

**Neuroelectrical Responses of Consumers  
to Nostalgic Advertisements**

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By

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**CERTIFICATE**

This is to certify that this thesis entitled '*Neuroelectrical Responses of Consumers to Nostalgic Advertisements*' is a bonafide record of research work carried out by **Ms. Mona Arthi Efcibha M S**, under my supervision and guidance, and that no part of this has been presented before for the award of any degree, diploma, associateship or fellowship of other similar title or recognition.

Place: Kalaburagi

Date: 01-09-2025

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## DECLARATION

I, Mona Arthi Efcibha M S, do hereby declare that this thesis entitled "*Neuroelectrical Responses of Consumers to Nostalgic Advertisements*" is a bona fide record of the research work carried out by me under the supervision of Prof. Romate John, Department of Psychology, School of Social & Behavioural Sciences, Central University of Karnataka. I also declare that this thesis or any part of it has not been submitted to any other University for the award of a Ph.D. degree in Psychology. References borrowed from other sources have been duly acknowledged. I also declare that this thesis is free from plagiarism and is within an acceptable limit.

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## TABLE OF CONTENTS

---

Certificate	i
Declaration	ii
Acknowledgement	iii
List of Figures	ix
List of Tables	x
List of Abbreviations	xii
Abstract	xiii

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SI No.	Chapter Title	Page No
1	Chapter – 1 Introduction	1
	Conceptualisation of Nostalgia as a Psychological and Marketing Phenomenon	2
	Typology of Nostalgia in the Psychological and Marketing Context	4
	Psychological Impact of Nostalgia	5
	Impact of Nostalgic Advertisements on Consumer Behaviours	6
	Unexplored Dimensions of Nostalgic Advertisements	7
	Integrating Behavioural and Neuroscientific Insights in Nostalgic Advertising Research	8
	Need and Significance of the Study	10
2	Chapter – 2 Review of Literature	13
	Theoretical Review	14
	Empirical Review	19
	Research Gap	40
	Conceptual Framework	46
3	Chapter – 3 Method	51
	Aim	51

	Operational Definition of the Variables	52
	Research Questions	55
	Objectives	56
	Hypothesis	56
	Research Design	58
	Population and Sample	59
	Sampling	59
	Assessment Tools	61
	Procedure	63
	Ethical Considerations	67
	Data Analysis	68
4	Chapter – 4 Results	72
	Descriptive Statistics and Demographic Details of the Participants in the Study	72
	Psychometric Properties of the Assessment Tools	74
	Intercorrelation of the Variables in the Study	75
	Mediation Analysis	82
	Differences in the Outcome Variables between Nostalgic and Non-Nostalgic Advertisements	87
	Prediction of Consumer Responses from EEG Band Powers	92
5	Chapter-5 Discussion	102
	Relationship between Nostalgia, Consumer Responses, and EEG Markers	103
	Mediating Role of Advertisement Relevance	110
	Differences in Consumer Responses between Nostalgic and Non-Nostalgic Advertisements	112
	Differences in EEG Band Power Patterns between Nostalgic and Non-nostalgic Advertisements	117
	Predictive Value of EEG Features for Consumer Responses	122

6	Chapter – 6 Summary and Conclusion	128
	Summary	128
	Conclusion	131
	Implications	132
	Limitations of the Study and Avenues for Future Research	136
7	References	138
8	Appendices	164
	Appendix A: Informed Consent	164
	Appendix B: Sociodemographic Data Sheet	165
	Appendix C: Screening Form	166
	Appendix D: The Evoked Nostalgia Scale	167
	Appendix E: Attitude towards the Advertisement	168
	Appendix F: Attitude towards the Brand	169
	Appendix G: Purchase Intention	170
	Appendix H: Advertisement Relevance	171
	Appendix I: Instructions to participants	172
	Appendix J: Selection of Stimulus	173
	Appendix K: Pretesting of Stimulus	184

## LIST OF FIGURES

SI No.	Title	Page No.
1	Conceptualisation of the Mediation Model	48
2	Schematic Representation of the Practice Trial	66
3	Schematic Representation of the Main Experiment	67
4	The Mediating Function of Advertising Relevance in the Association between Purchase Intention and Ad-Evoked Nostalgia	83
5	The Mediating Function of Advertising Relevance in the Association between Attitude towards the Advertisement and Ad-Evoked Nostalgia	85
6	The Mediating Function of Advertising Relevance in the Association between Brand Attitude and Ad-Evoked Nostalgia	86

## LIST OF TABLES

Sl No.	Title	Page No.
1	Descriptive Statistics of the Participants' Age in the Main Study	72
2	Summary of the Sociodemographic Characteristics of the Participants	73
3	Psychometric Properties of Assessment Tools Used in the Study	74
4	Inter-Correlation of the Difference Scores between Nostalgic and Non-Nostalgic Advertisements	75
5	Inter-Correlation of Variables for the Nostalgic Advertisement	78
6	Inter-Correlation of Variables for the Non-Nostalgic Advertisement	81
7	The Mediating Function of Advertising Relevance in the Association between Purchase Intention and Ad-Evoked Nostalgia	82
8	The Mediating Function of Advertising Relevance in the Association between Attitude towards the Advertisement and Ad-Evoked Nostalgia	84
9	The Mediating Function of Advertising Relevance in the Association between Brand Attitude and Ad-Evoked Nostalgia	85
10	Comparison of the Ad-Evoked Nostalgia Scores between Nostalgic and Non-Nostalgic Advertisements using Paired Samples t Test	87
11	Comparison of the differences in outcome variables between Nostalgic and Non-Nostalgic Advertisements using Paired Samples t Test	88
12	LOOCV Regression Performance Metrics for SVM and Baseline Models Predicting Consumer Response	92
13	Bootstrap RMSE Mean and 95% Confidence Intervals for Consumer Response Variables	94
14	LOOCV Permutation Feature Importance (%) for Predicting Purchase Intention (PI)	95

15	LOOCV Permutation Feature Importance (%) for Predicting Attitude toward the Advertisement	96
16	LOOCV Permutation Feature Importance (%) for Predicting Attitude toward the Brand (Aab)	97
17	LOOCV Permutation Feature Importance (%) for Predicting Advertisement Relevance	99
18	LOOCV Permutation Feature Importance (%) for Predicting Time to Skip	100

## LIST OF ABBREVIATIONS

Abbreviations	Terms
EEG	Electroencephalography
Aad	Attitude towards the Advertisement
Aab	Attitude towards the Brand
PI	Purchase Intention
Ad-Rel	Advertisement relevance
mPFC	medial prefrontal cortex
PCC	posterior cingulate cortex
U.S	United States
FTP	future time perspective
fMRI	Functional Magnetic Resonance Imaging
ERN	Event Related Negativity
EMA	Ecological Momentary Assessment
ANN	Artificial Neural Networks
HRV	heart rate variability
ET	eye tracking
ECG	Electrocardiogram
SVM	Support Vector Machine
LOOCV	Leave One Out Cross-Validation
FAA	frontal alpha asymmetry
Hz	Hertz
FFT	Fast Fourier Transform
RBF	radial basis function
RMSE	Root Mean Square Error

## Abstract

Nostalgic advertisements utilise imagery and products from bygone eras to establish emotional connections, thereby significantly increasing brand loyalty, purchase intention, and favourable attitudes toward advertisements and products. Although nostalgia has become a prevalent marketing strategy, the neurophysiological mechanisms that underlie its impact are not sufficiently investigated. The objective of this study was to investigate the neuroelectrical responses of consumers to nostalgic advertisements and to analyse the ways in which nostalgia influences attitudes, intentions, perceived relevance, and ad-skipping behaviours. Furthermore, the investigation aims to evaluate the potential of EEG-derived neural markers to predict consumer responses. In a within-subjects experiment, 67 Indian university students were observed as they viewed ten nostalgic and ten contemporary advertisements. Their brain activity was monitored using a 64-channel EEG. Participants reported their attitudes, purchase intentions, nostalgia, and relevance of the advertisement following each advertisement. The time taken to skip the advertisement was used to measure behavioural engagement. The results of the mediation analysis revealed that the persuasive power of nostalgia is primarily derived from perceived relevance. Specifically, the effects of ad-evoked nostalgia on brand attitude were fully mediated by ad relevance, while its effects on advertising attitude and purchase intention were partially mediated. In contrast to non-nostalgic advertisements, nostalgic advertisements significantly increased self-reported nostalgia, positive attitudes, purchase intention, and perceived relevance. However, they did not significantly reduce ad-skipping behaviour. The enhanced consumer attitudes, purchase intentions, and advertisement relevance reported in nostalgic advertisement exposure are

mirrored by neural patterns of increased attentional engagement and emotional processing. EEG analysis demonstrated that nostalgic advertisements resulted in substantial desynchronization (decreases) in alpha, beta, and theta power in the frontal, temporal, central, and parietal brain regions. This pattern substantiates the fluid retrieval of significant memories that are elicited by nostalgic content, as well as the assimilation of emotions and the deeper cognitive and sensory processing. SVM regression predictive modelling demonstrated that EEG features meaningfully predicted immediate consumer responses, particularly attitudes and relevance, over distal outcomes such as purchase intention and advertisement avoidance, despite their modest effect. It is important to note that temporal theta was the most effective predictor of advertisement skipping, while central theta predicted brand attitude, and parietal alpha predicted attitudes toward advertising. The findings emphasise that nostalgic advertising is most effective when it incorporates personally relevant, emotionally salient signals from the target audience's formative years. Although nostalgia significantly enhances evaluative responses, its influence on behavioural avoidance, such as advertisement skipping, is restricted, underscoring the necessity of integrative engagement strategies. They also demonstrate that neural signals can facilitate more personalised, data-driven marketing strategies.

*Keywords:* nostalgic advertising, neuroelectrical responses, consumer attitudes, advertisement relevance, EEG-based prediction

# CHAPTER 1

## INTRODUCTION

Advertisement, originating from the Latin word “advertere”, meaning “to turn one’s attention towards”, has emerged as the most important communication tool that shapes consumer responses (Danesi, 2015; Rehman et al., 2019). It helps in capturing the attention of consumers towards the brand, product or service.

Advertisements are a primary tool for communicating a brand's message, engaging customers, and driving sales (Kotler & Keller, 2016). Global advertising expenditure was projected to exceed 1.16 trillion U.S dollars in 2025, with digital advertising accounting for a significant portion of the spending (McDonald, 2025). Despite this investment, consumer engagement remains limited. Studies show that only 35% of digital display advertisements are viewed, and just 9% are watched for over a few seconds (Jefferson, 2023; Sutcliffe, 2023). In the current digital landscape, with the proliferation of advertisements across all media, including print, audio and video, consumers are saturated. While advertisements are designed to engage the target audience, consumers have become resistant to them. These statistics underscore the need for more compelling and engaging advertisements to enhance effectiveness.

Marketers use various strategies in advertisements. Advertisement appeals are strategies to capture the audience's attention and influence their thoughts, emotions or behaviours toward a product or service. These appeals are designed to resonate with consumers psychologically or emotionally, making the advertisements more persuasive and memorable. Common types of advertisement appeals include emotional appeal, which evokes feelings like nostalgia, love, or fear to create deeper connections (Rossiter & Bellman, 2005), Rational Appeal, which highlights logical benefits like price and quality (Kotler & Keller, 2016) and Celebrity Appeal, which

leverages famous personalities for credibility and influence (McCracken, 1989). Among these, emotional appeal is the most widely used in advertisements. It effectively creates a strong connection with consumers by tapping into their feelings, such as happiness, nostalgia, fear, or excitement. Emotional appeals are often more memorable and persuasive, making them a go-to strategy for building brand loyalty and fostering long-term relationships (Rossiter & Bellman, 2005).

Due to its capacity to elicit powerful emotional responses and impact consumer behaviour, nostalgia advertising has emerged as a key marketing tactic. Advertisements that evoke happy recollections of the past have been demonstrated to improve brand perceptions, enhance emotional engagement, and have a positive effect on purchase intentions (Ju, Kim, Chang et al., 2016; Muehling & Pascal, 2012). Thus, it is imperative to understand nostalgia as a psychological phenomenon to get a deeper insight into the functional mechanism of nostalgia and how it influences behaviour.

### **Conceptualisation of Nostalgia as a Psychological and Marketing Phenomenon**

Nostalgia is defined as "a sentimental longing or wistful affection for the past, in the New Oxford Dictionary of English (1998). The word "nostalgia" was initially used by the Swiss physician Johannes Hofer (1688/1934). It is an amalgamation of the Greek word "nostos" and "algos," which signify agony and to return home, respectively. Although initially considered a medical condition characterised by physical and psychological symptoms such as blood pressure and hopelessness by Hofer (1688/1934), nostalgia as a concept evolved over centuries.

In the late 19<sup>th</sup> and early 20<sup>th</sup> centuries, it was seen as a mental illness with symptoms including depression and anxiety (Batcho, 1998), but by the middle of the

20<sup>th</sup> century, it was more commonly referred to as homesickness. In the late 20<sup>th</sup> century, it diverged further and was no longer equated with homesickness but had a unique conceptual standing (Özdemir, 2025). Nostalgia is associated with warm recollections, fond memories of the past, the sentiment of the "good old days," reflections on childhood, and joyful moments gone by (Davis, 1979). In contrast, homesickness was linked with insecurity and separation anxiety (Fisher, 1989; Stroebe et al., 2002). Furthermore, while homesickness typically pertains to an individual's hometown, nostalgia incorporates a broader array of experiences and memories (Özdemir, 2025).

