning (Barrios et al., 2020). The hippocampus is activated by these emotions, because it is linked to memory and learning, allowing it to better anchor the knowledge obtained since it creates emotional memories, with the amygdala intervening in this process (Ledoux, 1999). This can be observed when in different cognitive tasks, neuronal areas work together to form a neuronal circuit in which some of them are activated at specific times to perform the required cognitive calculations in the appropriate order of the task demands (Posner and DiGirolamo, 2000).

Besides all that has been pointed out and concerning the topic addressed, Neuroscience contributes with a new approach as it manages to examine each process linked to decision-making, which is usually performed unconsciously. The introduction of its principles in the study of the consumer as a discipline has contributed to understanding the requirements of consumption that are currently evident, since in the motives of purchase aspects related to emotions, subconscious desires, and feelings that guide every decision made by people throughout their lives arise (Jurado, 2020; Baraybar-Fernández et al. 2017). At this time, scientists bring together in their postulates the primordial mental processes, which are classified into: conscious and unconscious; the latter are involuntary, effortless, quite fast, and capable of being generated at any time (Garcia, 2020). Neuroscience and economic theory manage to coincide to discern how each consumer decides, to understand how to sell a product or service, according to the level of consumer behavior.

### 4.2. Neuromarketing: a multidisciplinary approach

This discipline is the application of the neuroscience method to the study of traditional marketing (Crespo-Pereira et al., 2020). Due to the need to execute such techniques to innovate, it is among the best tools that advertising agencies and their professionals must handle to be successful in the labor market. It is worth noting that its applications are quite varied, however, it began by analyzing consumers' brain and emotional reactions, using some scientific technologies to measure the impact of certain products and their packaging designs to know how these elements influenced the consumer at the time of making a decision and their behavior during the purchase decision. In this sense, the research carried out in this field is based on studying what happens in the customer's mind and their brain reactions, as well as the processes of which they are not aware. This is how it establishes the results in front of the stimuli to which they have been exposed, and already examined.

Considering the above, it can be said that neuromarketing is at the forefront since it examines the brain processes capable of explaining how people behave and make decisions. Such operations include all the areas in which traditional marketing operates (Izaguirre-Torres et al., 2020; Cherubino et al., 2019);

likewise, it includes product and service sales management. Currently, it is a fundamental tool for business development and innovation, its applicability allows brain processes to be analyzed, which helps to understand the actions of consumers; demonstrating that the behavior of customers before a brand is more associated with emotions than with reasoning (Rodriguez-Orejuela et al., 2020; Jurado, 2021). Its importance as a science lies precisely in the fact that it helps to reveal that the person or buyer proceeds irrationally and their decisions come from unconscious processes (Baños and Baraybar 2022; Rodríguez-Orejuela et al., 2020); this is why it is known that consumers and customers are emotional and are dominated more by feelings than by reasons.

It is noteworthy that Neuromarketing presents a little-known area in which some debates have been held, it is the element called the "buy button in the brain" (Guerra and Gomes-Franco, 2017; Gutiérrez, 2019). This expression arose to explain that there is a brain area that when activated would generate a consumption behavior, perhaps without the person being aware of what they are doing. Based on the above, it is important to explain that the human brain works as a command board because it has cells that are activated when conscious and unconscious mental processes occur; each of the parts that integrate it has specific functions and through it, an individual makes decisions and can interact with their environment (Gavilán and Avello, 2020). This is how their reality is following what their brain perceives and internalizes. Neuroscience is useful in neuromarketing to explain which parts of the brain are connected to consumer behavior and which also give them the possibility of choosing a product or a certain brand (Baños and Baraybar, 2022; Duque-Hurtado et al., 2020).

Knowing a methodology such as the one provided by neuromarketing about brain and emotional processes allows an approach to any consumer, through the design and materialization of some particularities that consolidate the value of a brand, this increases preferences, purchase intentions, and willingness to pay (Salas, 2018; Cenizo, 2021). This is possible when the zones that are activated when a person knows a propitious brand are identified since it allows recognizing those characteristics that generate acceptance and rejection. This process is beneficial since the purchase decision is the result of the fit generated by the offer (Agustín et al., 2021). Because of the above, it is evident that the internal and metaconscious processes acquire greater preponderance when analyzing consumer behavior. In addition, this discipline helps to recognize what motivates a purchase, compared to the usual market research techniques; the fact that it focuses on unconscious patterns of behavior and purchase decision-making ratifies that the consumer does not proceed rationally and that any of their choices respond to the level of bonding that a business organization achieves with its clientele (Mendoza et al., 2018; Arrufat-Martín et al., 2022).

