

Survey as a Research Method in Neuromarketing: A Systematic Literature

Review

Mr. Urmil Ambaliya¹

Dr. Manish Sidhpuria²

¹ Research Scholar, VNSGU Surat

² Professor & Head Department of Business and Industrial Management, V.N.S.G.U., Surat

ABSTRACT

Neuromarketing is an interdisciplinary domain that integrates neuroscience, psychology, and consumer behavior to understand conscious and unconscious processes driving consumer decisions. This paper systematically reviews neuromarketing methods: neurological, physiological, psychological, behavioral, and self-report approaches, with a special emphasis on surveys for rapid, scalable, and cost-efficient capture of explicit consumer perceptions. While surveys remain the stalwart method for conscious attitude measurement across large populations, they are fraught with issues of bias and inability to tap into subconscious processes. This review points out strengths and weaknesses of various neuromarketing tools and positions survey methods as crucial but only pragmatically combined with biometric/neurological techniques for holistic understanding in consumer behavior.

Keywords: neuromarketing, survey methods, physiological measures, behavioural measures, consumer decision-making, neuroimaging.

INTRODUCTION

Contemporary consumer research recognizes that both conscious reasoning and automatic unconscious processes determine how consumers make purchase decisions. Surveys, interviews, and focus groups represent traditional approaches that provide a scalable means of capturing explicit consumer attitudes, but these approaches all too often miss subconscious influences underlying purchase decisions. As Malhotra et al. state, "The subconscious mind plays an important role when it comes to the consumer buying process" (2004). Neuromarketing developed as an interdisciplinary field of study at the crossroads of neuroscience, psychology, and marketing to understand the implicit processes underlying consumer reaction.

While sophisticated approaches like fMRI, EEG, MEG, eye-tracking, and biometric sensors offer deeper insights into emotional and cognitive mechanisms, these methods are often expensive, technically complicated, and low in ecological validity. By contrast, questionnaires remain the most widely adopted tool in consumer research due to their affordability, simplicity, and effectiveness for gathering large-scale data.

The present review aims at a systematic overview of the major neuromarketing techniques, focusing on their usefulness, limits, and application contexts. In particular, this paper focuses on the role of questionnaires as a fast neuromarketing technique and calls for methodological integration that overcomes the individual limitations.

LITERATURE REVIEW

(Neurophysiological) Brain Imaging Techniques(Neuroimaging) (Directly measure or influence brain activity)

These methods directly measure or influence brain activity to understand how consumers process information. They help reveal the cognitive, emotional, and reward-related

responses that cannot be captured through self-report. Researchers use these tools to study subconscious reactions during decision making, attention, and valuation.

(Neurological Measures)Recording Metabolic Activities in Brain

It involves increased blood flow, oxygenation, glucose metabolism but is slow and deep. These techniques track slow but deep brain processes through blood flow, oxygen levels, and glucose use. They help identify which brain regions are engaged during preferences, pricing judgments, or ad exposure. Their strength lies in detailed spatial insight, although they tend to be costly and less naturalistic.

Neurological tools directly measure brain functions in order to assess consumer responses.

fMRI has high spatial resolution and is widely used to examine valuation and emotional processing but suffers from high cost and low temporal resolution (Plassmann et al., 2007).

Vestergaard and Schultz (2020) McClure et al. (2004) Fehse et al. (2017) .

PET provides a measure of metabolic activity and neurotransmitter function, which, although invasive, is not practical for consumer studies of flavor preference and perception.

Thomas (2023) and Narayanan and Praveen (2020)

fNIRS is portable and low cost for real-world experiments, but again is limited to cortical regions. Çakir et al., 2018

DTI studies by Viswanath 2012 and Zhang et al. 2021 mapped white-matter connectivity, which functional tools fail to show.

CT work described by Wright 2009–2010 provided fast structural imaging at low costs.

Wright (2010)

X-ray studies, such as that by Dyer et al. (2016), have focused on basic anatomical mapping.

MRA was used to study vascular structure without radiation and is covered in clinical sources over the years 2018 to 2025. Anzai et al. (2018).

Note that Researchers employed metabolic and electrical, as well as hemodynamic, brain imaging techniques like fMRI, PET, fNIRS, EEG, DTI, CT, and MRA because they are different from the surveys and behavioral techniques in many ways in such a way that these are deep, hidden neural processes. These tools find subconscious preferences and biases, emotional drivers, and neural pathways with high spatial or biochemical precision which traditional self-reports often distort due to bias, memory limits, or social desirability.