Currently, nostalgia is defined as a widespread sentimental longing or affectionate desire for the past, a particular location or period connected to pleasant personal recollections. This definition reflects the widespread sentiment that nostalgia is a feeling experienced by almost everyone on a frequent basis (Boym, 2001; Özdemir, 2025).

Holbrook and Schindler (1991, p. 330) pioneered in defining nostalgia within the marketing context as “a preference (general liking, positive attitude, or favourable affect) toward objects (people, places, or things) that were more common (popular, fashionable, widely circulated) when one was younger (in early adulthood, in adolescence, in childhood, or even before birth)”. Particularly, they concentrated on object preferences as opposed to the memories such objects evoked. Nostalgia in the marketing context incorporates multiple strategies such as reintroducing vintage products, traditional packaging, using nostalgic cues such as old songs, jingles, and visuals and adopting storytelling that resonates with one's childhood or past. Stern (1992) further expanded on this concept in advertising by introducing and analysing two types of nostalgia: personal and historical.

## **Typology of Nostalgia in the Psychological and Marketing Context**

Nostalgia has been classified into various types depending on the temporal salience, cognitive effort, attitude and processes involved.

### ***The Three Orders of Nostalgia***

Davis (1979), in his book 'Yearning for Yesterday,' proposed three orders or levels of nostalgia based on the amount of cognitive effort involved. The three levels include simple nostalgia (first order), reflexive nostalgia (second order) and the interpreted nostalgia (third order). Simple nostalgia is the most fundamental type of nostalgia in which a person yearns to go back in time because they feel that it was better. This involves an uncritical examination and romanticising of the past. At the reflexive level, individuals critically examine the memories of the past and analyse whether the past was actually wonderful. Interpreted nostalgia involves the highest level of cognitive processing, where the individuals advance from a mere critical examination of the past to interpreting how this past reflects in their present life. Collectively, this typology provides a broad spectrum through which individuals process nostalgic experiences.

### ***Two Dimensions of Nostalgia***

Holak and Havlena (1998) organise nostalgia across two dimensions, including (a) direct or indirect nostalgia and (b) individual or collective nostalgia. Direct nostalgia is elicited by people, experiences and memories from one's lifetime. It is also known as personal, lived or true nostalgia. Indirect nostalgia refers to nostalgia for a time in the past that one has not lived through. It is also referred to as historical, vicarious or learned nostalgia (Sierra & McQuitty, 2007). Individual nostalgia refers to the nostalgia experienced by an individual, whereas collective

nostalgia refers to the nostalgia experienced by a group that often shares a common cultural or historical past. Both Individual and collective nostalgia could be personal, historical or vicarious in nature.

### ***Reflective and Restorative Nostalgia***

In the book 'The Future of Nostalgia', Boym (2001) categorises nostalgia as restorative or reflective depending on the attitude of the individuals towards nostalgia. Restorative nostalgia refers to the desire to rebuild or relive the past. This is marked by a lack of acceptance that the past is in the past, and individuals aim to reconstruct it in their present lives. Reflective nostalgia, on the other hand, does not focus on rebuilding the past. It involves recollecting memories from the past accompanied by feelings of joy or sadness. It is characterised by the acceptance that the past is irretrievable.

Advertisers and marketers strategically employ techniques that elicit different kinds of nostalgia and, in turn, shape consumer behaviour. Nostalgia is widely used in advertising due to its potential positive impact on individuals and consumer behaviour.

### **Psychological Impact of Nostalgia**

Nostalgia can improve the psychological health of individuals (Özdemir, 2025), ranging across a broader spectrum. Nostalgia is considered a self-regulatory psychological resource. It enhances psychological well-being by eliciting positive emotions, enhancing self-esteem and self-continuity (Sedikides et al., 2014). It also enhances social well-being by improving social connectedness, attachment security and prosocial behaviour (Juhl & Biskas, 2023). The results of recent studies and meta-analyses indicate that the effects of nostalgia extend beyond the university-age

cohorts often studied in previous research to more vulnerable groups. Frankenbach et al. (2020) reveal that even for those with significant levels of neuroticism, nostalgia was beneficial. Similarly, Wohl et al. (2018) found that among individuals with severe addiction, nostalgia enhanced intention to quit when perceived self-discontinuity was high. Additionally, Wildschut et al. (2019) found that nostalgia had a beneficial impact among refugees. Positive consumer behaviours are frequently a result of nostalgia's beneficial effects on people's psychological and social well-being.

### **Impact of Nostalgic Advertisements on Consumer Behaviours**

Nostalgia exerts a notable influence on consumer behaviour, affecting purchase decisions across a range of products and services, including automobiles, perfumes, tea, food, movies, songs, arts, entertainment, and even prosocial behaviours (Brown et al., 2003; Lambert-Pandraud & Laurent, 2010; Batcho, 2007; Schindler & Holbrook, 2003; Holak et al., 2008; Loveland et al., 2010; Merchant et al., 2011). Research into the effect of nostalgic advertisements on consumer attitudes and behaviours reveals compelling insights.

For instance, Ju, Kim, Chang et al. (2016) demonstrated that nostalgic advertisements engender positive brand attitudes and purchase intent. They also showed that the association between brand attitude and nostalgic advertisements is partially mediated by perceived self-continuity. Adding to this, Cheng & Yan (2022) verified in a meta-analytic evaluation that people find advertisements with nostalgia are more convincing than ones without. Muehling and Pascal (2012) delved into why nostalgic advertisements evoke more favourable consumer responses, finding that they trigger self-reflection and involvement in the advertisement. They noted that personal nostalgia, evoking past personal experiences, is particularly effective in this

regard. Moreover, Muehling et al. (2014) investigated how previous brand associations affected consumers' responses to advertisements with a nostalgic theme, emphasising that nostalgia had a greater effect on people who have a personal connection to the brand being promoted. Collectively, the existing literature provides compelling evidence that nostalgia is potent in driving positive consumer behaviour.

### **Unexplored Dimensions of Nostalgic Advertisements**

Although the current evidence supports the positive influence of nostalgia on consumer behaviour, there are numerous limitations. The current literature primarily relies on artificially generated advertisements for fictitious brands, which may not accurately represent the genuine nostalgic responses to the advertisement.

Advertisements from the study population's childhood and early adolescence may be particularly effective in inciting personal nostalgia, as nostalgia is characterised by its strong, autobiographical nature. Academic research has yet to investigate the extent to which consumer behaviour is influenced by exposure to advertisements during childhood.

Although nostalgia is defined by memories that are personal and relevant to each individual, the current literature fails to adequately investigate the role of advertisement relevance in nostalgic advertisements and its impact on consumer reactions.

Advertisers have implemented innovative strategies and utilised a variety of sensory modalities to interact with consumers in the realm of digital media. Static print advertisements have been the primary focus of existing research, which is inconsistent with the dynamic character of contemporary advertisements. The influence of various sensory modalities employed in nostalgic advertisements has yet to be investigated.

Attitude toward advertisements, brand attitude, and purchase intention are consumer behaviour outcomes that have been consistently evaluated in the existing literature. Although the current research has investigated the differential effects of nostalgic advertising on these consumer responses (Aad, Aab, and PI) in relation to type, mediators, moderators, product, and industry, it fails to evaluate a comprehensive range of consumer responses. In order to gain a comprehensive understanding of the impact of nostalgic advertisements, it is essential to investigate a wide variety of consumer reactions.

### **Integrating Behavioural and Neuroscientific Insights in Nostalgic Advertising**

Advertising interactivity has fundamentally altered the manner in which consumers interact with advertisements in the modern digital era. Advertisement interactivity is the capacity of the consumer to interact with the advertisement in a manner that is meaningful. It is a two-way communication process between the advertiser or advertisement and the ultimate consumers (Tan et al., 2013). This interaction is evident in the technology-driven landscape through the actions of liking, sharing, and skimming advertisements. Despite the growing importance of nostalgia advertisements, advertisement interactivity remains understudied. The skippable advertisement format is one of the most prevalent forms of advertisement interactivity. While this interactive format provides consumers with the autonomy to either view or disregard the advertisement, it also presents advertisers with the challenge of developing strategies that effectively captivate and maintain consumers' attention without allowing them to skip the advertisement. According to existing evidence, advertisements that evoke an emotional response are more likely to be viewed by consumers and are less likely to be disregarded (Teixeira et al., 2012). An effective strategy that could result in increased engagement and, as a result, a

reduction in advertisement skipping behaviour is the use of nostalgic advertisements that focus on the consumer's emotions. The impact of nostalgia on consumer responses has been largely confirmed by the existing nostalgic advertisement literature, which employs self-report measures. The application of nostalgic advertisements to a real-world scenario could be expanded by investigating a behavioural dimension, such as advertisement skipping. The utilisation of neurophysiological measurements in advertising research is another rapidly expanding trend that offers a more profound understanding of consumers' automatic and subliminal responses to advertisements. Neuromarketing is of particular significance, as it integrates the disciplines of neuroscience, psychology, and marketing to comprehend consumer behavior. The objective of neuromarketing is to comprehend consumer behavior by analyzing the neural responses that are associated with it (Morin, 2011). The underlying neural mechanism of the psychological impact of nostalgic advertisements remains unexplored, despite the extensive research on the subject (Mukhopadhyay, 2024).

A neuromarketing research instrument that is frequently implemented is electroencephalography (EEG). It provides an exceptional temporal resolution for the analysis of neural responses and captures real-time electrical activity in the brain. Neural markers that are linked to attention, affective engagement, decision-making, and memory retrieval have been identified in existing research. These markers are essential for the effectiveness of advertisements. Research can provide neural evidence of the impact of nostalgic advertisements by utilizing EEG to comprehend consumer responses in the context of nostalgic advertisements. Furthermore, the neuro-electrical data can be used to predict consumer responses by combining EEG

with machine learning techniques. This enables advertisers to implement advertising strategies that are informed by data.

### **Need and Significance of the Study**

As noted by Crespo-Pereira et al. (2021), nostalgia is incorporated into approximately 10% of television advertisements in the United States, which include music, visuals, and narrative. A comparable trend has been observed in other countries, such as the United Kingdom, Russia, and India, where nostalgic signals have been increasingly employed in advertisements for their engaging effects (Merchant & Rose, 2013; Srivastava et al., 2017). Additionally, businesses and advertisers are compelled to identify and create the most captivating advertisements that promote positive client engagement behaviours and discourage avoidance behaviours in response to the growing expenditure on advertising. This effect may be induced by nostalgic advertisements, which are emotionally charged and frequently utilized. The existing evidence has several limitations, as previously mentioned, despite its status as a powerful persuasive instrument.

The current study addresses a few gaps in the extant nostalgic advertisement literature. The study aims to establish ecological validity for the impact of nostalgic advertisements by utilising advertisements from the participants' childhood and early adolescence for nostalgia induction and comparing them to the impact of contemporary advertisements. Furthermore, the current study investigates the impact of nostalgic advertisements on the behaviour of skipping advertisements. This broadens the evidence regarding the influence of nostalgic advertisements on consumer behavioural responses. In addition, the study aims to expand the theoretical, particularly neuroscientific, understanding of nostalgia and nostalgic advertisements by investigating the underlying neural mechanisms of consumer responses to

nostalgic advertisements. The study offers data-driven evidence for the influence of nostalgia on consumers by utilising EEG-based machine learning to predict consumer responses.

The investigation is noteworthy in numerous respects. It theoretically enhances comprehension of nostalgia in advertising psychology and its influence on the act of skipping advertisements. It also contributes to consumer neuroscience by establishing a connection between nostalgia and EEG-based neural markers of engagement and decision-making. The results can be applied to the design of effective nostalgia-based campaigns that maximise engagement and minimise advertisement avoidance, thereby assisting advertisers and marketers. Furthermore, the application of EEG data to the development of machine learning models provides a data-driven approach to predicting consumer responses, which can be incorporated into personalised advertising strategies.

In order to facilitate comprehension, the current thesis is divided into six primary sections: Introduction, Review of Literature, Methods, Results, Discussion, Summary, and Conclusion. The introduction chapter offers a succinct summary of the current investigation's significance and the problem statement. The Review of Literature offers a comprehensive examination of the pertinent empirical and theoretical research on the variables under investigation, as well as the identification of gaps and potential areas for future research. In addition, it establishes a conceptual framework for the current investigation, which serves as a robust empirical and theoretical base. The research design, description of variables and tools, detailed description of the sample, procedures employed for data collection, ethical issues, and statistical techniques are all detailed in Chapter Three, Method. The results chapter provides a comprehensive explanation of the findings and data analysis. The results

obtained by the present study are substantially supported by the empirical evidence presented in the discussion. The study's primary conclusions, consequences, limitations, and recommendations for further research are summarized in the chapter, conclusion, and summary.

