

Neuromarketing and Tourism: Scientific Mapping and Challenges for Latin America

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Funding: The study has been developed as part of the project PS256LH001-002: Development and Competitiveness of the tourism product belonging to the Ministry of Tourism of the Republic of Cuba.

How to Cite the Article

Montesino Pérez, Alejandro; Hernández Flores, Yoan; Torres Hechavarría, Lisandra & Díaz López, Ananda (2026). Neuromarketing y turismo: mapeo científico y retos para América Latina [Neuromarketing and Tourism: Scientific Mapping and Challenges for Latin America]. *Vivat Academia*, 159, 1-25.
<https://doi.org/10.15178/va.2026.159.e1672>

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ABSTRACT

Introduction: Neuromarketing has emerged as an interdisciplinary tool that combines neuroscience, psychology, and marketing to understand consumer behavior. In tourism, its application allows for the analysis of visitors' emotional responses to marketing stimuli, generating more effective management and promotion strategies. However, in Latin America, its development is still in its early stages, highlighting the need for a systematic approach that identifies trends and research gaps. This study contributes to bridging that gap through a bibliometric and qualitative analysis of scientific production on tourism neuromarketing between 2010 and 2024. **Methodology:** An exploratory-descriptive study with a multi-method approach was conducted, following the PRISMA methodology for the systematic review. The Web of Science and Scopus databases were consulted using search strings in English and Spanish. The data were processed using the Bibliometrix R-package and its Biblioshiny interface, applying scientific mapping techniques and co-occurrence analysis. The final corpus included 62 documents, analyzed in three phases: performance, conceptual structure, and qualitative evaluation of regional practices. **Results:** An annual growth of 16.01% in publications was observed, with Spain, Italy, and the United States as leading countries, and Brazil as the most prominent in Latin America. Experimental studies focused on emotional response and the perception of tourist brands predominated. **Discussion:** The results show an increase in academic interest, although methodological shortcomings and technological limitations persist in the region. It is suggested to strengthen international cooperation and promote neuromarketing laboratories in Latin American tourism institutions in order to link innovation, competitiveness, and sustainability development. **Conclusions:** It is concluded that tourist neuromarketing in Latin America is in an early phase of expansion, but with promising prospects if research networks are consolidated and technological innovation is promoted as a driver of sustainable tourism development in the region.

Keywords: Neuromarketing; tourism; bibliometric analysis; consumer behavior; Latin America.

1. INTRODUCTION

The 21st century has been marked by profound social transformations driven by scientific and technological advances that, until a few decades ago, were unimaginable. In this context, the tourism sector has progressively adopted the use of new technologies to understand and optimize its various processes. Authors such as Herrera (2025) highlight that the application of technological tools ranges from destination management to improving the visitor experience. Consequently, continuous innovation emerges not so much as an option, but as a necessity. The adoption of creative measures and disruptive solutions can represent the difference between success and failure.

In the pursuit of innovation, tourism has drawn on tools from multiple disciplines – Geography, Biology, Psychology, Mathematics, Marketing, Medicine, etc. – to

achieve better results. Academics have investigated, from a multidisciplinary perspective, how tourism studies can benefit from new technologies (Alsharif et al., 2021). This has opened the door to neuromarketing, a discipline that has been categorized as:

the application of neuroscience techniques in the field of marketing, which analyze the levels of emotion, attention, and memory evoked by stimuli in the context of marketing, advertising, and sales, such as advertisements, products, services, or experiences, from the imminent understanding of the subconscious. (Gutiérrez Cárdenas, 2019, p. 1177)

Therefore, it uses both psychological and neuroscientific methods to investigate marketing-related issues concerning purchasing behavior. This offers a scientific explanation of consumer preferences and behaviors, which are now influenced by technologies such as AI (Alvino et al., 2020). Its application in tourism has recently been termed neurotourism (Cardoso & Fraga, 2024).

However, the term is not yet widely recognized, with neuromarketing being a more widespread and accepted concept in these fields. In his study, Al- Nafjan et al. (2023) show that, in recent years, tourism research has focused on demonstrating the influence of emotions on the motivations, actions, choices, and satisfaction of tourists. Furthermore, they show that measuring tourists' feelings using subjective tools such as self-reports is often insufficient. Therefore, methods like neuromarketing are emerging as intelligent ways to gather objective measurements of visitors.

In this regard, Li, Lyu et al. (2023) state that it can be used in tourism research to generate and test better theories, produce more accurate measures, and guide the development of new hypotheses and assumptions. Its practical applicability has been developed in various business divisions, such as finance, marketing, and human resources, with the aim of improving the understanding of both consumer behavior and organizational processes (Khaneja & Arora, 2024).

Despite its advantages, the development of studies based on neuromarketing applied to tourism has been limited, showing a lack of theoretical foundation and low interdisciplinarity (Li, Chark et al., 2023). Likewise, a lack of consensus persists regarding the most effective measures and the appropriate contexts for their application (Byrne et al., 2022). This situation is exacerbated in developing countries, where access to specialized technologies is limited or their costs are high.

It is important to note that, despite the growing interest in neuromarketing, no previous studies have been identified that develop bibliometric analyses to examine the importance and applicability of these measures in the context of tourism in Latin American countries. This gap underscores the need for and originality of this work. Consequently, this research employs a systematic literature review supported by bibliometric analysis to compile and analyze the applications of neuromarketing in the tourism sector.

2. OBJECTIVES

This article aims to fill this research gap by conducting a descriptive analysis of the scientific output related to neuromarketing and its applications within the tourism sector. To this end, the following research questions are proposed:

1. What has been the growth of scientific publications in indexed journals in the Web of Science or Scopus, which apply neuromarketing methods in tourism research?
2. Which are the main countries and authors that publish neuromarketing studies applied to tourism, with a special focus on Latin American countries?
3. What are the current lines of research and the most important future directions in the conceptual structure of scientific research in neuromarketing applied to tourism?
4. What are the most commonly applied neuromarketing methods in the tourism sector? Of these, which are most suitable for Latin American countries?