Last but not least, the senses also constitute elements of great value for neuromarketing since they are specifically located in the brain, have special characteristics, and are indispensable for the generation of different sensory responses, which help perception and other higher processes, as well as the generation of emotions and feelings (Guambo et al., 2020; Balconi et al., 2021). To effectively create perceptions and behaviors in consumers and stimulate their senses, brands create different sensory signatures. These can be categorized as a sound, a smell, or something visual associated with the design that differentiates one brand from another; consequently, the impressions of the senses generated in those individuals involved in an event will possibly be the secret that leads to strengthening a memory, thus resulting in a purchase decision.

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**Table 2.** *Scientific articles are associated with the top quartiles.*

| Authors | Year | Title | Keywords | Quartile | Journal | Data base |
|---|---|---|---|---|---|---|
| Arellano, F.J., Moreno del Pozo, G. Culqui, C. & Tamayo, V. R. | 2021 | Brain language processing from the perspective of neuroscience and psycholinguistics. | Neuroscience, psycholinguistics, Broca area, Wernicke area, language. | Q2 | Revista de Ciencias Sociales | Scopus |
| Arrufat-Martín, S. Rubira-García, R. Gomes-Franco e Silva, F. & Venet-Gutiereez, J. | 2022 | Neuromarketing as an object in Communication as an academic field in Spain: an approach to its study within doctoral theses. | Neuromarketing; neurocommunication; object of study; meta-analysis; academic field; doctoral theses. | Q2 | Icono 14. Journal Científica de Comunicación y Tecnologías Emergentes. | Scopus |
| Alsharif, A. H. Salleh, N. Baharum, R. Abuhassna, H. & Hashem, E. | 2022 | A global research trends of neuromarketing: 2015-2020. | Bibliometric analysis; PRISMA; neuromarketing; consumer neuroscience; Scopus database. | Q2 | Journal de Comunicación | Scopus |
| Alsharif, A. Salleh, N. Baharum, R. & Alharthi, R. | 2021 | Neuromarketing research in the last five years: a bibliometric analysis | Marketing; Marketing Research; Consumer Behaviour | Q2 | Cogent Business & Management | Scopus |
| Izaguirre-Torres, D. Málaga-Juárez, J. Chuqui-Diestra, S. Velásquez-Cosi, P. Siche, R. | 2020 | Neuroscience in the advertising of agri-food products: A beneficial tool or a public health hazard? | Neurociencia, electroencefalograma, neuroeconomía, neuroética, salud pública, comportamiento del consumidor, consumismo. | Q3 | Scientia Agropecuaria | Scopus & Scielo |
| Baraybar-Fernández, A. Baños-González, M. Barquero-Pérez, O. Goya-Esteban, R. De la Morena-Gómez, A. | 2017 | Evaluation of Emotional Responses to Television Advertising through Neuromarketing | Neuromarketing, marketing, market research, efficiency, advertising, commercial, memory, emotion. | Q1 | Comunicar | Scopus |
| Hakim, A. and Levy, D. | 2018 | A Gateway to consumers' minds: Achievements, caveats, and prospects of electroencephalography-based prediction in neuromarketing. | Consumer neuroscience, EEG, neuromarketing, prediction. | Q1 | Wiley. WIREs Cogn Sci | Scopus |
| Uma, R. Karmarkar and Hilke, P. | 2019 | Consumer Neuroscience: Past, present and future. | marketing, neuroscience, consumer neuroscience, consumer behavior, decision neuroscience, neuroeconomics. | Q1 | Organizational Research Methods | Scopus |