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## **CHAPTER 2**

### **REVIEW OF LITERATURE**

Review of Literature refers to the critical examination of existing research in a specific research topic (Creswell, 2018). It helps in synthesising the current knowledge in the field and identifying gaps in the existing literature. This helps in formulating new research that addresses the existing gaps. The present review chapter outlines the theoretical foundations and empirical evidence of nostalgia and consumer responses. The theoretical review includes the various theories and models of nostalgia and consumer behaviour under consideration in the present study. The empirical review critically examines the empirical evidence related to nostalgic advertisements, advertisement relevance, advertisement skipping and consumer responses. Given the paucity in literature on the neurophysiological underpinnings related to nostalgic advertisement, empirical evidence on the neurophysiological correlates of nostalgia and EEG-based prediction of consumers' responses is examined systematically. The empirical review by examining the impact of nostalgic advertisement on consumer responses highlights the methodology adopted, characteristics of participants recruited, analysis techniques employed, outcomes assessed, the findings and implications, along with limitations. By integrating the theoretical and empirical evidence, the review not only gives a broad overview of the research area but also illuminates the gaps identified in previous literature. This helps to justify the objectives of the present investigation, formulate appropriate research questions, and adopt a robust methodology in the present study that is strongly grounded in existing evidence. The review is organised into four main parts, including theoretical review, empirical review, research gaps and conceptual framework.

## **Theoretical Review**

The theoretical review critically outlines the existing theories and models related to nostalgia and consumer behaviour. In doing so, the review provides conceptual clarity and grounds the present study in the existing theoretical framework. The major theories and models of nostalgia include the Regulatory Model of Nostalgia by Wildschut and Sedikides (2022), the Cognitive Processing Model of Nostalgia (Cao, 2024), the Schematic Neural Model of Nostalgia (Kikuchi & Noriuchi, 2017) and the three-stage process model of nostalgia marketing (Cui, 2015). The major theories of consumer responses include the Affect Transfer Hypothesis (Batra & Ray, 1986), the Expectancy Value Model (Fishbein & Ajzen, 1975), the Meaning Transfer Framework by McCracken (1989), the Self-referencing theory (Rogers et al., 1977), the Motivated Attention Theory (Lang, 2006), the Hierarchy of Effects Model by Lavidge and Steiner (1961) and the Advertising Avoidance Model by Cho and Cheon (2004).

### ***Nostalgia***

**Regulatory Model of Nostalgia.** The ‘Regulatory Model of Nostalgia’ was developed by Wildschut and Sedikides (2022). This model positions nostalgia as a self-regulatory resource. In the face of adversity, nostalgia acts as a self-regulatory mechanism that helps to maintain psychological well-being. The model outlines a cyclical process of nostalgia, including an adverse event, nostalgic reverie and current state. According to the model, when individuals face adverse events such as loneliness or meaninglessness, it triggers nostalgic memories, which consequently diminishes the negative impact of the adverse events. Through his cyclical process, nostalgia

helps to maintain homeostasis by regulating the negative consequences of an adverse event.

**Cognitive Processing Model of Nostalgia.** The Cognitive Processing Model of Nostalgia was developed by Cao (2024). This model posits nostalgia as an affective cognitive process and not merely as a sentimental emotion. There are three major components in this model, including triggers, cognitive strategies and outcomes. According to this model, nostalgia is often triggered by difficult situations such as a perceived lack of social support or a diminished sense of belonging. Once triggered, nostalgia mainly operates by employing two cognitive strategies, which include distancing and idealisation. While distancing involves mentally retreating to the past, idealisation helps by transforming the past into an ideal world, thereby offering emotional security from the trigger. By employing such cognitive strategies, nostalgia helps individuals to soothe the psychological wounds and navigate the emotional challenges.

**Schematic Neural Model of Nostalgia.** This model, formulated by Kikuchi and Noriuchi (2017), explains in detail the brain regions involved and mechanisms of nostalgia. It posits nostalgia as a complex emotional state that involves multiple components of the brain, including memory, attention, emotional regulation and reward processing systems. The brain regions that are activated during nostalgic experience include the medial prefrontal cortex (mPFC), associated with emotion regulation and self-referential thinking, hippocampus, related to autobiographical memory, posterior cingulate cortex (PCC) and the praecuneus, associated with self-related processing and episodic memory. Other brain regions associated with nostalgic reverie include the ventral striatum, nucleus accumbens, amygdala and

insula, which are related to emotions and reward processing. In sum, the model positions nostalgia as a deeply social and emotionally rich experience that involves a distributed neural network involving memory, affect, self-processing, and reward systems.

### *Nostalgic Advertising*

**The Three-Stage Process Model of Nostalgia Marketing.** This model was established by Cui (2015), who conceptualised nostalgia-related consumer response as progressing through three key phases. This includes emotional reaction, cognitive reaction, and behavioural reaction to nostalgic marketing cues. According to this model, when individuals are exposed to nostalgic elements in the advertisement, it elicits an emotional reaction such as warmth and longing. This emotional arousal in turn influences the cognitive reactions towards the nostalgic advertisement, product and the brand. Here, due to the nostalgic undertone of the advertisements, consumers favourably evaluate the advertisement and the brand. The combined emotional and cognitive reactions translate into behavioural reactions wherein individuals engage in behaviour that favours the brand. The foundational premise of this model is that nostalgia fulfils the psychological needs of the consumers, which in turn motivates them to engage in actions that benefit the brand.

### *Attitude Towards the Advertisement (Aad)*

**Affect Transfer Hypothesis.** This hypothesis was initially proposed by Batra and Ray (1986). According to this hypothesis, the emotional responses towards the advertisement get transferred to the evaluations of the advertisement. In the context of nostalgic advertisements, the positive affect, such as warmth and joy, elicited by such

advertisements eventually influences the evaluative judgments about the advertisements. In other words, nostalgic advertisements elicit positive emotions, which in turn influence the attitude towards the advertisement (Aad).

### ***Attitude Toward the Brand (Aab)***

**Expectancy Value Models.** This model, proposed by Fishbein and Ajzen (1975), posits that attitudes towards the brand are formed through consumers' beliefs that the brand possesses certain attributes that are of value to them. Nostalgia proneness, the inherent tendency to feel nostalgic, could place greater value on nostalgic appeals in advertisements. This enhanced perception of value could lead to a favourable brand attitude.

**Meaning transfer framework.** This model, based on the role of celebrity endorsers and developed by McCracken (1989), elucidates how cultural meaning related to celebrity endorsers is transferred to the product and eventually to the consumers. In the context of nostalgic advertisements, the embedded personal meaning in such advertisements gets transferred to the brand, enhancing brand attitude.

### ***Purchase Intention (PI)***

**The Model of Hierarchy of Effects.** According to Lavidge and Steiner's (1961) model, a person's attitude toward the advertisement (Aad) immediately affects their attitude toward the brand (Aab), which in turn affects their desire to buy. When used in nostalgic advertisements, nostalgic appeals' personal relevance and upbeat feelings improve viewers' attitudes toward the commercial, which in turn affects

viewers' attitudes toward the brand, which in turn affects viewers' intentions to make a purchase.

### *Advertisement Relevance.*

**Self-referencing theory.** The self-referencing theory by Rogers et al. (1977) states that personally relevant information or information related to oneself is remembered better. In the context of advertising, the theory suggests that people are more likely to interact with or be convinced by commercials that contain information that is personally relevant to them. Nostalgic advertisements, by their inherent ability to elicit personally meaningful memories, could be perceived as relevant to the consumer.

**Motivated Attention Theory.** The Motivated Attention Theory proposed by Lang (2006) is based on evolutionary psychology and media processing. It posits that consumers attentionally engage with stimuli that have motivational significance. Advertisements that are personally relevant, emotionally charged, or socially meaningful activate the brain's motivational systems, which in turn receive prioritised cognitive processing. This theory highlights that emotionally relevant advertisements, such as those eliciting nostalgia, are better encoded in the brain and perceived as more persuasive due to their motivational salience.

### *Advertisement Skipping*

**Advertising Avoidance Model.** This model, by Cho and Cheon (2004), identifies three primary antecedents of advertisement avoidance: goal impediment, advertisement clutter, and perceived irrelevance. When users feel that advertisements interfere with their primary task (e.g., watching a video), appear excessively frequent

or cluttered, or lack personal relevance, they are more likely to engage in avoidance behaviours such as skipping.

The overview of the theories reviewed above gives a comprehensive insight into the conceptualisation of nostalgia and consumer behaviour. It also highlights the various functional mechanisms of nostalgia and consumer behaviour, by elucidating the triggers, process and consequences.

### **Empirical Review**

The empirical review provides a broad overview of the scientific studies related to nostalgia and consumer behaviour. It systematically examines the outcomes assessed, the methodology used, the population studied, and the findings. While it provides insights into the evolution of the research area, it also helps to identify gaps and limitations in the prior literature and thereby find avenues for future exploration. The following section is organised into Nostalgia in advertisements and consumer responses, advertisement relevance and consumer responses, advertisement skipping and consumer responses, neurophysiological correlates of nostalgia and nostalgic advertisements and EEG-based prediction of consumer responses.

#### ***Nostalgia in Advertisements and Consumer Responses***

Nostalgia refers to the sentimental yearning or fond affection for times gone by. Nostalgic appeal in advertising refers to strategies used by the marketers and advertisers to evoke the consumers' longing for the past to influence consumer attitude and behaviour. Nostalgic appeals are not just linked to personal memories, but also to cultural experiences and collective history. Nostalgic advertising is defined

as "the use of themes or images from the past that are intended to evoke positive emotions and associations" (Pascal et al., 2002).

Several studies have explored how nostalgic appeal in advertisements influences consumer responses. For instance, Muehling and Pascal (2011) aimed to determine whether there is a differential impact of nostalgic types (personal nostalgia, historical nostalgia, and non-nostalgic advertising) on consumer attitudes and behavioural outcomes such as self-referential thinking, positive affect, attitude towards the advertisement and brand, brand-related thoughts and advertisement recall. A between-subjects experimental design was employed, and three static print advertisements for a fictitious brand were created for the study. A large pool of 269 undergraduates from the U.S was randomly assigned to view one of three advertisements: personal, historical, or non-nostalgic. After viewing the advertisement, participants answered a structured questionnaire that included standardised measurement tools adapted from prior advertising research. The results led to the conclusion that both personal and historical nostalgic advertisements had more favourable consumer responses than non-nostalgic advertisements. Particularly, personal nostalgia had a greater impact on purchase intention and emotional engagement.

Building on the previous study, Marchegiani & Phau (2012) examined whether including nostalgia-themed music in advertisements differentially influences consumer responses in personal, historical, and no nostalgia conditions. By employing a 2x3 factorial design, 244 undergraduate students from Australia viewed one of six advertisements that differed by nostalgia type and presence versus absence of music. This study also used print advertisements with a fictitious brand. After exposure,

participants responded to measures for attitude towards the advertisement (Aad), brand (Aab) and nostalgia adapted from prior literature. The results demonstrated that in both personal and historical nostalgic conditions, the addition of music improved attitude towards the advertisement but not attitude towards the brand.

Personal relevance in terms of ‘advertisement involvement’ could be one explanation for the nostalgic advertisements’ effectiveness. Muehling & Pascal (2012) hypothesised that nostalgic advertisements would enhance advertisement involvement and self-reflection, along with attitude towards the advertisement and brand. A total of 269 undergraduate university students were allocated to one of three advertisement conditions randomly. Three print advertisements for a fictitious brand (Foton) were developed to manipulate nostalgia type. Post-exposure, participants completed measures of advertising involvement, nostalgia, and attitudinal responses as measured in previous literature. Both personal and historical nostalgic advertisements significantly increased levels of advertisement involvement and self-reflection among the participants when compared to the non-nostalgic condition.

Perceptions of brand heritage are also influenced by nostalgic advertisements. In their study, Merchant & Rose (2013) investigated whether advertising-induced vicarious nostalgia influences how consumers perceive brand heritage and brand attachment. Data was collected from 265 participants from the U.S. The tools developed and validated by the authors were used to measure the outcomes. The results of this correlational study show that individuals who are prone to be nostalgic experience higher vicarious nostalgia when exposed to nostalgic advertisements, which in turn partially mediated the relationship with perceived brand heritage.

Muehling et al. (2014) explored the role of past exposure to brands and brand attachment in influencing the effectiveness of nostalgia-themed advertisements on consumer responses. A pool of 180 participants recruited from the Amazon Mechanical Turk were assigned to one of the two experimental conditions. Participants viewed either a nostalgic or a non-nostalgic print advertisement developed for the study. After which, they rated their attitude toward the brand, purchase intention, advertisement involvement and attitude toward the advertisement on a seven-point scale. It was found that nostalgic advertisements elicited favourable consumer responses overall, and this effect was greater among those individuals with prior brand exposure.

Reminiscence bump and diachronic relevance seem to influence nostalgia-related consumer responses, particularly purchase intention. Ju, Choi, Morris et al. (2016) studied this relationship using a 3×2 between-subjects experimental design (time-frame including bump, non-bump past, present and age group including Generation X, late-stage baby boomers). A total of 168 participants were included in this study. For each age group, three print advertisements were created. Each participant was exposed to one advertisement, and following exposure, answered questionnaires assessing the outcome variables. Diachronic relevance was conceptualised as a combination of participants' attention to the advertisement and the personal relevance it held for them. Results showed that advertisements framed around the reminiscence bump elicited significantly higher levels of diachronic relevance. Moreover, these advertisements, which focused on the bump years, generated increased purchase intent, and this was fully mediated by diachronic relevance.