Based on the findings, the aim is to propose, as recommendations, a set of good practices for the implementation of these methodologies in the field of tourism management in Latin American countries.

3. METHODOLOGY

The bibliometric analysis in this study was conducted following the guidelines suggested by Ampah et al. (2021) for presenting bibliometric analyses and structurally evaluating specific research areas. In each phase of the research, the web application Biblioshiny, from the R Bibliometrix package (version 2024.12.1+563), was used. This tool is designed to assist users without programming knowledge in performing bibliometric analyses (Aria & Cuccurullo, 2017). The justification for selecting this tool over others widely used in bibliometrics, such as VOSviewer, lies in: 1) the need for integrated analysis of scientific performance and conceptual structure within a single workflow; and 2) the requirement for explicit quantification of performance metrics.

3.1. Data Sources

Data collection for the bibliometric study was carried out using the PRISMA methodology (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) (Page et al., 2021). The information sources selected to develop the analyses were the Web of Science (WoS) and Scopus. According to Duque-Hurtado et al. (2020), these databases are the most relevant for scientific production at the international level and offer advanced search tools that allow for robust bibliometric studies.

3.2. Search Strategy

The search strategy was designed to identify the most relevant literature on neuromarketing in the tourism sector. The search was conducted on October 29, 2024,

including all publications available up to that date. The query was performed using the title, abstract, and keywords, with the following search string: ("Neuromarketing" OR "neuroscience" AND "tourism")

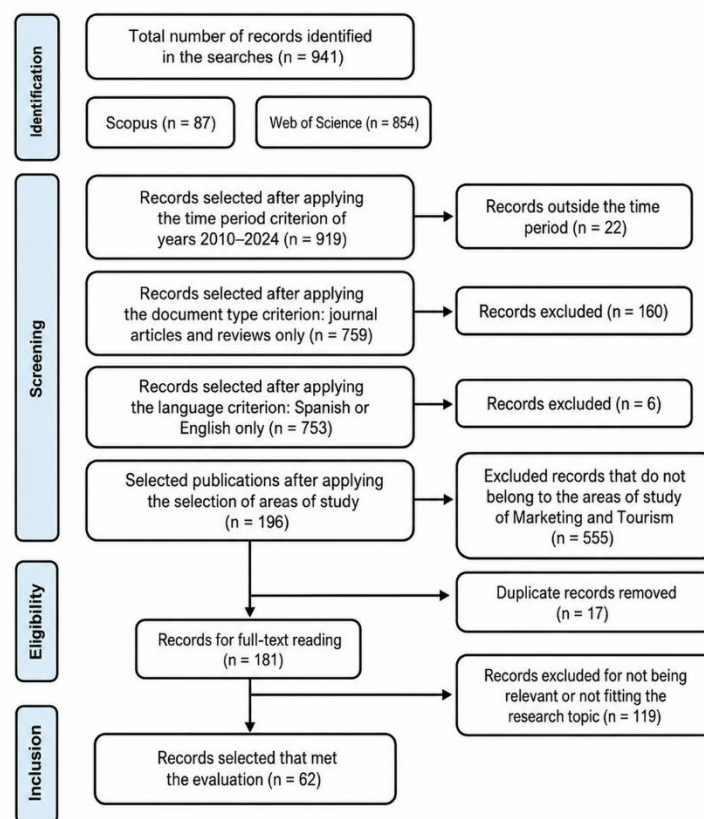
3.3. Data Collection

The following filters were applied to the document cleaning and selection process: 1) publication between 2010 and 2024; 2) document type: articles and reviews only; 3) written in English or Spanish; 4) all articles not belonging to thematic areas associated with tourism marketing, according to the specific research categories for WoS and Scopus respectively, were excluded. Once each database was cleaned, the results were combined, and duplicate documents were removed using the title/DOI matching functions in Bibliometrix.

Finally, the eligibility process was conducted independently by two researchers to minimize bias. Discrepancies in the selection were resolved by consensus with a third researcher. Thanks to this strategy (Figure 1), it was ensured that 62 studies addressing key neuromarketing issues in the tourism sector were included.

Figure 1

Flowchart of the Study Selection Process Based on the PRISMA Methodology



Source: Elaborated by the authors.

It must be acknowledged that this study faces some limitations, the most notable of which are: the analysis is restricted to documents indexed in WoS and Scopus, meaning that publications in other databases or regional repositories are not included. Additionally, although the eligibility process was developed independently by the researchers, the decisions associated with the criteria for including or excluding documents may have introduced selection biases that affect the final composition of the selected studies. It is also important to consider limitations associated with the bibliometric tool used, Biblioshiny: (1) cluster detection and word co-occurrence analysis depend on the quality of the metadata, the selected thresholds, and the network structure itself, which can influence how conceptual relationships are represented; (2) network visualization is less refined than in VOSviewer.

However, these limitations do not invalidate the findings, but they do suggest caution when generalizing the results, opening opportunities for future research within the region that integrates empirical approaches to compare the final results.

3.4. Data Analysis Process

3.4.1. Phase I: Performance Analysis

In this phase, a performance analysis was conducted based on annual scientific output, the most relevant countries, and the most prominent authors. This allowed for an understanding of the current state of international neuromarketing studies in tourism.