Recording Electrical Activities in Brain

These methods capture rapid electrical signals that reflect immediate cognitive and emotional responses. They are useful for studying attention, memory encoding, and moment-to-moment engagement with marketing stimuli. They offer high speed and portability, though they provide limited spatial precision.

EEG provides temporal resolution at the millisecond level and is useful to measure engagement and emotional responses; however, the provided spatial resolution is poor (Vecchiato et al., 2011). Khushaba et al. (2013)Vecchiato et al. (2012)Ohme et al. (2010)

MEG combines temporal and spatial accuracy but remains expensive for marketing applications.Babiloni et al. (2012)Vecchiato et al. (2011)

The Steady State Topography, **SST**, can cater for the continuous tracking of neural responses in commercials, as has been illustrated by Dimpfel in 2015 with his work combining the EEG and eye tracking-thus a different line from the fMRI and PET approaches.Silberstein and Nield (2008)

Activation of the **mPFC** indicates that health messages and crowdfunding are predictively successful, as evidenced by studies from Falk et al. (2012) and Genevsky and Knutson (2015);

MPR memory research by Phelps (2004) and McClure et al. (2004) pointed to the interconnection between emotional and brand memory in their impact on future decisions; deCharms (2005) and Sitaram et al. (2017) conducted **neurofeedback** research on self-regulation methods.

Neuroaesthetic research by Chatterjee and Vartanian (2014) and branding research by Mizuno et al. (2020) underlines how aesthetics and beauty are connected to the rewarding brain.

Field-based marketing research has employed **wearable** EEG technology (Lin et al. 2018, Pereira et al. 2018), and **hyperscanning** has gone a step further by providing insights into group-level brain synchrony impossible to achieve with single-brain measurements. Cui et al. (2012) and Dumas et al. (2010)

Note: Scientists used fast electrical-activity technologies like EEG, MEG, SST, mPFC tracking, neurofeedback, wearables, and hyperscanning, because these show in real time the attention, emotion, memory encoding, and group synchrony people can't accurately report. These neural signals uncover instant subconscious reactions beyond what biased, limited-recall surveys and behavioral tests can ever capture-and behind the gap between what people say and their brains really respond to.

Non-Neuroimaging / Non-Brain Imaging Techniques

These tools influence or monitor brain function without producing brain images. They are used to test causal mechanisms in decision processes or study digital behavior in natural

environments. Their value lies in affordability and real-world application, though some techniques may feel artificial to participants.

(Transcranial Magnetic Stimulation) Luber et al., 2007: TMS disrupted prefrontal cortex to study consumer decision-making. Camprodon et al., 2009 : Used TMS to explore causal roles of brain areas in cognitive tasks. Stimulates or inhibits targeted brain region to provide causal evidence. The fMRI/EEG techniques offer only correlational information, whereas PET is invasive.

Neuro-Information Systems (NeuroIS) Dimoka 2012: used NeuroIS to study trust and emotion in online commerce ; Riedl et al. 2010: explained how NeuroIS can enrich IS research with neuroscience tools. Combining methods from neuroscience with information systems to research the UX, trust, and online decision-making - what is not caught by traditional marketing surveys is unconscious cognitive and emotional drivers.

Psychophysiological

These methods look into bodily responses that best represent emotional, cognitive, and sensory reactions. They can help in the measurement of altered attention, arousal, and mood during the use of some product or exposure to media. They will be helpful in connecting physiological activity with the results of marketing, such as preference and engagement.

Physiological and Biometric Measures

It records signals such as eye movements, heart rate, sweat activity, and facial expressions. These methods are applied within the analysis of patterns of attention, emotional intensity, and immediate reactions. They can operate within natural or simulated contexts. However, neither of these methods is sensitive to the kind of information that differentiates motivational states with regard to direction or valence.

These are tools capture autonomic or bodily responses as indicators of attention, arousal, and emotional states.