Ju, Kim, Chang et al. (2016) examined the function of perceived self-continuity and product type between nostalgia and consumer responses across two studies. Study 1a investigated whether nostalgic advertising messages increased perceived self-continuity and led to favourable consumer responses, and whether these effects would differ based on product type. Using a 2 (nostalgic vs. present-focused)  $\times$  2 (hedonic fragrance vs. utilitarian sunscreen) between-subjects design, a total of 199 participants (below 40 years) were employed using the Amazon Mechanical Turk. The study participants were exposed to print advertisement stimuli for a fictional brand, either evoking nostalgia (1990s) or focused on the present (2015), and featured either a hedonic or utilitarian product. Following exposure, participants completed measures on evoked nostalgia, perceived self-continuity, and consumer responses. Results showed that nostalgic messages significantly increased perceived self-continuity. Nostalgic advertisements also led to significantly more favourable consumer responses than present-focused advertisements. However, product type (hedonic vs. utilitarian) did not significantly moderate these effects.

Ju et al. (2018) also examined the moderating role of future time perspective (FTP), the way individuals view their future, on consumer responses to nostalgic advertising. This was examined across two studies. Study One investigated whether purchase intention is influenced by past-focused advertisements compared to present-focused advertisements, and examined the mediating and moderating roles of ad-evoked nostalgia and future time perspective, respectively. In this study, the featured product was a camera in a print advertisement. Through the Amazon Mechanical Turk, 288 participants (aged 35 to 64) from the U.S. were recruited for a between-subjects study and were randomly shown one of the print advertisements created for the study. After exposure, participants completed standardised outcome measures.

Statistical analysis found that there was a significant increase in purchase intention in the past focus group, and this was mediated by ad-evoked nostalgia and moderated by future time perspective. Study two explored the moderating role of FTP between ad-evoked nostalgia and brand attitude on a new product in a print advertisement. Findings suggest that past-focused advertisements significantly improved brand attitude in comparison to present-focused advertisements, and ad-evoked nostalgia mediated this relationship, while FTP moderated it.

Similarly, Langaro et al. (2020) assessed the interaction between nostalgia and probability markers (phrases that signal the likelihood of future events) in influencing consumer reactions. An experiment was conducted using a 2 (hedonic vs utilitarian) × 2 (nostalgic and non-nostalgic condition) × 3 (pledge, hedge and no probability marker) factorial design. All participants were exposed to both product types and only one of the creative strategies and language styles, making a total of six groups. Using an online survey to measure the outcomes, a total of 575 valid responses were analysed. Results revealed a significant interaction effect where nostalgic advertisements were most effective when paired with high-certainty probability markers. In contrast, nostalgic advertisements paired with low-certainty markers led to weaker consumer responses. On the other hand, for non-nostalgic advertisements, probability markers did not significantly impact consumer responses.

Özhan and Talih Akkaya (2021) hypothesised that individuals with a higher nostalgia proneness are more likely to be influenced by such advertisements. The researchers used a single nostalgic television advertisement for this purpose in an experimental study. Adult participants (N=396) from a diverse age group in Turkey participated in the study who were exposed to the television advertisement and then

completed measures on nostalgia proneness and outcome variables. The results show that nostalgia proneness significantly influences ad-evoked nostalgia and that ad-evoked nostalgia mediates the relationship between nostalgia proneness and consumer responses, namely purchase intention and brand attitude.

While several studies compared nostalgic conditions with present-focused or neutral conditions, Lefi and Abderrazak Gharbi (2024) examined how nostalgic advertisements influenced the persuasion process and brand attachment in comparison with informative advertisements. The researchers investigated this using two television advertisements on Tunisian food in an experimental setting. A total of 360 participants were randomly assigned to view either the nostalgia-themed advertisement or the informational advertisement. Post exposure, participants were asked to complete a survey measuring outcome variables. Results show that nostalgic advertisements significantly increased positive emotional response, which in turn influenced consumer attitudes. The relationship between nostalgia and brand attachment was mediated by positive emotional responses. In contrast, informational advertisements increased perceived credibility and product knowledge and in turn consumer attitudes. However, emotional connection and brand attachment were weaker in comparison to the nostalgic condition.

From the 11 studies reviewed above from the nostalgic advertisement literature, several observations have been made. In terms of study population, the most commonly studied are the undergraduate students, followed by adult participants from online consumer panels such as Amazon Mechanical Turk. The sample size ranged from 150 to 400 participants, predominantly from a Western cultural context, with few studies extending the findings to countries like Turkey, Saudi Arabia and Tunisia. Most studies employed experimental design, particularly between-subject

designs and predominantly used Static print advertisements for fictitious brands. Few studies have attempted to use television advertisements in their study. Key dependent variables that were explored across most studies are ad-evoked nostalgia, brand attitude, attitude towards the advertisement, purchase intention, brand attachment, etc. Moderating or mediating variables assessed were nostalgia proneness, future time perspective, past brand attachment and self-continuity, diachronic relevance, etc. Almost all of these outcomes were measured using self-report measures that were either adapted from previous literature or standardised scales. Across most studies, nostalgia has been found to consistently positively influence consumer responses through diverse mechanisms and processes, specifically by tapping into consumers' emotions.

### ***Advertisement Relevance and Consumer Responses***

Campbell and Wright (2008) sought to explore how personal relevance and interactivity shape consumer attitudes toward online advertisements that are seen repeatedly. Using a survey and an experiment, a study was conducted to explore this functional mechanism. The survey, involving 97 participants, was designed to gather general insights into user perceptions of repetitive advertisements and their attitudes toward online advertising. The second phase was a controlled laboratory experiment involving 118 participants. In this experiment, participants were exposed to repeated banner advertisements embedded within a simulated website. The advertisement relevance and interactivity were systematically manipulated by the researchers. Participants in the experiment were asked to view the website and its embedded advertisements, after which they completed questionnaires measuring outcome variables. It was found that when advertisements were neither relevant nor interactive,

repeated exposure increased irritation and led to negative attitudes toward both the advertisement and the product. However, when the advertisement was perceived as personally relevant, consumers expressed significantly more positive attitudes, regardless of how many times they saw it.

In another study, Varnali (2012) investigated the psychological mechanisms that connect message relevance in SMS advertising with attitude toward the brand. A survey was conducted with a sample of 307 respondents, all of whom had previously received SMS advertisements. The findings revealed that higher message relevance significantly reduced perceived intrusiveness, which in turn led to more favourable attitudes toward the message. Subsequently, positive message attitudes significantly predicted more favourable brand attitudes.

Based on the two studies reviewed, both studies emphasise the importance of perceived message relevance in shaping consumer responses, although through different mechanisms.

### ***Advertisement Skipping and Consumer Responses***

Jeon et al. (2022) investigated how consumers' video-watching goals and emotional traits influence the likelihood of skipping emotionally charged advertisements on platforms such as YouTube. Specifically, the researchers examined whether the alignment between a viewer's video-watching goal and the emotional content of the advertisement can decrease the likelihood of advertisement skipping. Furthermore, they tested whether affective empathy mediates this relationship and whether a viewer's emotional approach tendency moderates the process. To investigate, three experimental studies were conducted using online video-watching

simulations. Across all three studies, participants were randomly assigned to conditions that manipulated either their video-watching goal or the emotional appeal of the advertisement. They watched a video embedded with an emotional appeal advertisement, and their advertisement-skipping behaviour was recorded. The sample included adult participants recruited online, with sample sizes across studies ranging from around 150 to over 300 individuals per experiment. Participants' emotional approach tendency and affective empathy were measured through validated self-report instruments. The main behavioural outcome was whether and when participants clicked the "Skip Ad" button, along with their self-reported perceptions of the advertisement, including emotional engagement and perceived effectiveness. The results consistently showed that viewers with an emotional goal were significantly less likely to skip the emotional advertisement compared to those with an informational goal. This effect was mediated by affective empathy. Additionally, the emotional approach tendency moderated the effect.

Dharba et.al. (2024) explored how viewers' perceptions of advertisement irrelevance and intrusiveness led to skipping behaviour and if individual differences in personality traits moderated these relationships. Using a quantitative, survey-based research design, data were collected from a diverse international sample of 329 adult online video consumers, primarily recruited through online panels. Participants reflected on recent experiences with skippable video advertisements and completed a questionnaire measuring key constructs, including perceived advertisement irrelevance and perceived intrusiveness, personality traits, and self-reported ad-skipping behaviour. The results revealed that both perceived irrelevance and intrusiveness significantly increased the likelihood of advertisement skipping, and personality traits moderated this effect.

From the two consumer behaviour studies on advertisement skipping reviewed above, it is observed that advertisement skipping is influenced by multiple factors, including viewers' characteristics and contextual factors. Effective advertisement targeting, which aligns with viewers' goals, emotional tendencies and personality, is a crucial factor that shapes advertisement skipping behaviour.

### *Neurophysiological Correlates of Nostalgia and Nostalgic Advertisements*

Yücel et al. (2020) examined the influence of nostalgic advertising on consumer responses, using a neuromarketing approach in the context of retro-themed advertisements. The study included 30 participants in the age group of 18 to 25 years who watched the advertisement in a controlled laboratory setting. Using electroencephalography (EEG), participants' neural activity was recorded. The results revealed that there was a higher left frontal asymmetry, indicating positive affect, while viewing the retro-themed advertisement.

As far as the researcher's knowledge, this is the only study that assesses neuro-electrical responses of consumers to nostalgic advertisements. Although a pioneering work, the study has several limitations. It examined the neuro-electrical responses using a single retro-themed advertisement with no comparison. Furthermore, the study examined only the frontal alpha asymmetry as an index of positive emotions.

Given the paucity of studies underpinning neural responses in the nostalgic advertisement literature, the following section will review the few existing studies that examined nostalgia as an emotion using neurophysiological methods, particularly functional magnetic resonance imaging (fMRI) and EEG.

Barrett and Janata (2016) explored the parts of the brain engaged in memory and affective processing when listening to nostalgic music. They also aimed to understand how individual variations in affective personality factors and dynamic musical patterns affected the brain reactions to music that evoked nostalgia. Twelve participants' brain activity was recorded using functional magnetic resonance imaging (fMRI) while they listened to thirty 20-second samples of popular music from their early years. After each excerpt, using a rating scale, participants rated it on nostalgia, autobiographical salience, happiness, sadness and familiarity. The results showed that the activity in the frontal, limbic, paralimbic, and midbrain regions was related to the nostalgia ratings for the music by the participants. This association was also significantly predicted by the affective personality traits, including nostalgia proneness and sadness. Furthermore, the inferior frontal gyrus, substantia nigra, cerebellum, and insula showed greater activity that matched the dynamic music structures in the nostalgic music when compared to non-nostalgic music.

In another study, Yang et al. (2021) explored whether nostalgia enhances sensitivity to existentially threatening stimuli, particularly death-related words and the neural and behavioural responses underlying such a mechanism. The experiment was conducted on a sample of 40 students in China, randomly assigned to either a nostalgia or a control condition. While participants in the nostalgia group viewed a series of images related to childhood, the control group saw similar modern-day images. Post nostalgia induction, participants completed an 88-trial "Word Relationship Task" during an fMRI scan. They saw two words in quick succession (both death-related or both neutral, or one of each) and judged whether the words belonged to the same semantic category. The activity in the amygdala was the focal neural measurement due to its role in detecting threats. The accuracy and time taken

to respond were the focal behavioural measurements. The results showed that the nostalgia group exhibited significantly stronger right amygdala activity and were more accurate in detecting death-related words that were semantically related. However, participants in the nostalgic group also took more time to detect the death-related words.

Zhang et al. (2022) explored the analgesic effect of nostalgia on the perception of pain and the underlying neural mechanisms. The study involved 34 young adults with moderate sensitivity to pain and nostalgia proneness. Using a within-subjects design, participants were exposed to multiple trials of nostalgic and control visual stimuli for eight seconds during an fMRI scan. A brief noxious thermal stimulus of high and low intensity was applied after each trial to induce pain. Next, using a scale ranging from zero to ten, which represents no pain to the greatest pain, participants scored the degree of pain. The results showed a significant analgesic effect of nostalgia, with reduced pain ratings observed in the nostalgia condition at low pain intensity but not at high intensity. fMRI analyses revealed that during pain processing, compared to control trials, participants in the nostalgia condition showed less activity in areas linked to pain, such as the lingual gyrus and parahippocampal gyrus. Additionally, mediation analysis indicated the thalamic response during pain mediated nostalgia's analgesic effect.

Tullett et al. (2015) examined whether the resting state frontal alpha asymmetry predicts nostalgia proneness. From a sample of 56 participants, the brain's electrical activity was recorded using an EEG, particularly focusing on the F3/F4 and F8/F7 electrodes in the frontal region. The frontal alpha asymmetry is a well-established marker of approach and avoidance motivation. Greater right frontal asymmetry indicates avoidance motivation, whereas greater left frontal asymmetry

indicates approach motivation. The participants also completed measures of nostalgia proneness and personality. The results revealed that there was a significant association between right frontal asymmetry and nostalgia proneness. This implies that individuals who experience higher withdrawal motivation are more prone to experience nostalgia.

Similarly, Bocincova et al. (2019) examined whether nostalgia could reduce event-related negativity (ERN), which is a marker of defence motivation. In this research, 60 participants were randomly allocated to either a nostalgic group or a control group. Nostalgia was manipulated using an event reflection task, where participants in the nostalgic group reflected on a nostalgic event and the control group reflected on an ordinary event, post which they completed a flanker task to elicit ERN. The results revealed that participants in the nostalgic group showed a reduced ERN amplitude when compared to the control group. The findings imply that nostalgia acts as a regulatory mechanism by reducing the emotional impact of making mistakes.