3.4.2. Phase II: Conceptual Structure of Neuromarketing in Tourism

Phase II allowed for an understanding of the fundamental themes that comprise the body of knowledge associated with neuromarketing research within the area of interest. To map the conceptual structure, a scientific mapping exercise was conducted. The analysis was based, in part, on the methodology proposed by Casado-Aranda et al. (2023), employing a keyword co-occurrence network that allowed for the organization of the conceptual structure by thematic axes. A minimum threshold of keyword co-occurrence in two documents was selected.

The clusters were generated using the Walktrap algorithm, selected for its effectiveness in detecting well-defined thematic communities in medium-sized keyword networks (60–300 nodes) (Paz Enrique et al., 2025). Prior to this, the lexicon was curated by unifying synonyms and removing generic terms to avoid artificial fragmentation of the clusters and ensure their semantic cohesion.

Finally, the temporal evolution of the frequency of topics addressed in the scientific literature was tracked (Aria & Cuccurullo, 2017). Based on this, a strategic diagram was developed highlighting the main topics according to their density and centrality. Following the criteria of Casado-Aranda et al. (2023): (1) centrality measures the degree of interaction of a network with other networks. This value can be interpreted

as a measure of the importance of a topic within the field of research; (2) density is related to the internal robustness of the network. It can be interpreted as a measure of the development of the topic.

3.4.3. Phase III: Qualitative Analysis and Formulation of Best Practices for Latin America

Finally, a qualitative analysis of the selected documents was conducted. This phase allowed for an evaluation of neuromarketing's potential to boost tourism development in nations, with a particular focus on Latin America. During the analysis, factors hindering the adoption and expansion of these methods in the region were identified, as well as the most effective alternatives and strategies for overcoming these barriers.

To this end, documents were selected and analyzed based on the following criteria: first, documents by leading authors in the field of neuromarketing applied to tourism and documents by Latin American authors were selected. Selection was also based on the research topics addressed. Articles on the practical application of neuromarketing methods in tourism were prioritized, followed by articles with a theoretical focus, primarily systematic reviews, to enrich and substantiate the analyses.

4. RESULTS

4.1. Performance Analysis

Table 1 shows a summary provided by the software Biblioshiny about key information on the analyzed database. As can be seen, the 62 documents analyzed between 2010 and 2024 were published in 49 scientific journals indexed in WoS or Scopus. The selection of documents shows that publications on neuromarketing applied to tourism are growing, with a positive rate of 16.01%. Furthermore, the average age of the documents—2.97 years, referring to the average number of years since the publication of each of the 62 articles—indicates that the field of study is relatively young.

Table 1

Main Features of the Review

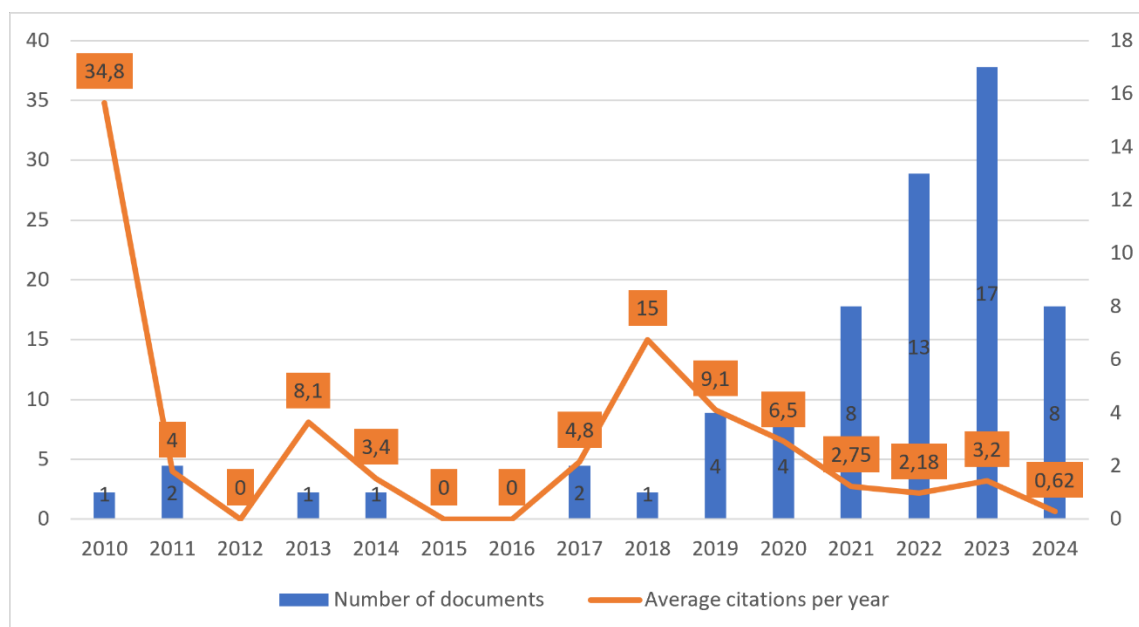
Characteristics of the Analysis	Results
Key information about the data	
Time span	2010 - 2024
Number of documents	62
Scientific journals	49
Annual growth rate	16.01%
Average age of the document	2.97
Average citations per document	25.66
References cited	5,270
Document Content	
Authors' keywords	216
Authors	
Total number of authors	221
Single-author documents	5
Average number of co-authors per document	3.71

Source: Elaborated by the authors based on the data provided by the software Biblioshiny.

On the other hand, the average number of citations per document (25.66) – understood as the total number of citations received within the corpus divided by the 62 documents – reflects the average impact of each publication in the field. The temporal distribution of these citations is shown in Figure 2.

Figure 2

Annual Distribution of Average Publications and Citations



Source: Elaborated by the authors using the software Biblioshiny.

The number of articles published over time during the analyzed period reached its peak in 2023 with 17 articles being published. The analysis in Figure 2 reflects an average of 4.13 publications per year, with a substantial increase from 2021, after which an average of 11.5 contributions per year were published.