Eye-tracking identifies the location of visual attention. Wedel and Pieters (2008) Orquin and Holmqvist (2010) Duchowski (2007) while Orquin and Loose (2013)

These techniques have been used to decipher micro-emotional expressions; examples include **facial coding and EMG**. Höfling et al. (2023) Sato et al. (2021) Lewinski et al. (2014) Cartocci et al. (2017) Cartocci et al. (2017), Larsen et al. (2003), Dimberg et al. (2000), and Coan and Allen (2007)

Skin conductance measures emotional arousal but cannot differentiate valence. Milstein et al. (2020) Bradley and Lang (2000) and Dawson et al. (2007), while Critchley (2002)

Wearables Sensors ECG track heart rate and stress responses in natural environments, although with a tendency to noise. Schuurmans et al. (2020), Kreibig (2010), Mendes et al. (2003), and Lu et al. (2008) **Myocardial Perfusion Reserve (MPR), Multimodal Physiological Response**. García-Madariaga et al. (2020), Srinivasan et al. (2016), Vecchiato et al. (2011), and Tredekamp et al. (2020) Lin et al. (2018), Pereira et al. (2018), and Sazonova et al. (2021)

Pupillometry research by Kang 2014, Bradley 2008, Shechter and Share 2020 and Zekveld 2010 suggest that the size of the pupil is an indicator of attention and cognitive load.

Research into **thermal imaging** by Kosonogov 2017, Pavlidis 2007, Ioannou 2014 and Copley 2005 shows that fluctuations within facial temperature denote differing states of arousal.

Research in **voice analysis** by García-Madariaga (2020), Ververidis and Kotropoulos (2006), Eyben (2016), and Wöllmer et al. (2013) indicates that vocal cues may give away emotional states in spontaneous speech.

Note that the research tools included eye tracking, facial coding, EMG, GSR, heart rate, respiration, pupillometry, thermal imaging, voice analysis, and wearable multimodal systems, all of which capture in real time emotional arousal, shifts in attention, and physical reactions that people cannot always explain or accurately report. These bodily signals reveal genuine moment-to-moment responses that surveys and behavioral measures miss due to memory gaps, biased answers, and the limits of observing only outward behavior.

Psychological & Sensory Measures

Comprehend the sensory drivers, narratives, ethics, and management applications. These techniques study how sensory cues, emotions, and memory build consumer experience. They deliberate on how sight, sound, smell, touch, and taste impact preference and brand loyalty. They are flexible and insightful but tend to rely more on conscious reporting, which can have inherent bias.

While **VR/AR and sensory testing** enable controlled experiential simulations, it raises problems in cost and scalability. Smink et al. (2019) Flavián et al. (2019)

Psychological Scales: The PANAS by Watson et al.(1988), NASA-TLX by Hart & Staveland (1988), STAI by Spielberger (1983), &POMS by McNair et al.(1992) are well established scales for assessing mood, stress, mental effort, respectively, in consumer behavior contexts. AI-powered Neurodesign: Affdex and Realeyes, for example, draw from the work of among others, Kulke et al.(2020) &Krumhuber et al.(2019), to show that **AI-Powered Neurodesign and Personalization** AI can estimate emotional responses at scale from facial and vocal cues.

Predictive **Neuro-Pricing:** Research by Plassmann et al. (2007) associates brain activity in the orbitofrontal cortex with purchasing intentions, while studies by Knutson et al. (2007)

and Berns and Moore (2012) explore the connection between neural activation and consumer decisions.

IoE-driven neuromarketing: Van Loon (2016) has demonstrated how IoE technologies are put to use to capture in real time physiological and behavioral data on the consumer experiences.

Neuromanagement and NeuroIS: Dimoka et al. (2012) show how the combination of neural signals with decision-making data leads to better understandings of trust and risk in digital commerce.

Neuroprivacy and Ethics;lenca and Andorno (2017) propose neurights to secure mental privacy due to increasingly growing brain-data technologies with related problems of consent and ownership.

Cross-Cultural & Social Neuroscience: Cui et al. (2012) find increased inter brain synchrony in cooperative situations; broader studies (2010–2020) emphasize cultural influences on neural responses tied to emotion and identity.

Note: The various methods of testing-Researchers apply sensory testing, psychological scales, AI emotion analytics, neuro-pricing models, IoE wearables, NeuroIS tools, and cultural neuroscience-because they are sensitive to real-time emotional, cognitive, and contextual reactions that people cannot adequately express or remember. These also uncovers subliminal drivers of perception, value, trust, and engagement, while surveys and behavioral measures fall short due to bias, guesswork, and the gap between what consumers say and what their minds and bodies actually do.

Other psychophysiological & Neurological

These techniques represent a mix of implicit cognition, behavior, and subjective reporting in a way to understand consumer thought. Complementing brain and biometric measures,

they capture the patterns of decisions and meaning-making. They help in the revelation of how emotions, biases, reasoning jointly drive marketplace choices.