Hungenberg et al. (2020) explored how nostalgia experienced during Minor League Baseball influenced the spectators' psychological, emotional, and behavioural responses. Specifically, this study aimed to determine the prevalence of nostalgia while watching the game and examine if such nostalgic experiences enhanced the social well-being and influenced the spectators' intentions to revisit. Using a multi-modal approach, the brain activity of 46 spectators was recorded while watching the game in two baseball parks. The baseball parks differed in their setting; one was modern and the other traditional. Participants also engaged in Ecological Momentary Assessment (EMA), where they responded to prompts assessing the prevalence of nostalgia and its triggers every 20 minutes while watching the game. Post the league,

the participants answered questionnaires on social well-being and intentions to revisit the game. The results revealed that there were recurrent experiences of nostalgia, with instances of nostalgia peaking during the middle of the game. This was triggered by the sensory cues such as visual, music and sounds as well as social interactions. The neurophysiological results also revealed that individuals who experienced frequent nostalgia also exhibited neural signatures that indicated higher arousal and inward attention. Nostalgic spectators also reported greater intention to revisit and recommend the game.

Hu Shuxiang et al. (2025) examined whether different sensory modalities of nostalgia induction, including visual, auditory, or audio-visual, activate distinct neural mechanisms. The researchers recruited 38 first-year university students in China. Participants were exposed to nostalgic and non-nostalgic stimuli across three sensory modalities across 36 trials. Each trial consisted of a 30-second stimulus presentation followed by self-report measures on nostalgia, pleasure, arousal, and dominance using Likert scales. Additionally, EEG data were collected to capture neural responses during each trial. The results revealed that nostalgic stimuli, across all sensory modalities, significantly increased emotional responses, especially pleasure and arousal, compared to non-nostalgic stimuli. Participants reported the strongest nostalgic feelings in response to audio-visual stimuli, followed by auditory and then visual. However, when examining neural responses, auditory nostalgia emerged as particularly potent as it induced higher theta and gamma power, and stronger alpha wave amplitudes, especially in the prefrontal and central regions. Furthermore, EEG network analyses showed that nostalgic stimuli, particularly in the alpha and gamma bands, enhanced functional connectivity, increased global and local network efficiency, and reduced eigenpath length, indicating more efficient neural processing.

These effects were more pronounced for auditory nostalgia, suggesting it fosters deeper autobiographical memory retrieval, emotion regulation, and cognitive integration. In conclusion, this study demonstrated that nostalgia, particularly when delivered through auditory channels, optimally activates emotional and cognitive networks in the brain.

From the seven neuroscience-based nostalgia studies reviewed above, several critical insights emerge regarding the neurophysiological underpinnings and regulatory functions of nostalgia. Across studies, nostalgia was induced through a variety of methods such as personal memory recall, nostalgic music, visual and audio-visual stimuli, and real-life experiences such as sporting events. Neural responses were consistently recorded across key brain regions implicated in emotional regulation, self-referential processing and memory retrieval. EEG-based studies revealed modulations in alpha, theta, and gamma band power, with functional connectivity enhancements especially pronounced for auditory nostalgia. fMRI investigations confirmed nostalgia's capacity to attenuate responses in pain-related regions and amplify affective engagement, particularly in music and visual cue paradigms. Event-related potential analyses demonstrated that nostalgia dampens early error-monitoring responses, while mobile EEG and EMA approaches showed that nostalgic moments in naturalistic settings align with neural markers of inward attention and arousal. Notably, nostalgia also heightened sensitivity to existential threats, as seen in amygdala hyperactivity to death-related words. Collectively, these findings position nostalgia as a multi-dimensional emotional state with robust neurophysiological correlates, capable of regulating threat perception, enhancing social and self-focused processing, and even reducing physical pain. The evidence underscores that nostalgia is not merely a reflective emotion but a dynamic neural

process involving cognitive, emotional, and motivational systems, with implications for resilience, well-being, and consumer engagement across diverse contexts.

### ***EEG-based Prediction of Consumer Responses***

The pioneering study by Guixeres et al. (2017) explored whether artificial neural networks (ANN) trained on the EEG, heart rate variability (HRV), and eye tracking (ET) can classify and predict advertisement effectiveness, including advertisement recall, liking and number of views. The study involved a sample of 35 healthy adult participants who were exposed to three 30-second Super Bowl TV commercials embedded within a 30-minute documentary. Neurophysiological data were recorded using EEG, Electrocardiogram (ECG), and an ET. The experiment unfolded in three phases, including a relaxation period with a mindfulness audio, the advertisement viewing phase during the documentary, and a delayed recall task conducted two hours later. From the signals that were acquired, several measurement indices were obtained. The Pleasantness Index (PI), Interest Index (II), and z-scores for spectral strength in the delta, theta, alpha, beta, and gamma bands were among the metrics used for EEG. Average heart rate and standard deviation of continuous HR measurements are examples of non-linear domains that HRV measures throughout time and frequency. ET was used to calculate two new indices: Brand Ratio (the percentage of time spent looking at the brand) and Quadrants per Second (Quad/sec). Conventional metrics like fixation duration and brand area of interest (AOI) visits were also calculated. The findings revealed robust correlations between neurophysiological metrics and advertisement effectiveness outcomes. EEG responses, especially in theta and delta bands, were significantly higher for advertisements that were later recalled or liked. HRV analyses showed greater beat-

to-beat variability for remembered advertisements, and increased low-frequency power for liked advertisements. Eye-tracking data indicated that unrecalled advertisements elicited longer durations of brand fixations, possibly suggesting difficulty in brand identification. Furthermore, ANN models trained on the biometric metrics were able to predict advertisement view count classifications with 82.9% accuracy and estimate actual YouTube view numbers with a mean error of just 0.199. Among the input variables, the EEG-based Pleasantness Index in the theta band emerged as the most influential predictor, followed by HRV entropy and fixation count from ET data. In conclusion, the study provided compelling evidence that neuroscience-based metrics are not only associated with traditional advertising outcomes but can also forecast real-world advertisement success on digital platforms.

Wei et al. (2018) explored a neuroscience-based method for rapidly and objectively assessing the impact of advertisements using single-channel wearable EEG devices and support vector machine (SVM) algorithms. The study sought to determine whether EEG signals recorded as consumers viewed advertisements could predict, with high accuracy, their willingness to purchase the advertised product and other facets of their response. The experiment recruited thirty male participants from Zhejiang University in China, aged 20–35 years. Language and gender selections were controlled to avoid confounding variables related to the understanding of advertisement language and product relevance. Each participant was shown between four and five randomly-selected TV advertisements (ranging from 15 to 20 seconds) drawn from a pool of 220 commercials across four product categories: cars, digital goods, clothing, and food. These advertisements were gender-neutral or male-oriented, with audio and video standardised for quality. During the viewing, EEG data were collected in real time via a low-cost, single-electrode wearable device. After

each advertisement, participants filled out a comprehensive 22-item questionnaire covering not only direct purchase intent, but also factors like content and image quality, excitement, brand recognition, memorability, and various advertising features. The study's approach involved transforming the raw EEG signals into frequency-domain features, including power in Delta, Theta, Alpha, Beta, and Gamma bands, as well as attention and meditation metrics. These EEG features were then paired with corresponding participant questionnaire responses, which served as behavioural labels. The data underwent rigorous processing: normalisation, feature selection, and augmentation (bootstrapping) to overcome the relatively small sample size. SVM classifiers were trained to predict various outcomes, most importantly, willingness to buy, using cross-validation to test generalizability and to check for overfitting or underfitting. The findings indicated that EEG features collected from a single-electrode device could predict participants' willingness to purchase products after viewing advertisements with about 75% accuracy, as measured by cross-validated SVM models. This predictive power was consistent both for individual product categories and the full set of advertisements, with clothing and food advertisements showing the highest predictability and cars the lowest (possibly due to the higher perceived cost and individual circumstances impacting purchasing decisions). The model performed slightly better when using ranked-answer questions (such as 1–7 Likert scales for attitudes) than when combining these with binary answers (yes/no), but both approaches produced solid results. Cross-validation curves showed that the model was neither over- nor underfit. The research supports the feasibility of using rapid, low-cost, neurophysiological data to quantitatively assess consumer response to advertisements, offering a scalable and less-biased alternative to traditional survey or sales-based evaluation. It also suggests that EEG-based

metrics, especially when linked with multidimensional emotional or cognitive responses, can provide actionable insight into how effectively advertisements engage and persuade viewers.

The study by Golnar-Nik et al. (2019) set out to assess whether consumer preferences, such as liking or disliking an advertised product, or choosing to buy it, could be predicted using electroencephalography (EEG) power spectral features, and to explore how changes in advertisement content, specifically background colour and promotional cues, affected such decisions. The sample consisted of 16 healthy, Persian-speaking undergraduate students from top universities in Tehran, aged 23 on average. Participants were exposed to a sequence of mobile phone advertisements across four brands, varying the content by adding an orange background and/or promotional elements like discounts or free shipping, thus creating four advertisement types: simple, background-coloured, promotional, and both background-coloured plus promotional. Participants viewed each advertisement for 20 seconds, after which they indicated whether they liked, disliked, or would buy the product, or made no explicit decision. EEG was recorded throughout using a 32-channel system, and the data were pre-processed to remove artefacts. Key EEG features, relative power and power ratios in different frequency bands were extracted for analysis. To evaluate whether consumer decisions could be predicted from EEG data, the authors classified decision events using machine learning algorithms (support vector machines and linear discriminant analysis), while statistically comparing EEG features between decision states and advertisement types. The analysis revealed that EEG power features could predict the incidence of any decision event ("Like," "Dislike," or "Buy") with over 87% accuracy. The distinction between "Like" and "Dislike" responses was more challenging, with classification accuracy around 63%. The most predictive brain

regions were found in the frontal and centro-parietal areas, particularly at the Fp1, Cp3, and Cpz electrode sites, whereas the difference between "Like" and "Dislike" was most evident at the right frontal sites (F4, Ft8). In terms of advertising content, adding a coloured background or promotional cues increased the visual complexity of the advertisements, which led to more participants shifting their preference from "Like" to "Dislike." Behaviourally, these added features reduced reaction times for making a decision, an effect correlating with changes in EEG activity in right parietal regions. The EEG findings suggested that decisions changing from "Like" to "Dislike" were accompanied by decreases in power across frontal, central, and parietal regions, particularly in the beta/alpha ratio. Overall, the investigation demonstrates that EEG provides meaningful and objective indices of consumer preferences and decision-making in response to advertising.

From the three EEG-based consumer neuroscience studies reviewed above, several important insights emerge about the predictive capacity of neurophysiological signals in understanding and forecasting consumer responses to advertisements. Across these studies, participant samples ranged from 16 to 35 healthy young adults, with EEG data collected via both multi-channel systems and wearable single-channel devices. The experimental paradigms involved exposure to real-world advertisements of varying lengths and formats, ranging from Super Bowl commercials to product-specific TV advertisements, often embedded within broader viewing experiences or randomised presentations to control for order effects. EEG signals were analysed in terms of spectral power across frequency bands (delta, theta, alpha, beta, and gamma), often in combination with derived indices such as Pleasantness and Interest. Complementary biometric measures such as heart rate variability and eye tracking enriched the data landscape in some studies, while others paired EEG data with self-

report questionnaires to train machine learning models, including support vector machines and artificial neural networks. Consistently, EEG responses, particularly in theta and delta bands, were found to correlate with key consumer outcomes like advertisement recall, liking, and purchase intention. Predictive models achieved strong accuracies (ranging from 75% to over 87%) in classifying consumer decisions and estimating real-world advertisement success metrics, demonstrating the feasibility of using EEG for both binary decisions (e.g., buy/not buy) and continuous behavioural metrics (e.g., YouTube views). Importantly, the studies also highlighted that EEG-based predictions sometimes outperformed or revealed patterns not captured by self-report data alone, emphasising the implicit and affective dimensions of consumer engagement. Together, these findings support the growing role of EEG as a powerful, scalable, and objective tool in advertising research, capable of unlocking granular insights into consumer cognition, emotion, and behaviour that can inform campaign design, targeting strategies, and digital platform optimisation.

### **Research Gap**

The relationship between nostalgia, consumer responses, and advertising effectiveness has been extensively examined across disciplines such as marketing and psychology. Despite the increasing interest of scholars and practitioners in utilising nostalgia to foster emotional connection, build brand equity, and drive behavioural outcomes, there are significant and persistent research gaps in this field, particularly at the intersection of observable actions such as advertisement-skipping, self-reported attitudes, and neural responses.

The pervasive use of static, print advertisements and fictitious or generic signals as stimuli is one of the most prominent limitations in the current nostalgic

advertising literature. Retro logos, stylised vintage scenes, or fabricated content that is unrelated to the viewer's authentic autobiographical experiences are used in numerous studies to elicit nostalgia. Although these methods provide experimental control, they are deficient in the ecological validity that is essential for comprehending the impact of genuine, personally evocative nostalgia (particularly that which is anchored in one's own childhood) on consumer attitudes and neural responses in real-world persuasion contexts.