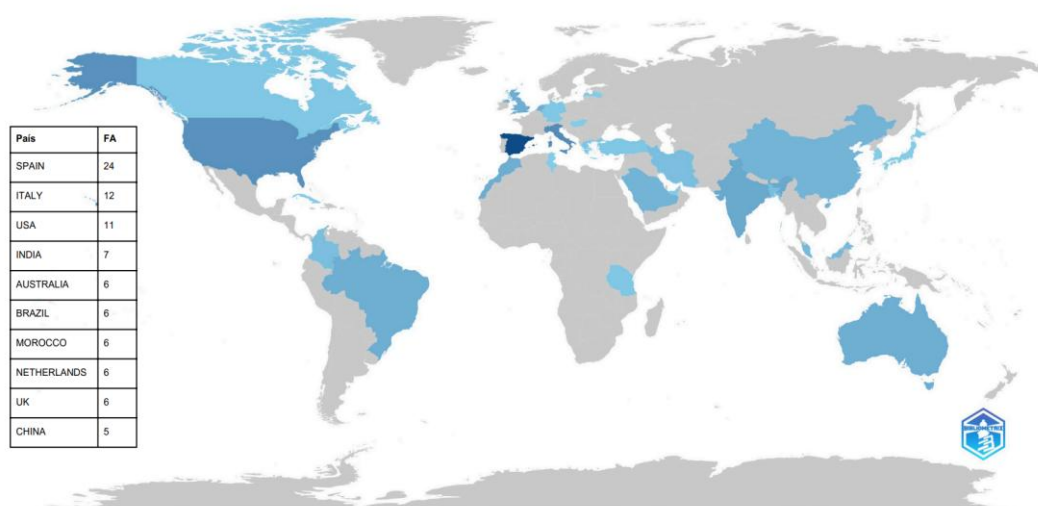
Additionally, the average number of citations per year is presented, calculated as the number of citations divided by the sum of the years cited. The year with the highest average (34.87) was 2010, followed by 2018 with an average of 15 citations. Since then, no other year has reached or exceeded that level.

Regarding the countries with the highest scientific output according to the nationality of their authors, Figure 3 shows that Spain leads the list with 24 authors. Other prominent countries are Italy with 12 and the United States of America with 11. In Latin America, Brazil is the most relevant country in the region and one of the best positioned worldwide (6 authors). It should be noted that, of the 62 articles analyzed, 25.81% had international co-authorship; therefore, international collaboration within the field is quite limited.

The leading countries coincide with the top global tourist destinations in 2023: Spain (2nd), USA (3rd), Italy (4th), United Kingdom (7th), China (13th) and the Netherlands (17th) (World Tourism Organization, 2024). This reflects their growing concern to stay up-to-date in the adoption of innovative tools.

Figure 3

Scientific Output of the 10 Most Relevant Countries in Terms of Neuromarketing Studies Linked to Tourism



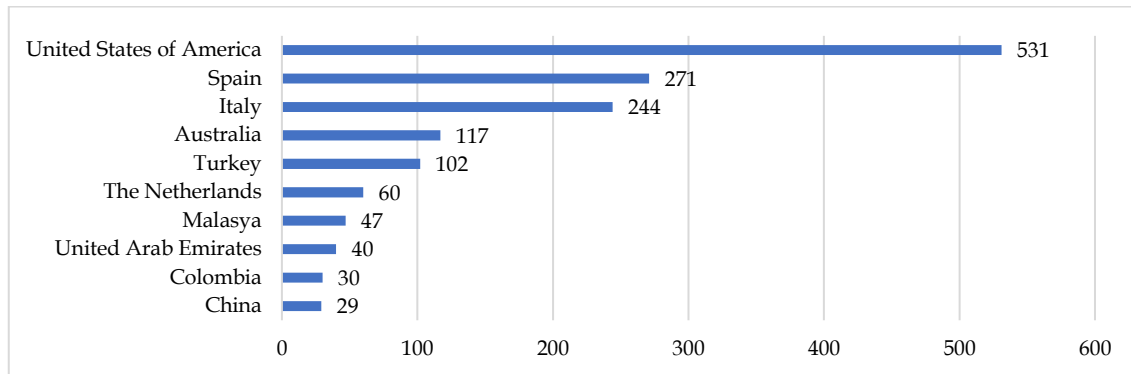
Source: Elaborated by the authors using software Biblioshiny.

Within the selection of 62 articles, the most influential countries in the field of research are: first, the USA with 531 citations, which means that its researchers are not only among the most prolific in scientific output, but are also theoretical references in the topics addressed (Figure 4). In the case of Latin America, Colombia

stands out among the 10 countries with the most citations received, compared to others such as Brazil, which, despite its significant representation of authors, does not appear among the most cited.

Figure 4

Countries With the Highest Number of Citations Received



Source: Elaborated by the authors using software Biblioshiny

Regarding the most cited authors (Table 2), Ariely and Berns stand out, with a total of 523 citations. Their research offers a critical view of the potential and limitations of neuromarketing, highlighting how neuroimaging techniques can complement, but not replace, traditional market research methods (Ariely & Berns, 2010).

Table 2

Most Cited Authors

Number	Authors	H-index	Total Number of Citations	Average Number of Citations per Year	of
1	ARIELY D	1	523	34.87	
2	BERNS G	1	523	34.87	
3	SÁNCHEZ-FERNÁNDEZ J	2	111	9.25	
4	CIORCIARI J	1	105	15	
5	GOUNTAS J	1	105	15	
6	HARRIS J	1	105	15	
7	BOZ H	2	102	9.27	
8	KOC E	2	102	9.27	
9	LIS	3	38	12.67	
10	LYU T	2	25	8.33	

Source: Elaborated by the authors using software Biblioshiny.