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|---|---|---|---|---|---|---|
| Cherubino, P., Martínez-Levy, A., Caratú, M., Cartocci, G., Di Flumeri, G., Modica, E., Rossi, D., Mancini, M., & Trettel, A. | 2019 | Consumer Behaviour through the Eyes of Neurophysiological Measures: State-of-the-Art and Future Trends. | | Q1 | Hindawi Computational Intelligence and Neuroscience. | Scopus |
| He, L. Freudenreich, T. Yu, W. Pelowski, M. & Liu, T. | 2021 | Methodological Structure for Future Consumer Neuroscience Research. | Brain network, consumer neuroscience, methodological structure, multibrain paradigm | Q1 | Psicología & Marketing | Scopus |
| Joanne, M. Harris, J. and Gountas, J. | 2019 | Consumer Neuroscience and digital/social cause advertisement effectiveness. | Consumer neuroscience, neuromarketing, EEG, public health digital/social media advertisements, social marketing, advertising effectiveness, action/challenge/emotion-based marketing, behavioural change. | Q1 | Behavioral Sciences | Scopus |
| Constantinescu M, Orindaru A, Pachitanu A, Rosca L, Caescu S-C, Orzan MC | 2019 | Attitude Evaluation on Using the Neuromarketing Approach in Social Media: Matching Company's Purposes and Consumer's Benefits for Sustainable Business Growth. | Neuromarketing; social media; sustainable communication; quantitative marketing research. | Q1 | Sustainability | Scopus and Wos |
| Spence, Ch. | 2019 | Neuroscience-Inspired Design: From Academic Neuromarketing to Commercially Relevant Research | Neuroimaging, neuroergonomics, neuromarketing, neurogastronomy, neuroscience-inspired design. | Q1 | Organizational Research Methods | Scopus |
| Zuschke, N. | 2020 | An analysis of process-tracing research on consumer decision-making. | Consumer decision-making Process-tracing Bibliometric analysis Eye tracking Consumer neuroscience Verbal protocol. | Q1 | Journal of Business Research | Scopus |
| Cenizo, C. | 2021 | Neuromarketing: concept, historical evolutionand challenges. | Advertising; decision making; consumer; neuromarketing; neuroscience; marketresearch. | Q2 | Revista Icono 14. Revista Científica de Comunicación y Tecnologías Emergentes. | Scopus |
| Baños-González, M. & Baraybar-Fernández, A. | 2022 | Cognitive Science and Neuromarketing:Academic Research, Emerging Technologies andProfessional Challenges. | Neuromarketing; advertising; persuasion; emotions; advertising research; neurocommunication. | Q2 | Revista Icono 14. Revista Científica de Comunicación y Tecnologías Emergentes. | Scopus |
| Sánchez-Fernández J, Casado-Aranda L-A, Bastidas-Manzano A-B | 2021 | Consumer Neuroscience Techniques in Advertising Research: A Bibliometric Citation Analysis. | bibliometric research; consumer neuroscience; advertising research; emerging trends; neuroimaging tools; consumer behavior. | Q1 | Sustainability | Scopus |

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|---|---|---|---|---|---|---|
| Levallois, C. Smidts, A. & Wouters, P. | 2019 | The emergence of neuromarketing investigated through online public communications (2002–2008). | Neuromarketing, university-industry relations, World Wide Web, neuroeconomics, digital humanities. | Q1 | Business History | Scopus |
| Abadie, M., & Waroquier, L. | 2019 | Evaluating the Benefits of Conscious and Unconscious Thought in Complex Decision Making. | Decision making, unconscious thought, conscious thought, gist memory, verbatim memory. | Q1 | Policy Insights from the Behavioral and Brain Sciences | Scopus |
| Alsmadi, S., & Hailat, K. | 2021 | Neuromarketing and Improved Understanding of Consumer Behaviour Through Brain-Based Neuro Activity. | Neuromarketing, consumer behaviour, brain activity, neuroscience. | Q3 | Journal of Information & Knowledge Management | Scopus |
| Zúñiga, I., Colom, A. & Fransi E. | 2022 | Family Agrarian Neuroeconomics: Application of the Hierarchy of Emotional Neural Patterns in the Alpaca Fiber Sector and Native Potatoes in Peru. | Social economy, neural networks, sustainable agribusiness, holistic innovation. | Q2 | Economía Agraria y Recursos Naturales | Scopus |
| Šimi´c, G., Tkal˘ci´c, M., Vuki´c, V., Mulc, D., Špani´c, E., Šagud, M., Olucha-Bordonau, F. E., Vukši´c, M. R., & Hof, P. | 2021 | Understanding Emotions: Origins and Roles of the Amygdala. | Amygdala; anxiety; emotion; evolution; fear. | Q2 | Biomolecules | Scopus |
| Rodríguez-Cruz & Pinto, M. | 2018 | Information use model for the strategic decision making in information organizations. | Strategic decision. Information use model. Information processes. Managerial processes. Strategic decision-making. | Q1 | Transinformação | Scopus |
| Posadzy, K. & Hausfeld, J. | 2019 | Tracing risky decisions for oneself and others: The role of intuition and deliberation. | Decision making for others, risk preferences, decision noise, dual-process theory, eye-tracking. | Q1 | Journal of Economic Psychology | Scopus |
| Lim, W. M. | 2018 | Demystifying neuromarketing. | Neuromarketing Neuroscience Marketing science Marketing theory Marketing practice. | Q1 | Journal of Business Research | Scopus |
| Kaufmann, L. Wagner, C., & Carter, C. | 2017 | Individual modes and patterns of rational and intuitive decision-making by purchasing managers. | Behavioral supply management Rationality Intuition Taxonomy Supplier performance. | Q1 | Journal of Purchasing and Supply Management | Scopus |
| Karmarkar, U.R., & Plassmann, H. | 2019 | Consumer Neuroscience: Past, Present, and Future. | Marketing, neuroscience, consumer neuroscience, consumer behavior, decision neuroscience, neuroeconomics. | Q1 | Organizational Research Methods | Scopus |
| Gutiérrez Cárdenas, G. | 2019 | Neuromarketing, as an effective tool for education in sales and advertising. | Neuromarketing, Communication, Education, Sales, Advertising. | Q1 | Revista Latina de Comunicación Social | Scopus |