Moreover, static images or print media, despite their ease of manipulation for experimental purposes, are unable to convey the multisensory, dynamic, and emotionally immersive properties of video advertisements. Real television commercials from the formative years of individuals are replete with cues (jingles, animation, voiceovers, period-specific aesthetics) that are capable of evoking autobiographical memory and intense nostalgia, thereby engaging both higher-order cognitive appraisal and low-level emotional processing regions in the brain. There is a significant dearth of research that utilises these types of childhood video advertisements. Consequently, there is a lack of understanding regarding the impact of ecologically valid, emotionally salient material on neural and psychological outcomes in comparison to laboratory-created, fictitious alternatives. In addition to addressing unresolved theoretical concerns regarding personal relevance and autobiographical memory in nostalgia-driven persuasion, the utilisation of authentic childhood advertisements represents a methodological improvement.

The current body of literature indicates a significant predilection for the utilisation of self-reported data to evaluate the effects of nostalgic advertising. Ad-evoked nostalgia, enjoyment, emotional connection, and other consumer responses are

typically the focus of questionnaires (Aad, Aab, and PI). Although these measures are valuable for their direct reflection of conscious cognitive and affective responses, they are plagued by well-documented limitations, such as social desirability bias, memory distortions, and introspective inaccuracy. Furthermore, self-reports offer minimal information regarding the rapid, automatic, or unconscious processes that underlie consumer decision-making processes, which can be directly accessed through neural recording technologies such as EEG.

Equally concerning is the inadequate attention paid to authentic behavioural outcomes. Advertisement-skipping behaviour in the context of digital advertising has been the subject of recent research, including Jeon et al. (2022) and Dharba et al. (2024). Nevertheless, these endeavours rarely establish a connection between observable actions, such as advertisement-skipping, and self-reported attitudes and neural measures. The absence of advertisement-skipping from the majority of nostalgia-related studies is a substantial lacuna, as it is a concrete, real-world decision that has immediate implications for advertising effectiveness. In the digital and streaming advertising landscape, consumers have a significantly greater degree of control. Consequently, it is essential to comprehend the complete behavioural impact of nostalgic content in order to advance both theoretically and in practical marketing strategies.

Despite the recent advancements in neuroscience-informed marketing (neuromarketing), the majority of nostalgic advertising studies have either omitted neural measures or have adopted a very restricted focus. Research typically confines analysis to a limited number of markers when employing EEG, with frontal alpha asymmetry (FAA) serving as the most typical indicator of approach/avoidance

motivation. For instance, Yücel et al. (2020) noted that nostalgic advertisements caused an increase in left-frontal EEG activation, which is indicative of positive motivational states. Nevertheless, there has been a dearth of systematic endeavours to establish a connection between these neural patterns and a broader range of self-reported and behavioural variables, including perceived advertisement relevance or advertisement-skipping.

Furthermore, there are only a handful of studies that have fully utilised the predictive potential of EEG data. The majority of papers employ conventional between-group statistical comparisons, neglecting to employ machine learning models (such as random forests or support vector machines) that can simulate intricate, multi-dimensional patterns in EEG signals to forecast consumer responses at the individual trial or subject level. This divide is essential because contemporary marketing is increasingly attempting to personalise and optimise content based on real-time, neurophysiological feedback. This shift is from broad population averages to individualised models of persuasion and behaviour prediction.

Additionally, there is a scarcity of research that directly investigates the relationships between real-time behavioural choices, self-reported outcomes, and neural responses in the context of nostalgic advertising. It is widely recognised that nostalgic advertisements can enhance emotional engagement and positive brand attitudes. However, the extent to which specific EEG features can predict a broader range of consumer responses, including advertisement-skipping, perceived advertisement relevance, and multiple facets of attitude, remains uncertain. For instance, which components of the EEG response to nostalgic stimuli are associated with an increase in purchase intention and a decrease in skipping behaviour? Are

certain neural markers more closely associated with the emotive than the cognitive aspects of the advertising response? These are critical inquiries that remain unresolved.

In particular, advertisement relevance is frequently identified as a critical factor in the effectiveness of advertisements and as a potential mediator of the impact of nostalgic content on consumer attitudes and intentions to make a purchase. Nevertheless, there are few studies that have measured the perceived relevance of advertisements in the context of nostalgia-evoking stimuli, let alone examined the mediation role of perceived advertisement relevance between nostalgia, neural activity, and key outcome variables such as attitudes toward the advertisement (Aad), attitudes toward the brand (Aab), and purchase intention (PI). The mediational and moderating mechanisms through which nostalgia exerts its influence are still limited due to the absence of such integrative research.

The neuroscience and nostalgia literature significantly underrepresent the phenomenon of advertisement-skipping, which is central to contemporary digital marketing. Although consumer recall, affective response, and purchase intention have long been the foundation of advertising research, the distinctive challenge of retaining the attention of digitally empowered consumers, that is, preventing them from skipping advertisements altogether, has only recently emerged. The studies that incorporate advertisement-skipping measures frequently analyse them in isolation from neural or emotional responses and rarely endeavour to predict who skips which advertisements or why, based on psychophysiological data. Given that in-platform video advertising platforms (such as YouTube) frequently provide advertisement-

skipping capabilities, this is a critical oversight. Skipping is a tangible result that has immediate economic repercussions for brands.

Furthermore, advertisement skipping is not solely a consequence of boredom or irritation; it may also be influenced by subtle factors, including the profundity of nostalgic experience, perceived advertisement relevance, and interactions between emotion and cognition. The absence of neural prediction frameworks that model these dynamics, particularly in the context of personalised, meaningful nostalgic advertisements, leaves a substantial theoretical and practical lacuna.

These gaps collectively justify a new wave of research that is focused on the following: (a) the use of authentic, emotionally powerful childhood advertisements in video format; (b) integrated neural (EEG) and self-report data collection; (c) the inclusion of contemporary, digitally-relevant behavioural outcomes such as advertisement-skipping; (d) sophisticated, predictive analytic approaches (e.g., support vector machines); and (e) empirically testing the roles of mediation (especially by advertisement relevance) in the nostalgia–attitude–behaviour chain. This research has the potential to make substantial conceptual, methodological, and applied contributions to both academia and marketing practice by elucidating not only the effectiveness of nostalgic advertising but also the reasons and how it works. By doing so, it has the potential to advance the discipline beyond its current dependence on subjective reports and artificial stimuli, resulting in generalizable, robust insights that are suitable for a data-driven, personalised persuasion era.

## **Conceptual Framework**

### *Neuroelectrical Underpinnings of Nostalgia*

Nostalgic advertising leverages autobiographical recall, heightened personal relevance, and emotionally charged memories to elicit a persuasive response from consumers. These processes can be operationalised through distinct patterns of brain oscillations, as measured by electroencephalography (EEG), from a neuroscientific perspective. The current study defines nostalgia as a state that influences cognitive-affective engagement, attentional allocation, and memory retrieval. These changes are evident in specific EEG frequency bands and brain regions.

Cognitive control, evaluative processing, and sustained attention have been associated with frontal beta activity (Hanslmayr et al., 2014). Nevertheless, beta suppression frequently occurs in conjunction with more fluid, affect-driven processing. It is anticipated that nostalgic advertisements will result in a decrease in frontal beta activity in comparison to non-nostalgic conditions, which is indicative of a transition to more automatic, emotionally grounded responses, as nostalgia typically reduces evaluative scrutiny and promotes affective resonance.

Frontal alpha suppression is a reliable indicator of approach-related motivation and affective engagement. Increased cortical activation and attentional focus are indicative of decreased alpha power (Klimesch, 2012). Compared to non-nostalgic advertisements, the emotional salience and personal relevance of stimuli are anticipated to increase approach tendencies in nostalgic contexts, resulting in a greater suppression of frontal alpha. This is indicative of increased motivational readiness and emotional immersion in response to nostalgic stimuli. Parietal alpha suppression

is a well-established indicator of visual information processing and visuospatial attention (Foxye & Snyder, 2011).

Nostalgic advertisements frequently employ culturally or personally salient visual signals (e.g., period-specific imagery), which are expected to increase selective visual attention and result in stronger parietal alpha suppression in comparison to non-nostalgic advertisements and enhance selective visual attention. This suggests a more profound visual connection with content that is personally significant. The processing of auditory and semantic information is influenced by temporal alpha oscillations.

The active engagement with linguistic and aural content is indicated by the suppression of temporal alpha (Weisz et al., 2011). It is anticipated that nostalgic advertisements will generate a greater degree of temporal alpha suppression than non-nostalgic advertisements, as they frequently incorporate culturally significant language, familiar jingles, and antiquated music. This is indicative of a more profound integration of semantics and auditory information.

Semantic retrieval, associative memory, and music-evoked autobiographical recall are all significantly associated with temporal theta power (Janata, 2009). As individuals engage in associative binding of past experiences with current advertising content, nostalgic signals should amplify temporal theta activity. The recruitment of memory networks that facilitate the reconstruction of emotionally rich personal experiences is suggested by this increased theta activity. Conflict monitoring and cognitive control have been linked to theta activity (Cavanagh & Frank, 2014).

It is anticipated that advertisements that are not nostalgic will evoke a higher central theta, as they may necessitate a more rigorous evaluation. In contrast, nostalgic advertisements, which offer affective fluency and personal relevance, should

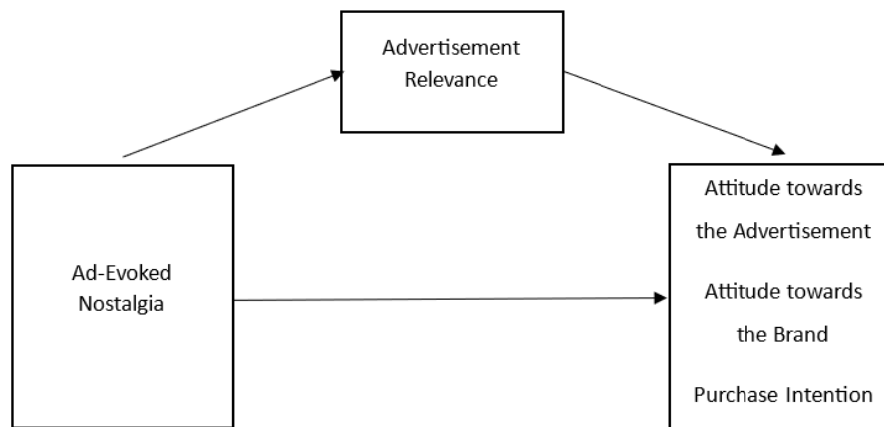
alleviate the necessity for such regulatory control, leading to a decrease in central theta activity.

The integration of self-relevant information, working memory maintenance, and internally directed attention are all correlated with frontal midline theta (Fm $\theta$ ) (Mitchell et al., 2008). It is anticipated that nostalgic advertisements will generate a greater degree of Fm $\theta$  activity than non-nostalgic advertisements, as nostalgia is fundamentally associated with the retrieval of autobiographical memories. This increase is indicative of the mobilization of cognitive resources for the purpose of memory integration and personal meaning-making.

### *Mediating Role of Advertisement Relevance*

**Figure 1**

#### *Conceptualisation of the Mediation Model*



It has been demonstrated that nostalgia has a significant impact on the formation of consumer attitudes and behaviours, particularly by invoking positive affect and autobiographical memories (Schindler & Holbrook, 2003; Wildschut et al., 2006). Ad-evoked nostalgia is the degree to which consumers experience nostalgic emotions in response to an advertisement in advertising contexts. Previous research

has shown that advertisements that evoke nostalgia can improve "attitude toward the advertisement (Aad), attitude toward the brand (Aab), and purchase intention (PI)" by activating self-relevant memories and eliciting affective responses (Muehling & Sprott, 2004; Pascal et al., 2002).

Nevertheless, recent developments in consumer psychology have underscored the possibility that nostalgia's impact may not be direct, but rather through the relevance of advertisements. This refers to the extent to which an advertisement is perceived as meaningful, personally resonant, and contextually appropriate (Zheng, 2020). When an advertisement invokes nostalgia, it activates personal connections that increase perceived relevance, thereby enhancing consumer evaluations and behavioural intentions. Therefore, advertisement relevance functions as a psychological mechanism that converts nostalgic experiences into favourable consumer responses.

The personal significance of an advertisement is frequently enhanced by nostalgic signals, including retro imagery, familiar music, or references to past cultural moments (Batcho, 2013; Marchegiani & Phau, 2012). An advertisement is more likely to be pertinent to the self-identity and lived experiences of consumers when they perceive it as nostalgic. This increased relevance enhances the persuasive power of the advertisement by rendering it more engaging, meaningful, and authentic.

Advertisements that are perceived as relevant have consistently been associated with more favourable consumer outcomes. Geng et al. (2021) have found that advertisements that are perceived as particularly significant generate a more positive attitude toward the advertisements (Aad) by enhancing engagement and perceived entertainment. These effects frequently transfer to the sponsoring brand,

resulting in a more favourable brand attitude. (Schindler & Holbrook, 2003). Ultimately, consumers are more likely to have a purchase intention (PI) when they perceive an advertisement as highly relevant, as relevance increases both the perceived value of the product and the affective connection with the product (Cao, 2025).

This framework suggests that the relationship between ad-evoked nostalgia and consumer responses (Aad, Aab, PI) is mediated by advertisement relevance. Although nostalgic cues directly evoke positive affect, their influence on consumer attitudes and intentions is most potent when viewers perceive the advertisement as pertinent to their personal experiences. Therefore, the relevance of advertisements serves as a conduit for the conversion of nostalgia into favourable consumer outcomes.