Li ShiNa's work is noteworthy, as she has an h-index of 3—referring to the total number of articles (h) by an author cited at least h times by others—over the last 5 years. Furthermore, she is the second author with the highest average number of citations per year, calculated by summing the average number of citations per year

for each of her documents and dividing by the total number of documents she has in the corpus.

4.2. Conceptual Structure of Neuromarketing in Tourism

From the selection of articles, 25 terms were identified, distributed into four color-coded clusters, with red (Neuromarketing) being the most prominent, followed by green (Tourism), and with purple (Product) and blue (Review) being less represented (Figure 5). The connecting lines between terms reflect the intensity of the thematic relationships — thick lines and intense colors indicate a stronger connection.

The Neuromarketing cluster is composed of the terms “neuromarketing,” “consumer neuroscience,” “EEG⁵,” “consumer behavior,” “marketing,” “review,” “decision-making,” “ERP⁶,” “machine learning,” “psychology,” “advertising,” “advertising effectiveness,” “consumer psychology,” “emotions,” “physiological tools.” This cluster is the center of the network, integrating words that represent important theoretical, methodological, and technological foundations. Therefore, it is the conceptual axis of the field, showing how strategies are designed based on an understanding of human behavior (Alzboun et al., 2024; Byrne et al., 2022). Its composition suggests that the field evolves driven by technical capabilities (What can be measured?) rather than by conceptual questions (What needs to be understood?)

Based on the cluster's composition and considering the criteria addressed by the various documents in the corpus, the authors define neuromarketing as the application of neurophysiological and psychophysiological measurement methods to quantify unconscious cognitive and emotional responses to commercial stimuli (advertisements, brands, products, tourist experiences). Its defining characteristic is the objective measurement of unconscious processes, differentiating it from traditional marketing, which relies on self-reporting.

Figure 5

Keyword Co-Occurrence Network



Source: Elaborated by the authors using software Biblioshiny.

⁵ Electroencephalogram

⁶ Event-Related Potentials

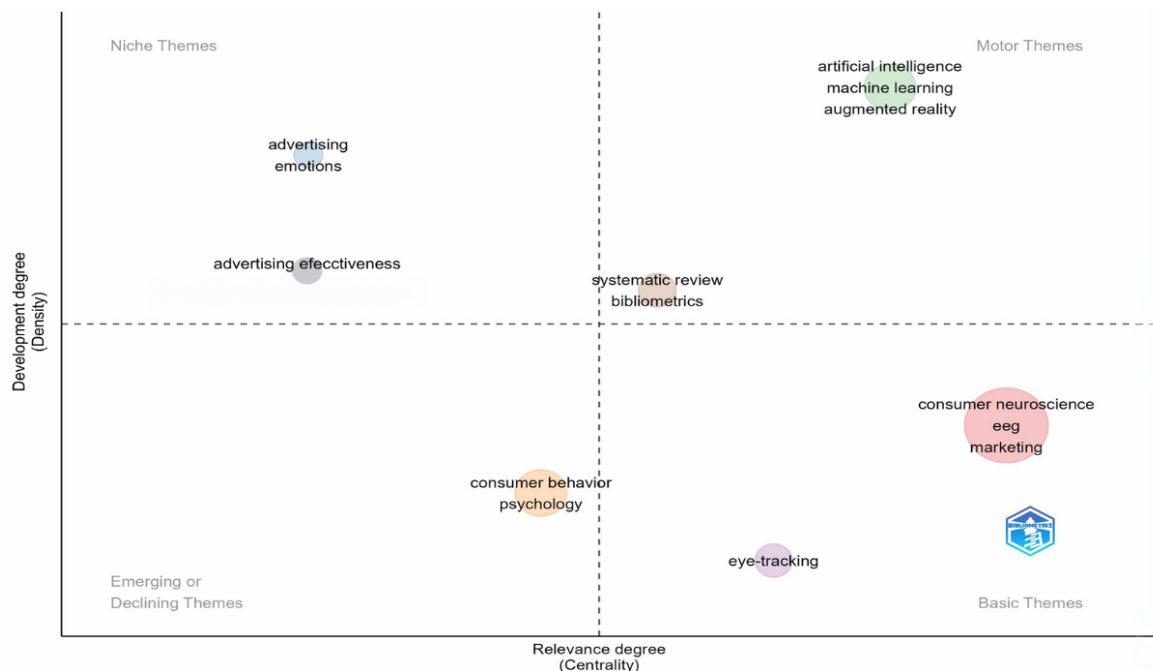
The Tourism cluster includes the terms “neuroscience,” “eye -tracking (ET),” “tourism,” “artificial intelligence,” “business,” and “neuro-tourism.” This cluster represents the application of neuromarketing within tourism, highlighting the role of technologies and innovation (Duque-Hurtado et al., 2020). It also reflects some emerging trends and concepts such as neuro-tourism, a term mentioned only in Al-Nafjan et al. (2023), Alzboun et al. (2024) and Cardoso and Fraga (2024). This makes it a concept that has not been widely adopted until now. It refers to the application of neuroscientific methods to design, evaluate, and improve tourist experiences.

Conversely, the Review cluster, made up only of “systematic review” and “bibliometrics” demonstrates that these are the most common types of scientific contributions made to date on this topic. In the case of the Product cluster, the terms “branding” and “packaging” represent specific applications of neuromarketing within the merchandising and brand identity of tourism products and companies.

The strategic diagram in Figure 6 highlights the relative relevance of the topics being discussed. It is important to mention that the driving fields include AI (artificial intelligence), machine learning, augmented reality and, to a lesser extent, systematic review and bibliometrics. These are topics that are highly developed and of great importance within the foundation of research structures in neuromarketing and tourism.