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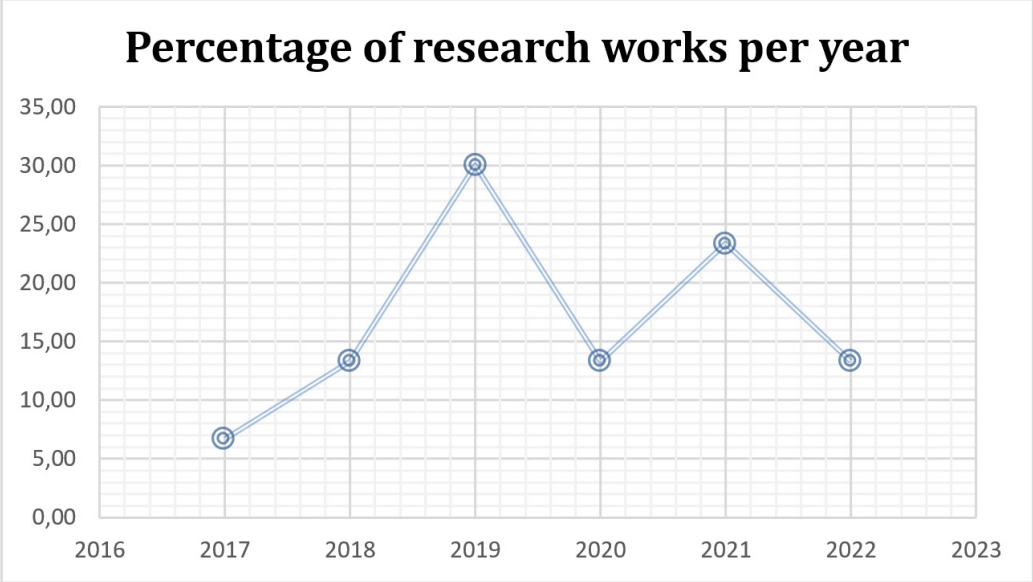
|---|---|---|---|---|---|---|
| Grayot, J. D. | 2020 | Dual process Theories in Behavioral Economics and Neuroeconomics: a Critical Review. | | | Rev.Phil.Psych | WOS |
| García García, E. | 2020 | Neuroscience, Humanism and Posthumanism. | Neuroscience; humanism; transhumanism; posthumanism; brain; mind; culture. | Q3 | Logos. Anales del Seminario de Metafísica | Scopus |