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## **CHAPTER 3**

### **METHOD**

The present study, which investigated the neuro-electrical responses of consumers to nostalgic advertising, employed a within-group experimental research design using a quantitative approach. This chapter outlines the methods and procedures utilised for conducting the research. In a simpler sense, a research method or research procedures refers to the key techniques and measures that the researchers often use in a particular study to answer the research question. Previous studies have shown that, for several reasons, a well-structured and scientifically sound research method is essential for completing a scientific study. Bryman (2016) has noted that through the adoption of transparent criteria for selecting the participants, collecting data and analysing it, research studies can minimise bias and error to a certain extent. The research framework for this study is designed on the understanding that a rigorous research method is essential for any scientific research. Through the detailing of each step, the research method ensures that the research is carried out in a structured and consistent manner without bias (Creswell, 2018). This exercise will also help the future scholars potentially utilise this method to replicate the study or adapt it to a new investigation. The chapter describes in detail the aim, objectives, operational definitions of the variables, research design, population, sampling procedure, inclusion criteria, exclusion criteria, assessment instruments, assessment procedure and data analysis.

#### **Aim**

The aim of this within-subject experimental study was threefold: (a) to examine the mediating role of advertisement relevance in the relationship between ad-evoked nostalgia with attitude towards the advertisement, attitude towards the brand,

and purchase intention. (b) to investigate the differences in the neural activity and consumer responses, including attitude towards the advertisement, attitude towards the brand, purchase intention, advertisement relevance, and time taken to skip the advertisement and (c) to explore if EEG features elicited during nostalgic exposure predict consumer responses using a machine learning based regression model.

### **Operational Definition of the Variables**

The key variables include Neuro-electrical activity, Purchase Intention, Attitude toward the Advertisement (Aad), Attitude toward the Brand (Aab), Advertisement Relevance, Time to Skip the Advertisement, and Ad-Evoked Nostalgia. Each of them is defined below in the actual sense in which they have been used in this study.

#### ***Neuro-electrical Response***

It refers to the electrical signals generated by the neurons in the brain. It is measured using electroencephalography and can indicate various cognitive processes such as attention, memory and perception. In the present study, neuro-electrical activity refers to the EEG frequency band power in regions of interest. The following EEG frequency band powers are examined in the present study.

**Global Beta.** Beta band power (13–30 Hz) represents neural oscillations associated with active cognitive processing and attention. In this study, beta power is measured from EEG signals during exposure to nostalgic and non-nostalgic advertisements, reflecting participants' engagement and arousal related to nostalgia-evoking stimuli.

**Frontal Alpha.** Frontal alpha power (8–13 Hz) is the spectral power recorded from frontal scalp electrodes. Lower frontal alpha power typically indicates increased

cortical activation. Here, it is used as an index of emotional and cognitive processing elicited by nostalgic advertising content.

**Frontal Beta.** Frontal beta power (13–30 Hz) measured over frontal electrodes reflects active cognitive engagement and emotional processing during exposure to advertisements. In the context of nostalgia, activity in frontal beta power suggests heightened attentional and emotional involvement.

**Frontal Midline Theta.** Mean frontal midline theta power (4–8 Hz), averaged across midline frontal electrodes, is linked to memory encoding, emotional regulation, and focused attention. It serves as an indicator of nostalgia-related emotional and mnemonic processing triggered by the advertisements.

**Temporal Theta.** Temporal theta power (4–8 Hz), recorded at temporal lobe electrodes, is associated with episodic memory and emotional processing. This variable reflects neural activity related to recalling personal memories during nostalgic advertisement viewing.

**Temporal Alpha.** Temporal alpha power (8–13 Hz) from temporal electrodes is related to cortical inhibition and information processing. Changes in temporal alpha power during nostalgic advertisements indicate modulation of memory-related cortical regions.

**Parietal Alpha.** Parietal alpha power (8–13 Hz) recorded at parietal scalp sites is often linked to attentional processes and sensory integration. In this study, it indexes the degree of attentional focus or disengagement during nostalgic versus non-nostalgic advertisements.

**Central Theta.** Central theta power (4–8 Hz) measured at central scalp locations is related to cognitive control and emotional processing. It reflects the neural

correlates of participants' emotional engagement with nostalgia-evoking advertisements.

### ***Nostalgic Advertisements***

Nostalgic advertisements refer to the memorable childhood television advertisements that were selected through screening and pretesting.

### ***Non-nostalgic Advertisements***

Non-nostalgic advertisements refer to contemporary television advertisements that were selected through screening and pretesting.

### ***Young Adults***

In the context of this study, young adults are individuals who belong to the age group of 18 to 25 years and are studying in colleges or universities in India.

### ***Ad-Evoked Nostalgia***

Ad-Evoked Nostalgia refers to the subjective experience of nostalgia elicited by the television advertisement, which is measured using a validated nostalgia scale administered immediately after each advertisement.

### ***Purchase Intention (PI)***

It refers to the self-reported likelihood or willingness of participants to buy the advertised product. It was measured on a standardised questionnaire immediately after each advertisement exposure. It indicates the behavioural outcome influenced by nostalgia.

### ***Attitude toward the Advertisement (Aad)***

In the context of this study, attitude toward the advertisement refers to participants' evaluative judgment of the advertisement. It was measured via self-report scales assessing liking, favourability, and perceived effectiveness. It reflects affective responses influenced by nostalgic content.

***Attitude toward the Brand (Aab)***

It refers to participants' overall evaluation of the advertised brand, captured through self-report questionnaires post-advertisement exposure. It indicates brand perception influenced by nostalgia evoked in the advertisement.

***Advertisement Relevance***

It measures the degree to which participants perceive the advertisement content as personally meaningful or related to their own experiences, assessed through self-report items, capturing the personal resonance of nostalgic advertisements.

***Time to Skip***

It refers to the duration (in seconds) that the participants take to exit the advertisement before they press the skip button. A longer time to skip during nostalgic advertisements suggests higher engagement or reluctance to terminate the viewing experience.

**Research Questions**

1. Does advertisement relevance mediate the relationship between ad-evoked nostalgia and consumer responses (Aad, Aab and PI)?
2. Is there a difference in EEG-based neural activity between and non-nostalgic advertisement conditions?
3. Are there significant differences in consumer responses (Aad, Aab and PI), advertisement relevance, and time taken to skip the advertisement, between nostalgic and non-nostalgic advertisement conditions?
4. Can EEG features elicited during nostalgic exposure predict consumer responses (Aad, Aab and PI), advertisement relevance, and time taken to skip, using machine learning regression models?

## Objectives

A set of key objectives have been identified for this study.

1. To examine if there is a relationship between ad-evoked nostalgia, attitude towards the advertisements, attitude towards the brand, purchase intention, and advertisement relevance
2. To determine if advertisement relevance mediated the relationship between ad-evoked nostalgia and attitude towards the advertisement (Aad), attitude towards the brand (Aab), and purchase intention (PI).
3. To compare the difference between the nostalgic and non-nostalgic advertisement conditions in attitude towards the advertisement, attitude towards the brand, purchase intention, and advertisement relevance
4. To assess if there is a difference in time taken to skip the advertisement between the nostalgic and non-nostalgic advertisement conditions.
5. To examine the differences in neuro-electrical activity between the nostalgic and non-nostalgic advertisements.
6. To explore if neuro-electrical features predict purchase intention, attitude towards the advertisement, attitude towards the brand, advertisement relevance and time taken to skip the advertisement using Support Vector Machine (SVM).
7. To determine the relative importance of EEG features in predicting various consumer responses using feature importance analysis.

## Hypotheses

1. There is a significant relationship between ad-evoked nostalgia and attitude towards the advertisement.

2. There is a significant relationship between ad-evoked nostalgia and attitude towards the brand.
3. There is a significant relationship between ad-evoked nostalgia and purchase intention.
4. There is a significant relationship between ad-evoked nostalgia and advertisement relevance.
5. Advertisement relevance significantly mediates the relationship between ad-evoked nostalgia and purchase intention.
6. Advertisement relevance significantly mediates the relationship between ad-evoked nostalgia and attitude towards the advertisement.
7. Advertisement relevance significantly mediates the relationship between ad-evoked nostalgia and attitude towards the brand.
8. There exists a significant difference in attitude towards the advertisement between nostalgic advertisements and non-nostalgic advertisement conditions.
9. There exists a significant difference in attitude towards the brand in nostalgic advertisements between nostalgic advertisements and non-nostalgic advertisement conditions.
10. There exists a significant difference in purchase intention between nostalgic advertisements and non-nostalgic advertisement conditions.
11. There exists a significant difference in advertisement relevance in nostalgic advertisements between nostalgic advertisements and non-nostalgic advertisement conditions.
12. There exists a significant difference in the time taken to skip the advertisement between nostalgic advertisements and non-nostalgic advertisement conditions.

13. There exists a significant difference in neuro-electrical activity related to attention between nostalgic advertisements and non-nostalgic advertisement conditions.
14. There exists a significant difference in neuro-electrical activity related to autobiographical memory retrieval between nostalgic advertisements and non-nostalgic advertisement conditions.
15. There exists a significant difference in neuro-electrical activity related to cognitive and affective engagement between nostalgic advertisements and non-nostalgic advertisement conditions.
16. EEG features elicited during nostalgic exposure predict purchase intention, with greater predictive power than compared to a baseline model.
17. EEG features elicited during nostalgic exposure predict attitude toward the greater predictive power than compared to a baseline model.
18. EEG features elicited during nostalgic exposure predict attitude toward the brand, with greater predictive power than compared to a baseline model.
19. EEG features elicited during nostalgic exposure predict advertisement relevance with greater predictive power than compared to a baseline model.
20. EEG features elicited during nostalgic exposure predict the time taken to skip, with greater predictive power than compared to a baseline model.

### **Research Design**

The present study employed a within-subjects experimental research design, wherein each participant was exposed to a total of 20 television advertisements, consisting of ten nostalgic and ten non-nostalgic advertisements. In a within-subjects experimental research design, the same participants take part in all conditions of the experiment. This design was preferred as it helps in reducing the inter-individual

variability (Charness et al., 2012). This is important in electroencephalography (EEG) research, as neural responses between individuals are due to anatomical and physiological differences such as scalp size, thickness, and conductivity (Luck, 2014).

### **Population and Sample**

The population for the present study comprised young adults, specifically college-going students aged between 18 and 25 years. Previous studies have established that studies on nostalgia recruiting younger generations have better response rates. A recent study has found that 15% of the Generation Z and 14% of the Millennial participants who were surveyed preferred to think about the past rather than the future (Daszkiewicz, 2024). It is primarily because the young generation of contemporary society is nostalgic and follows such trends that recall their past experiences or memories (Harlow, 2023). Furthermore, due to the linguistic, cultural, ethnic and regional diversity participants for the study were employed from the Central University of Karnataka, to ensure heterogeneity in the study sample.

### **Sampling**

The study used a purposive sampling technique to select participants who met the pre-determined inclusion criteria. This non-probability sampling method was deemed appropriate for the aims and objectives of this study, as it allowed the researcher to intentionally recruit participants who are most likely to have experienced the types of advertisements used in the experimental task. It helped the researcher ensure participants' meaningful engagement with nostalgic content.

### ***Inclusion Criteria***

Based on the objectives and research design of this phase of the study, six inclusion criteria were set to recruit the participants. Only individuals who fulfilled the following criteria were included in the study.

- Young adults who belonged to the age group of 18–25 years.
- Individuals with normal or corrected vision were recruited to ensure visual clarity.
- Individuals who are right-handed were recruited to control hemispheric dominance in EEG analysis.
- Individuals who provided written informed consent for participation were recruited.
- Individuals who were proficient in the English language, including reading, writing, and speaking, were recruited.
- Individuals who have at least basic knowledge of the Hindi language to understand the advertisements were recruited.

### ***Exclusion Criteria***

Additionally, the researcher has set four exclusion criteria to avoid any chance of bias. Individuals who met these criteria were not included in the study.

- Individuals with neurological or psychiatric disorders (e.g., epilepsy, major depressive disorder, schizophrenia) were excluded as they may affect EEG signals.
- Individuals who use psychoactive substances or have a history of substance abuse were excluded to avoid confounding factors related to altered neural processing.
- Individuals with severe auditory impairments were excluded.

- Individuals with metal implants or pacemakers were excluded, as they may interfere with EEG equipment.

### **Assessment Tools**

To systematically collect the data and to measure the variable most reliably, the researcher used the following assessment instruments.

#### ***Personal and Sociodemographic Data Sheet***

The personal and sociodemographic details of the participants, such as age, sex, educational level, and state of residence, were collected using a basic sociodemographic form prepared by the researcher (See Appendix B).

#### ***The Evoked Nostalgia Scale***

The advertisement evoked nostalgia was measured using the Evoked Nostalgia Scale developed by Pascal et al. (2002). The Scale consisted of ten items, which the participants responded to on a seven-point scale. The responses included from 1 'Strongly Disagree' to 7 'Strongly Agree.' Items included statements such as "Reminds me of the past" and "Makes me feel nostalgic." Higher scores indicated higher levels of evoked nostalgia in the participants. The Cronbach's Alpha score was reported to be .96, indicating a good reliability (Pascal et al., 2002), and internal agreement with the intraclass correlation coefficient equal to .84. (See Appendix D).