Figure 6

Strategic Diagram of the Main Topics Related to Neuromarketing and Tourism



Source: Elaborated by the authors using software Biblioshiny.

Furthermore, although advertising has lost some relevance in recent years, it remains a widely explored topic with high potential to gain prominence in the near future

(niche topic). This will be especially true as the use of new technologies combined with neuromarketing methods becomes more established, allowing for increased advertising effectiveness through the study of users' subconscious and emotions.

The lower right quadrant illustrates the interdisciplinary themes: consumer neuroscience, EEG, marketing, and eye tracking (ET). These topics have lost their novelty but they are highly integrated within the scientific output in the field. Finally, the lower left quadrant refers to topics that currently have little relevance and that could be declining or, conversely, in the process of resurfacing and beginning to play a decisive role in future research: consumer behavior and psychology.

The analysis of the conceptual structure confirms the initial concerns regarding the weak theoretical foundation and low interdisciplinarity of neuromarketing in tourism. The tourism cluster acts less as a conceptual center and more as a domain for applying tools created in other contexts. For Latin America, this suggests a direction for future research: starting with real tourism problems and identifying which neuromarketing tools can be useful, rather than adopting tools and then looking for where to apply them.

4.3. Qualitative Analysis

The application of neuroscience to tourism research is attracting increasing attention. It provides novel methods by which researchers can assess unconscious emotional and cognitive responses with unprecedented accuracy. Consequently, neuroscience can no longer be ignored in tourism. If the means exist to look inside the tourist's brain and quantify the bodily experience, then they should be leveraged to drive tourism development (Li, Chark et al., 2023).

In the past, tourism companies relied on traditional methods, such as interviews, focus groups, and questionnaires—self-report measures—to study and analyze consumer purchasing behavior. However, these data collection methods have gradually become less relevant due to their limitations in cost, time, and accuracy. Furthermore, due to social desirability bias, consumers may not always express their true thoughts. Moreover, this aligns with Alsharif et al. (2021) that most of the consumer purchasing process occurs unconsciously, which cannot be predicted solely using traditional research methods.

The methods used in neuroscience can overcome the lack of validity and social desirability bias problems associated with self-report measures (Byrne et al., 2022). However, it is important to note that, on their own, they often lack explanatory power. That is, they show what happens, but not why it happens. In this respect, the authors of this article agree with Li and Chark et al. (2023), who recommend combining multiple psychophysiological methods with self-report methods. Plassmann et al. (2015) argue that neuromarketing methods should not be seen as a way to replace traditional marketing methods; instead, they should be considered complementary.

For Latin American destinations, the above would be particularly beneficial in increasing their competitiveness. However, neuromarketing is not currently a concept with which the countries of this region are familiar. Further research is needed to explore how to introduce these practices to address the region's specific problems, thereby boosting tourism development.

Latin America has a limited production of neuromarketing studies related to tourism in top-ranking journals. This is presumed to be due to barriers such as the level of expertise required to interpret neuromarketing measures, as well as the establishment and maintenance of a research center. Or simply because the topic is not widely known globally, leaving its study primarily to countries with greater resources (Duque-Hurtado et al., 2020; Méndez Lazo et al., 2023).

Furthermore, there is a perception that acquiring the technology needed to conduct the studies is expensive and difficult to manage. Al- Nafjan et al. (2023) suggest that researchers require guidance and training when using these devices for the first time, in contrast to traditional methods that are well-known and relatively easy to apply with minimal expertise. Furthermore, countries with neuroscience research centers, and therefore the necessary personnel and equipment, often limit their application to the field of medical sciences.

To better understand these methods, it is important to know that they are usually classified according to the type of measurement. Boz et al. (2017) and Alvino et al. (2020) have divided these methods into two categories: physiological and neurophysiological (Table 3). Physiological methods can measure voluntary and involuntary reflexes, such as fixation and tracking of visual stimuli or movements of the facial muscles—facial expressions (Alvino et al., 2020). Neurophysiological methods measure and record brain activity to study consumer behavior (Boz et al., 2017).

Table 3

Types of Neuromarketing Methods

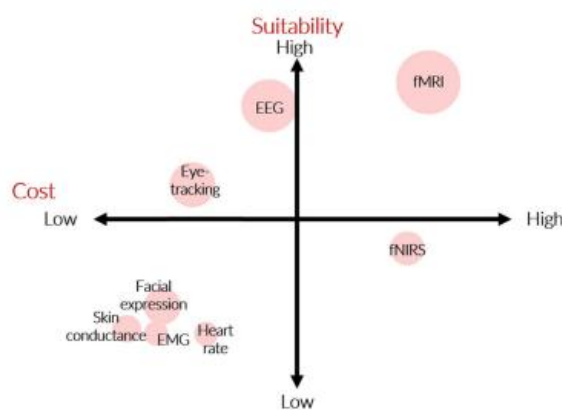
Type of Method	Method Name	Measurement
Physiological	ET	• Visual attention • Pupil dilation • Fixations
	Facial expression	Facial expressions
	Electrocardiogram (ECG)	• Heartbeat • Blood circulation
	Galvanic skin response (GSR)	Skin moisture level
	EEG	Brain activity
Neurophysiological	Functional magnetic resonance imaging (fMRI)	Brain activity
	Functional near-infrared spectroscopy (FNIRS)	Brain activity

Source: Elaborated by the authors.

Li, Chark et al. (2023) suggest that as technology advances, its cost may decrease and its operation may become simpler, which will likely further encourage the application of neuroscience to tourism. In this regard, Casado-Aranda et al. (2023) summarize in Figure 8 the cost-suitability relationship of applying the most widely used neuromarketing methods worldwide from 1979 to 2021 in the field of communication. Cost is defined here as the expenses for design, materials, instrumentation, and software which are necessary to obtain interpretable data from each experimental subject.