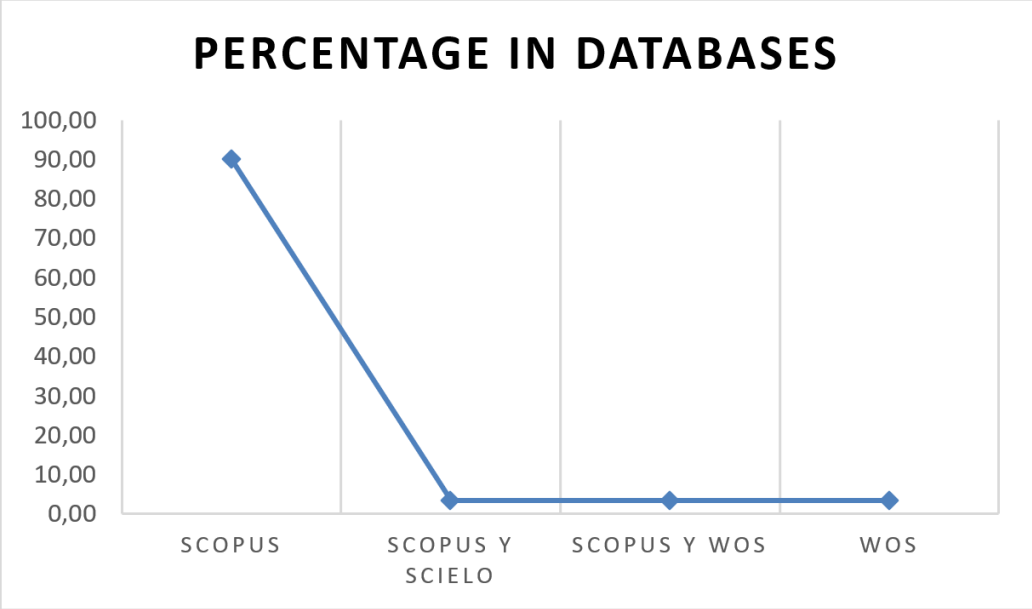
**Source:** Own elaboration.

**Figure 2**. *Percentage of research works per year.*




**Source:** Own elaboration.

**Figure 3**. *Percentage in databases.*




**Source:** Own elaboration**.**

### 4.3. Perception and recall: Neuroconsumer and decision making

The consumer's buying process, regularly, can be understood as a series of steps developed continuously, which lead to a final decision, converted into a purchase. Now, for this to become a reality, this process must go through some stages; different proposals in this regard point them out as awakening, locating what is needed, gathering information and treatment, formulating and executing the choice, as well as evaluating the results (Dubois and Rovira, 1998; Tremblay et al., 2017). It should be emphasized that such a process represents a set of relationships and actions that currently challenge researchers on the subject since it is important to assess both internal and external factors in the consumer purchase process itself. It is significant to emphasize internal factors and emotions as a fundamental element of marketing and from an updated approach constituted by neurosciences, not meaning that it represents the only aspect capable of influencing the final decision of consumers.

Neuroscience intervenes in a relevant way to explain discoveries related to consumer decisions and how such findings can be integrated into different areas of knowledge, for example: neuropsychology, neuroethics, neuromarketing, and neurophilosophy, among others. By combining these approaches, neuroeconomics is born, becoming a new discipline responsible for studying decision-making, which also seeks to apply knowledge about the human brain and its functioning to the field of economics. Now, within neuromarketing, the perceptual process according to which the person creates a very particular reality is studied in great detail. Perception is a process through which a subject chooses, organizes, and interprets stimuli to understand the surrounding reality (Muñoz-Querales et al., 2020). Neuromarketing seeks to understand what happens in that process, its analysis is quite profitable when performed at the level of the senses because they act as receptors of information about the environment (Spence, 2019).

The interesting part of the topic is located in knowing how the nervous system works because it provides very useful knowledge at the time of understanding what the consumer experiences regarding their emotions. Many research studies seek to explain consumption habits, and reactions to advertising stimuli, among others; but it should be noted that in the information collected, the consumer's conscious reality is revealed in a preponderant way, however, in the same way, a highly significant element present in consumer decisions is subjective, which in a variety of situations does not obey the rationality pointed out in different studies.

Now, to understand this process, neuroeconomics has appeared during the last decade and has gained a foothold among the neuro disciplines as it seeks to understand the neurobiological basis that determines the neural processes involved or that intervene every time decisions are made (Zúñiga et al., 2021; Trejos-Salazar et al., 2021; Grayot, 2020), thus, both neuroeconomics and decision making are very relevant aspects in consumer theory. The decision to purchase a product or service begins long before the purchase, generating a subsequent consequence; in this process, economic, learning, psychological, and sociological elements are intertwined, psychological mechanisms that influence economic behaviors, starting from preferences, choices, and decisions made linked to the satisfaction of needs (Thaler, 2016). Then, consumer behavior manages to be understood as the internal and external reaction of the customer recorded at the moment they try to satisfy their needs with goods and services. Such factors can be cultural, social, personal, and psychological (Kotler and Keller 2012).