Behavioral and Implicit Measures

Reveal subconscious attitudes, hidden biases, and cognitive speed. These methods tap into subconscious associations, hidden biases, and automatic reactions to brands or stimuli. They often rely on speed, accuracy, or priming effects as ways to indicate attitudes that are not overtly expressed. They are rapid and scalable but offer limited insight into the causes driving responses.

Implicit tools tap into automatic associations beyond conscious control.

Implicit Association Tests(IAT/ RIAT), response time tasks and priming , McGhee and Greenwald et al. 1998, that can measure subconscious attitudes to brands and stimuli. Tools are cheap scalable but suffer from design sensitivity and limited ecological validity Maison, Bruin 2001, Schwartz (1998), Kardes (1986) Dijksterhuis and Smith (2002) Fazio, Jackson, Dunton, and Williams (1995) Wentura and Degner (2010)

Survey and Self-Reporting Measures

Traditional + modern explicit approaches to consumer insight

These traditional tools involve the direct collection of conscious evaluations, beliefs, and intentions directly from the consumer.

They are versatile, cost-effective, and easy to administer across large populations. Their key weakness is their reliance upon self-awareness, which limits their ability to detect unconscious influences.

Questionnaires and Surveys

Surveys, interviews, focus groups, diaries, and self-assessment tools record explicit beliefs, attitudes, and intentions. They provide standardization and scalability but are sensitive to

recall bias, social desirability bias, and lack the ability to record unconscious processes. Nevertheless, the survey is an imperative tool for the measurement of conscious responses. Surveys present a good starting point for triangulating neuromarketing research. Podsakoff et al., 2003 De Leeuw, 2005 Krueger & Casey, 2015 Bolls, Lang, & Potter, 2001

Diaries and Experience Sampling

According to Csikszentmihalyi and Larson (1987), Experience Sampling Methods (ESM) enable the researcher to capture feelings and behaviors at the exact moment they occur in natural settings. Scollon, Kim-Prieto, and Diener (2003) cited high ecological validity for the above-mentioned methods, whereas Bolger, Davis, and Rafaeli (2003) quoted how diaries provide context that surveys miss. These methodologies yield naturalistic data but can be intrusive and onerous for the respondents.

Hybrid Neuro-Survey Tools: Biometric + Survey; Gamified Surveys; Conjoint Analysis; Best-Worst Scaling. Advanced tools such as conjoint analysis and Best-Worst Scaling allow for a better understanding of trade-offs that consumers make in their choices. Green and Srinivasan (1990) illustrated that conjoint analysis predicted consumer choice based on the features of competing products. Louviere, Flynn, and Marley (2015) illustrated how Best-Worst Scaling had provided clearer discrimination than standard rating scales. Wills and Tatar (2017) talked about gamified surveys, through which there is greater engagement and better response quality. These hybrid and choice-based tools provide explicit reporting with deeper behavioral patterns, although they are more resource-intensive than simple surveys.

METHODOLOGY

This paper applies a **systematic literature review** approach.

Objectives: include categorizing neuromarketing measures into neurological, physiological, psychological, and behavioral/self-report types, alongside evaluating their advantages, limitations, and applications in marketing research. The identified research **gaps:** highlight a tendency to study individual methods in isolation without cross-modal integration, a lag in field applications compared to controlled experiments, emerging cross-cultural studies lacking robust evidence, and underrepresentation of neuroprivacy and data ownership ethical concerns in empirical marketing research.

DATA SOURCES AND RESEARCH DESIGN

Observations

Peer-reviewed journals from the American Psychological Association, Elsevier, Wiley, Cambridge, Springer, Sage, and Frontiers publishing between 1980

This paper is a systematic review of scholarly journals for information on neuromarketing techniques using publishers like APA, Elsevier, or Wiley. These papers encompass both some of the earliest work as well as some of the latest developments that exist on neuromarketing techniques. This paper is limited to scholarly journals, using intentional **sampling** to select for literature related to marketing, psychology, neuroscience, or business that falls into either theoretical or methodology-based discussions related to literature that dates back to the 1980s until 2025.

Inclusion

Research employing neuromarketing techniques

Peer-reviewed empirical/conceptual papers

Since the,Research with methodological advancements in neuromarketing

Studies comparing or evaluating research instruments

Review Process

Purposeful sampling was employed to select articles dealing with brain imaging, physiological responses, psychological scales, behavioral observations, and surveys. These articles were then coded for their strengths, limitations, applications, and relative advantages.