Figure 8

Suitability and Cost Relationship Matrix



Source: Taken from Casado-Aranda et al. (2023).

As shown above, the methods with the best cost-effectiveness ratio are EEG and ET, which confirms their popularity among researchers. Therefore, they deserve greater attention, and their application in the Latin American context should be encouraged. Other valid alternatives could be methods that, while not the most suitable, have the lowest costs.

4.3.1. Eye-Tracking (ET)

Eye-tracking technology has gained application in various consumer-related disciplines and, more specifically, in tourism-related studies. Eye tracking involves continuously measuring where people are focusing their gaze, that is, monitoring fixations – when the gaze is directed at a specific point in space for a certain period of time – and saccadic movements – periods between fixations when the gaze shifts from one point to the next – (Li, Chark et al., 2023; Lyu & Mañas-Viniegra, 2021).

Previously, they were only suitable for laboratory studies, but recently glasses have become available that allow recordings to be made in natural conditions in the field, which has boosted their implementation within tourism (Li, Chark et al., 2023; Lyu & Mañas-Viniegra, 2021). Eye tracking has been used as a tool to study visual attention in advertising, the processing of photographs of tourist activities, perceptions of landscape and product images, perceptions of destination image, design of

marketing materials, and website optimization (Al- Nafjan et al., 2023; Li, Chark et al., 2023; Méndez Lazo et al., 2023).

4.3.2. Electroencephalography (EEG)

EEG involves recording the electrical activity of the central nervous system — the brain, brainstem, and spinal cord (Li, Lyu et al., 2023). This method is used to measure the neural activity of visitors while they engage in consumption-related behaviors, or in the periods immediately before and after such behaviors (Alvino et al., 2020). Therefore, it offers great potential for understanding and predicting consumer behavior.

However, Li, Chark et al. (2023) express skepticism about the practical feasibility of applying these studies in uncontrolled environments. The electroencephalogram is a very small electrical signal and, therefore, highly susceptible to contamination by other brain signals if proper care is not taken. Therefore, performing electroencephalograms in real-world settings involves facing the challenge of interpreting highly noisy signals in equally complex and variable contexts (Li, Chark et al., 2023). Despite the above, EEG is a promising research tool for tourism scholars in the area and it has the potential to make a relevant contribution to tourism research in the coming years (Li, Chark et al., 2023).

The most common applications of EEG in tourism to date include: studies on destination image, evaluation of promotional effectiveness; examining emotional reactions to images; understanding the selection process among various options; creating and designing strong brands that are easy to remember and have a strong emotional appeal (Al- Nafjan et al., 2023; Alvino et al., 2020; Li, Lyu et al., 2023).

5. DISCUSSION

5.1. The Potential of Neuromarketing for Latin America

This scenario suggests that neuromarketing remains a maturing field with a low degree of theoretical consensus, which explains the high relevance of systematic review research and the use of bibliometric tools. In general terms, some tourism challenges in Latin America that could be addressed initially include: the quality of tourism services based on customer perceptions; the development of destination brands that differentiate Latin America's tourism offerings both within the region and from competing regions; the design of more attractive tourism experiences for the region's target segments; and the design of communication campaigns that create an appealing image of destinations for each of their main source markets and improve the work environment and employee satisfaction, a critical aspect in some destinations with high turnover rates.

Furthermore, considering the motor-related aspects within the field, empirical research could be conducted on AI applications combined with neuromarketing in Latin American tourism. For example, machine learning applied to neuromarketing

has demonstrated significant advantages in obtaining more accurate measurements when combined with EEG tools, opening new possibilities in emotional analysis (Al-Nafjan et al., 2023; Khaneja & Arora, 2024).

Another driving force within neuromarketing is augmented reality (AR), a technology that opens new possibilities for generating immersive experiences (Crespo-Pereira et al., 2023). Its integration with neuroscience tools could be especially useful for tourism managers in Latin America. It would allow them to expand their understanding of the role of emotions in decision-making, as well as how advertising can effectively stimulate visitors by identifying and leveraging key emotional triggers.

In order to take advantage of the potential offered by neuromarketing to increase the tourism competitiveness of Latin American destinations, the authors propose a set of best practices that could be implemented in the medium and long term by those in charge of tourism management in these countries:

1. To promote alliances between universities, governments and tourism companies in Latin America to facilitate access to neuromarketing technologies.
2. To encourage Latin American researchers, within the field of tourism studies, to publish theoretical and practical studies on neuromarketing and tourism in top-level journals, which will allow the construction and enrichment of a conceptual structure specific to Latin America.
3. To promote the training of neuromarketing specialists within the Latin American tourism sector.
4. To start by using ET and EEG, or alternatively, use other tools that offer less effective but cheaper measures.
5. To implement neuromarketing measures by combining traditional marketing methods such as surveys, interviews, and focus groups.
6. Leveraging the benefits offered by new technologies such as AI and AR for the development of neuromarketing studies in tourism.

5.2. Priority Research Agenda for Latin America: Challenges, Gaps and Future Lines of Research

Although neuromarketing in tourism is experiencing global growth, its development in Latin America faces three critical structural challenges that demand a differentiated research agenda. First, there is a shortage of technical infrastructure, due to the limited number of countries in the region with EEG/ET laboratories accessible to tourism researchers. Second, there is a lack of specialized training, with a complete absence of postgraduate programs or certifications in neuromarketing applied to tourism. Third, there is a persistent disconnect from local issues, as 92% of existing studies focus on mass European/American destinations, ignoring the community-based and rural tourism characteristic of the region.