Now, decision-making represents a process characterized by its dynamism, which allows selecting among different alternatives and in certain circumstances the most convenient one, considering how future actions will be affected (Rodríguez-Cruz and Pinto 2018). Considering the above, it can be established that when a consumer reason and decides to make a purchase, their predominant cognitive functions are linked to memory, learning, attention, motivation, and emotions, its duration obeys the importance of the purchase. Hence, the person places their emotions in the first place when they want to buy or acquire a product; emotions have a significant impact when prices are set and perceived, some studies have shown that a person proceeds more emotionally because when a price is set they opt for the cheapest; however, when the product is presented with certain more attractive features, their decision about the price is increased by the simple emotional pleasure of having it because they believe that the product is exclusive or that it is a renowned brand (Forero and Duque 2014; Forero-Casas et al., 2016).

Furthermore, and related to the above, there are more concrete contextual influences, which consider the usefulness of the product, for example: the purchase price, size, performance, and the costs it incurs. There are also aspects associated with image -for example, color- and status -the brand-, which are related to normative and identity elements (Bonales and Mañas-Viniegra, 2022). Establishing those factors that intervene in consumer behavior contributes to perfecting the techniques and strategies used in marketing, linking them to the particularities of the actual and potential customer segment. By knowing some of these elements, it would be very likely to achieve the stimulation of the buyer's desires and achieve the objectives that have been designed at the commercial level.

#### 4.3.1. Between Invisibility and Recognition: Decision-Making Traps

The study of decision-making found its major representatives in James March, Herbert Simon, and Henry Mintzberg. In particular, Simon (1947) points out that this process is carried out in the context of people's limited rationality, which may occur due to cognitive limitations, incomplete information, or even the influence of time. Moreover, he states that at first it is necessary to establish the possible alternatives and then check what result is achieved from each of them; finally, to choose the most convenient alternative in terms of efficiency. Seeking to explain and describe how decisions are

executed, as well as to establish those variables that guide people's choice behavior, in many contexts, is a subject that includes some psychological aspects. The information obtained about the process generated when making a decision is quite significant, hence decisions can be made with total security, total ignorance, or with some risk.

However, certain theoretical positions point out that, at the clinical level, decision-making is characterized "as a hypothetico-deductive process that allows the choice of an action through clinical reasoning" (Abarca et al., 2022). Nevertheless, according to this perspective, the study is based on technical and cognitive models of reasoning that exclude affective elements which mediate decision-making. Therefore, it has been established that decision-making does not seem to depend solely on a "rational" and "conscious" logic since various affective, subjective, contextual, and social elements are involved. This is supported by several studies that assert that human beings are "predictably irrational" (Ariely 2008). Likewise, some approaches show that when making daily decisions, people inadequately handle probabilities, seek information that allows them to ratify their models, and impose their opinions, among other cognitive processes, which can cause them to make certain processing errors (Posadzy and Hausfeld 2019).

In general, decisions made by individuals have consequences that can be affected over time; however, due to uncertainty, it is often difficult to assess such consequences and rely only on intuition to make good decisions. When making decisions regarding time or other factors, it is observed how a series of biases and errors of perception can affect them. When a person makes decisions, it does not seem so rational. In fact, these depend, to a large extent, on the perceptions of each individual and not, precisely, on reason (Bonales and Mañas-Viniegra, 2022); that is to say, of the totality of processes executed by the brain, it is only connected with the outside world in 2%, hence, the remaining operations occur inside. All this means that people's needs, desires, opinions, and perceptions intervene in conditioning the way they see the world around them (Morin 2001). The difficulty lies in the fact that all these prejudices, biases, or traps make it impossible for the person, at a given moment, to select the best alternative, thus causing serious consequences. Different types of psychological traps have been studied and documented, for example, the most evident prejudices when making a decision are analyzed by Hammond et al. (1998), Kahneman and Tversky (1979), Gilovich et al. (2002), Bazerman and Moore (2008) analyze different psychological traps and the relationship with the human mind in different decisions.