DISCUSSION AND RESULTS

Neurological Tools versus Survey Methods

Neurological tools do indeed provide very granular insights into cognitive and emotional processes; however, they suffer from the following:

- High cost
- Low portability
- Very limited real-world application.
- Interpretation of complex information

While lacking neural precision, the strengths of surveys are:

- Large-scale reach
- Rapid administration
- Low operational cost
- Clear measurability of explicit attitudes

Type of Methods	Advantage	Limitations
<p>1. (Neurophysiological)</p> <p><i>Brain Imaging</i></p> <p><i>Techniques (Neuroimaging)</i></p>	<p>Deep neural insights</p>	<p>Expensive, low ecological validity</p>
<p>1.a. Metabolic Activity [e.g., MRA]:</p>	<p>Sharp images, non-invasive, clinically validated.</p>	<p>Expensive, time-consuming, not portable, main application: lab/hospital setting</p>
<p>1.b. Electrical Activity (e.g., EEG, MEG)</p>	<p>Real-time monitoring, portable, and cost-effective.</p>	<p>Poor spatial resolution; susceptible to noise, not tracking deep-brain activity.</p>
<p>2. Non-Neuroimaging, includes for example TMS or NeuroIS:</p>	<p>Investigates cause-effect relations, cheaper, and portable.</p>	<p>Aversive for participants, TMS requires sophisticated knowledge, NeuroIS.</p>
<p>3. Psychophysiological</p>	<p>Real emotional data in real time</p>	<p>Cannot capture motives</p>
<p>3.a. Physiological and Biometric Measures (e.g., Eye Tracking, Facial Coding)</p>	<p>Simple, affordable, measures where</p>	<p>Difficulty in interpreting emotional arousal, noisy data from wearables.</p>

	people focus, records emotional signals.	
3.b Psychological & Sensory Measures (e.g., VR/AR, Sensory Testing):	Immersive experiences, adaptive, affordable.	Disadvantages: High costs for VR, motion sickness, subjective biases in sensory testing.
4. Behavioural/Implicit	Biases not as obviously objectionable	Interpretational difficulties
5. Surveys/Questionnaires	Affordable and scalable	Cannot measure unconscious processes

(Compiled based on review of literature).

Thus, surveys remain the **quickest neuromarketing method** but must be paired with Psychological & physiological measures for comprehensive insight.

Quick Neuromarketing with Surveys method

The review elaborates on three arguments:

Scalability: Large populations are reached by surveys with efficiency and lower costs.

Agility/flexibility: The facility for rapid customization is available in online surveys, micro-surveys, and hybrid questionnaires.

Complementarity: Taken together-with biometric tools, for instance, GSR and survey-the predictive accuracy increases considerably.

Need for Methodological Integration

These findings reveal a gap in the sense that most studies assess one technique in isolation. Hybrid approaches incorporate combinations of survey data, eye-tracking, and fNIRS, thus providing, in fact, deeper insights into both conscious and unconscious drivers of consumer behavior.

CONCLUSION

Neuromarketing is the application of a number of technologies ranging from brain imaging and biometric sensors to psychological and behavioral measures. Each of the tools has distinct advantages, but none by itself is adequate for fully explaining consumer decision-making.

However, surveys are still the fastest and easiest way to measure explicit attitudes, and as such, they form the foundation of most neuromarketing studies. If one were to depend entirely upon questionnaires, little could be learned about the subconscious influences. The future of neuromarketing is multi-method integration; ecological validity will improve while the ethical, technological, and cultural challenges will be better addressed.

AREAS FOR FURTHER RESEARCH

There is Future studies should encompass areas such as:

- **Integrated Neuro-Survey Models:** How Surveys Can Be Coupled with EEG, GSR, or Eye Tracking.
- **Cross-Cultural Neuromarketing:** An Examination of Cultural Variations that Drive Variations in Brain Activity as
- **Applications of Ethics:** Building neuroprivacy guidelines, consent practices.
- **AI-Based Personalization:** An Examination of Explainable AI for Neuromarketing
- **Ecologically Valid Experiments:** Creating real-world environments for neuromarketing through the use of IoT and wear

- **Scalable VR/AR Systems:** Investigation of cost-efficient immersive research tools.

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