The bibliometric analysis reveals four priority research gaps. First, no empirical studies of in-situ neuromarketing in Latin American destinations were found within the corpus. Second, there is a lack of cross-cultural validation, as no study compares the neurophysiological responses of Latin American tourists versus European tourists. Third, there is a lack of cost-effectiveness analyses adapted to emerging economies, with no feasibility studies of portable EEG versus eye-tracking in Latin American university budgets. Fourth, there is insufficient theoretical development, with no conceptual frameworks integrating neuromarketing with critical theories of Latin American tourism.

To address these gaps, at least five lines of action are proposed. First, a capacity assessment is needed to map EEG/ET infrastructure in different countries, using success indicators from public databases. Second, regional pilot studies should be conducted applying neuromarketing in at least three of the main destinations (Brazil, Mexico, and Colombia), making the results visible through databases such as Web of Science/Scopus. Third, networks should be formed by creating the Latin American Network of Tourism Neuromarketing, which would bring together experts in the field. This agenda would transform Latin America from a passive consumer of Global North methodologies into a generator of innovation adapted to its unique tourism realities, positioning the region as a leader in contextualized neuromarketing.

5.3. Practical Recommendations for Tourism Management

The results of this study demonstrate that neuromarketing techniques constitute a strategic resource for improving the design of tourism products, brands, and campaigns, by providing objective information on the emotional and attentional responses of visitors; therefore, the following practical implications are derived for public and private tourism managers, with special emphasis on Latin America:

1. Design of campaigns and promotional materials: To use ET and/or EEG to pre-test advertisements, promotional videos, destination images and web pages, identifying which elements capture the most attention and generate positive emotional responses.
2. Destination brand management: To use neuromarketing tools to evaluate logos, slogans, color palettes and brand narratives of destinations, identifying which ones are associated with emotions of pleasure, safety, authenticity or novelty in different tourist segments.
3. Design of on-site tourist experiences: To integrate psychophysiological measurements to detect moments of greater engagement, fatigue, or confusion throughout the visit.
4. Improvement of the quality of service and the work environment: To apply neuromarketing in combination with traditional techniques to analyze how elements of the service environment (music, lighting, space distribution) influence stress, comfort and perception of quality by tourists and workers.

5. Strategic management in contexts of limited resources: To prioritize, in a first phase, methods of lower relative cost and high suitability (basic EEG and ET) and limited pilot projects, instead of large laboratories, which is especially relevant for Latin American destinations with budget constraints.
6. Innovation based on AI and augmented reality: to design prototypes of experiences and augmented reality pieces and subject them to neuromarketing tests before their mass implementation, reducing the risk of ineffective investments in tourism innovation.

Taken together, these implications show that neuromarketing should not be understood only as a technological tool, but as a support for more informed, efficient, and visitor-centric management decisions.

6. CONCLUSIONS

The study provided a deeper understanding of the current state of neuromarketing applied to tourism. The results show exponential growth in scientific output in this field, particularly over the last five years, with an annual growth rate of 16.01%. This increase reflects the growing recognition of the value of neuroscience in understanding the cognitive and emotional processes underlying tourist behavior. However, this development is concentrated primarily in developed countries with strong economies and established scientific systems, while in Latin America, research output remains in its early stages, indicating a significant gap in the adoption of these innovations.

The analysis of the leading countries and authors reveals interesting patterns. Spain, Italy, and the United States emerge as undisputed leaders, not only in publication volume but also in scientific influence. This leadership is closely linked to their status as global tourism powerhouses and their capacity to invest in cutting-edge research. In contrast, Latin America's presence is marginal, with Brazil as the only significant representative, albeit with a limited impact in terms of citations. This disparity underscores the need to strengthen research capabilities in the region, particularly in countries with thriving tourism sectors but less developed scientific systems.

The conceptual framework of the field reveals a theoretical development still underway, with thematic axes ranging from consumer neuroscience to the application of emerging technologies. Particularly relevant is the growing interest in integrating artificial intelligence and augmented reality with neuromarketing techniques, opening new possibilities for tourism research. However, significant challenges remain, such as the lack of consensus on standardized methodologies and the limited interdisciplinary integration between neuromarketing and tourism studies. These challenges are especially pronounced in Latin American contexts, where limitations in infrastructure and specialized training also contribute to the problem.

Regarding the most commonly used methods, EEG and ET stand out for their balance between cost and effectiveness, positioning themselves as viable alternatives for Latin American researchers. These instruments overcome some limitations of traditional methods, such as survey biases, by providing objective data on tourists' emotional and attentional responses. However, their implementation in the region faces significant obstacles, ranging from the high initial cost of the equipment to a lack of trained experts in its use and interpretation.

For Latin America, the results of this study suggest the urgent need to implement concrete strategies to close the technological and scientific gap. This includes, firstly, establishing strategic alliances between universities, research centers, and tourism companies to share resources and knowledge; and secondly, developing specialized training programs in neuromarketing applied to tourism.

The potential of neuromarketing to transform the tourism sector is undeniable. Its ability to uncover the unconscious processes that guide travelers' decisions offers unprecedented opportunities to design more satisfying experiences, more effective marketing campaigns, and tourism products better aligned with consumers' actual preferences. However, as this study shows, its implementation in Latin America requires overcoming significant structural barriers and adopting a pragmatic approach that considers the region's specific characteristics.

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AUTHORS' CONTRIBUTIONS, FUNDING AND ACKNOWLEDGMENTS

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Funding: The study has been developed as part of the project PS256LH001-002: Development and Competitiveness of the tourism product belonging to the Ministry of Tourism of the Republic of Cuba.

Conflict of interest: There are no conflicts of interest.

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ISSN: 1575-2844