These authors state that psychological traps are generated by the mind in an unconscious and hidden way, resulting in decisions being made that are not the best. These traps can be classified as follows: Anchor trap: in this case, the mind gives priority to the first information or impression received, which conditions future judgments or ways of thinking. Confirmation test trap: occurs when the person only accepts that information with which they can support their reality or thought, discarding that which contradicts it. It serves the individual to self-justify their decision (Kahneman, 2012 and Morin, 2001). Created situation trap: Associated with the particular desire to maintain the comfort zone, although there may be better alternatives. Irrecoverable cost trap: this is related to the previous one, and has to do with maintaining the current situation even when aware that mistakes already made are maintained because of an unwillingness to admit the error (Hammond et al., 1998).

In the same order of ideas and according to the "Prospect Theory" proposed by Daniel Kahneman and Amos Tversky (1979), there are three errors when making a decision; the first of them refers to the aversion to losing: it states that the suffering or pain generated by losing something generally exceeds the joy of winning something; then there are the asymmetric risk preferences: where one prefers not to bet when one is winning, but to risk more when one is losing, and finally the erroneous estimation of probabilities: it consists of believing that certain events present a greater possibility of occurring than

they actually do. This theory stands out because it is observed how individuals do not make decisions considering their general state but focus on changes: gains, losses, or neutral results; in other words, the theory of perspectives shows that people are not rational when they are going to make a decision, managing to reach poor positions by not choosing the best alternative and, consequently, not seeing their welfare maximized (Torre, 2020; Rampello, 2019).

#### 4.3.2. Resizing Mental and Emotional Patterns

The organization of the thinking system comprises three deeply related subsystems, whose character is determined by a series of adaptive processes and historical-cultural appropriation. One of them is constituted by mental patterns, which make up a system of representations or codification; in this system, stimuli or information are organized to make them meaningful. Mental patterns are acquired throughout the life of the human being, one is not born with them; that is to say, they are neuronal circuits that are formed and stored in the mind through life learning. They are perceived through the senses and are elaborated using the system of perception of the information; furthermore, they become images - mental patterns that have their base in neural patterns - which are born regarding the states of the organism, inform about them, and of the emotion they produce, likewise, these images lead to action, direct it, and, at the same time, symbolize movements, both of the internal environment and the surroundings. Thus, mental images and neural patterns are representations, they symbolize an object, either external or corresponding to an internal state (Damasio, 1999).

Considering the above, it is significant to remember that emotions represent a concrete observable pattern of responses originating when it is interpreted that a situation or object may threaten survival and well-being (Andollo, 2021; Bjerg, 2019). This model encompasses physiological and expressive responses, which are generated from neurological activity (Damasio, 1998). Likewise, emotions can be classified into positive and negative: the former, such as happiness, allow approaching the chosen situation, while the latter, for example, sadness or anger, leads to distancing or avoidance.

Seen in this way, basic emotions compose individual patterns of expressive behavior, which are linked to a certain pattern of physiological activation, to a specific cognitive-subjective experience or feeling; moreover, different studies show that they are processes associated with adaptation and evolution, with a "neural, innate, universal basis and a unique associated affective and cognitive state" (Šimi' et al., 2021). According to the above, an emotion can be categorized as an experience in which several dimensions are involved with at least three response systems: cognitive/subjective; behavioral/expressive; and physiological/adaptive (Mejías et al., 2021; Bjerg, 2019; Greenberg and Paivio, 2007). In the same discursive thread, when it is possible to link emotion with some stimuli and their respective consequences, it is likely to project future situations since it is known how emotion impacts people's behavior at a social level (Damasio, 2003). Likewise, the link established between emotions and society emerges as a somatic marker; this involves an emotional memory generated in the body/brain associated with a certain event. Many of these markers result from socialization and such emotional memory facilitates making a decision. As previously stated, it is not that decisions are made emotionally; however, emotion can discriminate and value among the totality of rationally possible alternatives and discard those that generate discomfort (Damasio 2005).

Thus, concerning the emotions generated when a decision is made, it can be said that any individual subjected to intense emotion can think and act wrongly, distorting the reality that surrounds them, as well as their approach to the world and even their own preferences. In other words, emotions can overcome objective analysis; likewise, studies have shown, for example, that the presence of a lot of emotion does not allow a thorough examination of the different options available to the person making the decision (Flores, 2022).

In closing, it is necessary to emphasize that there is currently an enormous advertising bombardment of products and offers that compete in a reality of consumerism; this leads consumers to copy the behavior of society, influenced by trends and the majority. This shows that there are some patterns, both social and personal, that in a certain way guide the person's thinking and, consequently, their purchase decision (Ariely, 2008).

## 5. Discussion and conclusions

As a result of the narrative review of the literature about the neuroconsumer, from their mental and emotional patterns, it is observed that the cognitive processes present failures, starting in the memory, since they are not able to record as a hard disk the totality of what happened, but they take from that reality what is necessary to rearrange it to make sense according to the subjective system of the person, this is proven by the studies of Baddeley (1990), Tulving (1972), Shacter (1987). Likewise, emotions can help to interpret reality updated by the cognitive process governed by self-organized criticality. This happens due to the temporal memory located in the neocortex where information is optimized under the principle of singularity. Likewise, dendrites enable such connections and are configured in the brain by identifying that information is possible to be organized from the bottom up, starting from the experience that helps to deduce and create judgments about one's own reality. Seen in this way, during learning, people make mistakes and face fears, experiences, frustrations, and desires, which would constitute competencies that guide the cognitive process which encompasses the emotional and ends with the rational (Zúñiga et al., 2022).

Currently, studies on the brain are greater, seeking to establish the behaviors of the individual in the face of certain factors. Such research aims to answer certain questions, for example: why a customer chooses one product over another when deciding to buy something and what factors influence them to decide that (Vera et al., 2019; Henríquez-Ramírez et al., 2021). According to the above, it is possible to assert that, in general, there are no sensible decisions when acquiring a product because the individual lets their impulses and emotions guide them, leaving reason aside. Numerous studies indicate that a buyer does not always proceed rationally (Kaufmann 2017; Rodríguez-Orejuela et al., 2020). These analyses show that emotions manage the will of human beings, resulting in an unconscious decision-making process.

Considering all of the above, it is possible to define a neuroconsumer as a buyer who knows and practices everything related to their general well-being. Likewise, they pay attention and recognize the procedures and different marketing methods to manipulate, i.e. neuromarketing; hence it is asserted that it is a novel form of incitement and guidance aimed at studying visual attention and the link established with the brain neuro-connections generated in the person who consumes (Torres, 2020). In this sense, emotions represent the primary element of the attitudes of the neuroconsumer since they are responsible for guiding people and/or consumers when deciding to purchase a product.

Most of the decisions that a person makes are influenced by three factors: the psychological state of the individual; the environment that surrounds them, and the ideas perceived about the situations they live in (emotional codes). It is worth noting that people are quite complex, and this complexity makes it difficult to anticipate their behavior; for this reason, neuroeconomics attempts to support microeconomic studies in aspects related to the functioning of the brain, especially in the way decisions are made, strategic thinking, and exchange.

Given the above, the bibliometric analysis of neuromarketing made it possible to identify the new trends that exist to date in the scientific production of this topic, linked to the neurosciences, and also the cognitive processes that guide consumer behavior. Likewise, the results reveal that the United

States, Spain, and Latin America (Ecuador, Colombia, and Peru) lead the publications of scientific articles on neuromarketing (see figures 1 and 2). In the same way, it could be evidenced that the link between neuroscience and marketing makes it easier for companies to penetrate the subconscious of their clientele and thus, estimate the rational, emotional, and instinctive aspects, to create effective commercial advertising strategies, based on their motivations, aspirations, and requirements. Thus, explaining the process that occurs in the brain regarding the choices made by the individual in the light of science, and from neuromarketing, allows behavioral economics to find an experimental and verifiable basis because it would not only rely on economic and psychological studies "but also from scientists who can demonstrate how the brain works from its most natural environment. Therefore, the success of a campaign from a neuromarketing perspective is that the organization manages to combine emotion and reason" (Muñoz-Sánchez et al., 2022).

It is also noteworthy that the findings showed the importance of brain dynamics, in particular, the "hidden psychological traps", especially in decision-making when it comes to choosing a product or service. In this regard, it should also be noted that from the database analyzed, there is no evidence of research related to the Neuroconsumer, only those linked to neuromarketing. Therefore, as a suggestion, it is considered relevant to develop research on the emotional aspects related to neuroconsumer behavior, taking into account qualitative and quantitative elements for its scientific approach. Regarding the lines of research that could be developed in the future, firstly, a bibliographic review of contents referring to the main findings found in the study of mental and emotional patterns from the neuroscience of the consumer stands out. Secondly, a question or knowledge gap emerges from the findings in which the thematic clusters found (consumer behavior and emotions created in the brain) could be located from the analysis of the research disciplines with which they are linked.

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