#### ***Attitude towards the Advertisement (Aad)***

Attitude toward the advertisement (Aad) was measured using a 4-item scale adopted from Muehling and Pascal (2012). For each item, the response options were anchored, such as *bad/good*, *unfavourable/favourable*, *negative/positive*, and

*unpleasant/pleasant* on a seven-point scale. Higher scores indicated more favourable attitudes toward the advertisement. This scale demonstrated excellent reliability with Cronbach's alpha = .97 (Muehling et al., 2014) (See Appendix E).

#### ***Attitude towards the Brand (Aab)***

Attitudes toward the brand were assessed using a 4-item scale adopted from Pascal et al. (2002). For each item, the response anchors were *bad/good*, *dislike very much/like very much*, *unfavourable/favourable*, and *worthless/valuable* on a seven-point scale. Higher scores indicated a more favourable attitude towards the brand. This scale demonstrated high reliability in prior research with Cronbach's alpha = .95 (Muehling et al., 2014). The scale showed a good internal consistency with an intraclass correlation coefficient of .88. (See Appendix F).

#### ***Purchase intention (PI)***

Purchase intention was measured using a 3-item scale with response options such as *unlikely/likely*, *improbable/probable*, and *impossible/possible* regarding the likelihood of purchasing the product. Participants responded on a 7-point scale, with higher scores indicating greater purchase intent. This scale was adapted from Pascal et al. (2002) and demonstrated high reliability in prior research (Cronbach's alpha = .93; Muehling et al., 2014). The intraclass correlation coefficient of .82 indicated that the scale had a good internal consistency (see Appendix G).

#### ***Advertisement Relevance***

Advertisement Relevance was measured using a single-item tool developed by Hühn et al. (2017). The item is "*When I saw the advertisement, I thought the*

*advertisement was relevant.*” Participants responded to this item on a 7-point Likert-type scale, where responses ranged from 1 = *strongly disagree* to 7 = *strongly agree*. This concise, validated item was adopted to capture participants’ immediate perception of the personal relevance of the advertisements in the current study. Single-item measures have been demonstrated to be effective for unidimensional constructs like advertisement relevance, especially in the fields of marketing and advertising (Bergkvist & Rossiter, 2007). The scale showed a good internal consistency with an intraclass correlation coefficient of .89 (See Appendix H).

### ***Time Taken to Skip the Advertisement***

Time Taken to Skip was operationalised as the duration (in seconds) from the moment the skip option appeared during the advertisement until the participant actively pressed the skip button (Choi & Kim, 2021).

### ***Electroencephalography***

EEG data were recorded using the 64-channel ACTi Cap Slim active electrode system and the Brain Vision Recorder Version 1.23.0003.

## **Procedure**

### ***Selection and Pretesting of Stimulus***

The advertisements that were to be utilised in the experiment were meticulously chosen and pretested. Initially, a survey was administered to 164 young adults between the ages of 18 and 25 to determine which advertisements from their childhood or early adolescence evoked nostalgia. This resulted in the identification of 20 advertisements that elicited nostalgia among a diverse group of young adults.

Secondly, with the assistance of two advertisement experts, 20 contemporary advertisements that were comparable to the childhood advertisement identified previously were chosen. Six experts in the advertising industry further validated these two sets of advertisements. This ensured that the advertisements were comparable in terms of duration, relevance, popularity, and brand recognition. In order to guarantee that the advertisements evoked nostalgia as intended, a group of 57 young adults pretested a set of ten childhood advertisements and ten contemporary advertisements, as determined by the expert validation study. The stimulus-selection and validation procedure devised by Kessous et al. (2015) and Hu Shuxiang et al. (2025) was implemented by the researcher to guarantee a systematic process in the selection of stimuli (refer to Appendix J and K for the comprehensive methodology for stimulus selection and pretesting).

### ***Identifying and screening participants***

Students from the Central University of Karnataka were invited to participate in the study. An official email was sent through the Head of the departments, and a poster about the study was disseminated to all student groups via WhatsApp. Students who were interested in participating completed a Google form by accessing the link provided in the poster. This form checked for students' eligibility to participate in the study. (See appendix C)

### ***Informed Consent and Preparation for Recording***

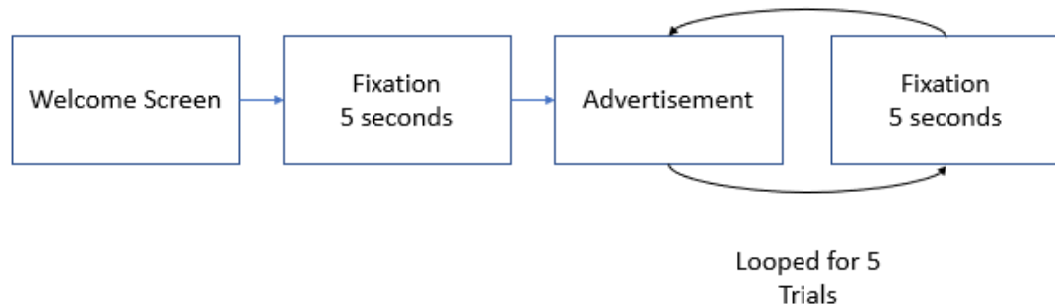
Before the investigation, eligible participants were invited to the laboratory by appointment. Participants were advised to refrain from consuming caffeinated beverages on the day of the recording and to have a restorative night's sleep the day

prior to the experiment. Rapport was established with the participants in the laboratory to guarantee a comfortable experimental experience. The participants were once again apprised of the procedures involved in recording the EEG data. After ensuring their comfort, informed consent was obtained from the participants, along with socio-demographic data.

Subsequently, electrodes were placed on the participant's head using an electrode cap that was suitable for the participant's scalp size. The 64-channel ACTi cap slim active electrodes were positioned with the assistance of AgCl electrode gel to ensure the appropriate conductivity of signals and to reduce impedance (refer to Appendix A for the informed consent form and Appendix C for screening form).

### *Practice Trial*

A practice trial was conducted prior to the main experiment to ensure that the participants understood the experimental procedure. In this trial, the participants read the instructions that appeared on the screen. Subsequently, they viewed five advertisements with incorporated skip buttons, which appeared after 10 seconds from the advertisement's onset. Participants had the option to either continue watching the advertisement or dismiss it after ten seconds. The participants were required to observe a five-second fixation cross that appeared before each advertisement. This was instrumental in preventing distraction prior to the onset of the stimulus (refer to Figure 2).

**Figure 2***The Schematic Representation of the Practice Trial****Main Experiment***

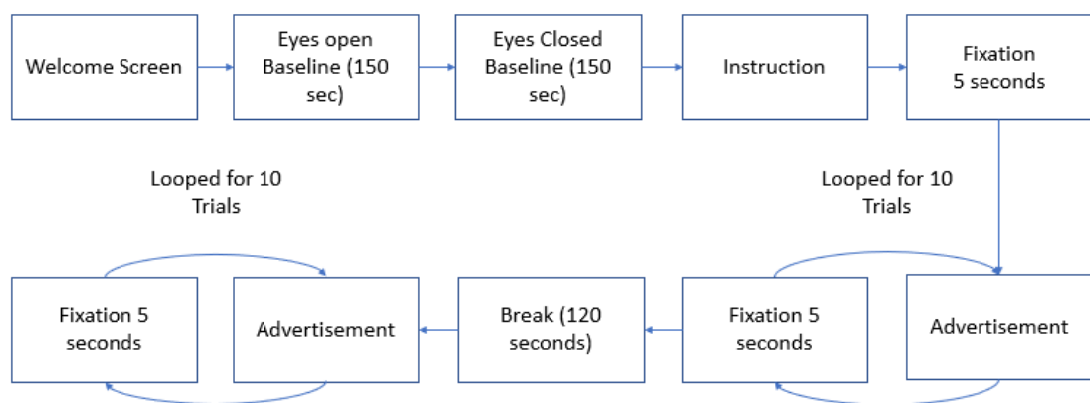
Before the main trial commenced, doubts, if any, were resolved by the participants following the conclusion of the practice trial. A five-minute baseline EEG data was recorded with both eyes open and closed in the main trial, prior to stimulus presentation. A five-second fixation cross was presented before each advertisement, which facilitated the participants' reestablishment of attentional focus. Following this, an advertisement stimulus was presented. Each advertisement was presented in its entirety; however, a "Skip Ad" button was made available to participants at precisely ten seconds into the advertisement, enabling them to either continue viewing or skip the remaining portion. This method facilitated a naturalistic evaluation of advertisement-skipping behaviour by documenting the time required to skip. To reduce the impact of order effects, each participant was exposed to a total of 20 television advertisements, which included ten nostalgic and ten non-nostalgic advertisements. The advertisements were presented in a random order.

Following each advertisement, participants completed a series of self-report measurements that evaluated their attitudes toward the advertisement (Aad), the brand

(Aab), purchase intention (PI), the relevance of the advertisement, and the nostalgia evoked by the advertisement. Responses were documented using 7-point Likert scales (refer to Figure 3).

### Figure 3

#### *The Schematic Representation of the Main Experiment Flow*



### Ethical Considerations

Ethical clearance was obtained from an independent ethics committee prior to the commencement of the study (Reference Number: KBNU/FOMS/IEC/2024-25/109). Additionally, the study adhered to the ethical standards outlined in the seventh edition of the American Psychological Association (APA). The participants were informed that their participation in the study was wholly voluntary and that they had the right to withdraw at any time. Confidentiality was ensured, and participants provided their informed consent. The participants were provided with a comprehensive debriefing regarding the study's objectives following the experiment. The study did not provide any compensation for participation.

## **Data Analysis**

Data analysis comprised three phases: preprocessing and extraction of EEG data, statistical analysis, and predictive modelling with SVM-based regression. In order to enhance the quality of the data, the unprocessed EEG signals were cleaned, and artefacts were eliminated during the preprocessing stage. The Fast Fourier Transform was employed to extract the pertinent EEG features during the extraction stage. Descriptive statistics were implemented during the statistical analysis phase to summarise the data, the Hayes Process Macro was implemented to investigate the mediating role of advertisement relevance, and the Paired Samples T test was implemented to compare the neural, self-report, and behavioural outcomes. The extracted EEG features and consumer responses were subjected to a machine learning-based regression using a Support Vector Machine (SVM) in the final stage. The subsequent procedures and the various phases of analysis are detailed in the following sections.

### ***Preprocessing and Extraction of Electroencephalographic (EEG) Data***

The EEGLAB (version 2023.1) and ERPLAB (version 12.01) were employed to perform the data preprocessing and extraction. The continuous EEG data that were initially recorded at a sampling rate of 500 Hz were down-sampled to 250 Hz. The acquired EEG data were filtered to eliminate high-frequency noise by employing a 0.5 Hz to 40 Hz band-pass filter. The channels exhibiting subpar signal quality were identified and rectified through the implementation of spherical spline interpolation. The event markers embedded in the data were used to organise the data into two bins that represented the experimental conditions. The data were subsequently epoch-shifted from -200 milliseconds (pre-stimulus onset) to 10,000 milliseconds (post-stimulus onset). The artefact rejection procedure was implemented at the epoch level

to eliminate any ocular and muscular artefacts. The cleansed epochs were subsequently averaged across each bin and subjected to baseline correction.

The EEGLAB's 'spectopo' function was employed to conduct a spectral power analysis of the recorded data after preprocessing. This function utilises the Fast Fourier Transform (FFT) to derive band power across various frequency ranges and regions of interest. The average power of each band was determined for each region.

### *Statistical Analysis*

The socio-demographic profile of the participants was analysed using descriptive statistics. The participants' scores for each outcome were combined across all trials. This approach to within-subject aggregation protected the structure of the repeated-measures design and prevented pseudo-replication by ensuring that repeated measurements were not regarded as independent (Muhammad, 2023). Spectral power values in pertinent frequency bands (e.g., alpha, beta, theta) were also averaged across trials per condition for each participant in the context of EEG data, in accordance with the most effective methods of EEG analysis (Luck, 2014). The relationship between the research variables was determined using Pearson's correlation.

PROCESS MACRO (version 4.2) was implemented in SPSS (version 25) for Mediation Analysis. The difference scores (nostalgic–non–nostalgic) for each outcome per participant were calculated and analysed using Hayes' PROCESS Model Four. When experimental variation is within-subject and the researcher intends to concentrate on intra-individual change or contrast rather than item-level (ad-level) variation, the use of difference scores in mediation analysis is a methodologically solid approach. Difference scores are appropriate and interpretable in within-subject designs where the interest is in the differences in how individuals respond across conditions, as per Judd et.al. (2001). This method is consistent with previous

recommendations for the investigation of psychological mediation in repeated-measures experiments (Montoya & Hayes, 2017). Montoya and Hayes (2017) specifically demonstrated that the computing of difference scores and their subsequent analysis through straightforward mediation (PROCESS Model four) can accurately assess whether a mediator explains the impact of a condition-level manipulation on an outcome without the necessity of modelling lower-level item variance.

The effect size was determined using JAMOVI (Version 2.6.26), and a paired sample t-test was implemented in SPSS (version 25) to investigate the differences between consumer responses and EEG activity in the nostalgic and non-nostalgic advertisements.

### ***Predictive modeling***

Consumer responses were predicted using a regression model based on a Support Vector Machine (SVM) and a radial basis function (RBF) kernel to investigate whether EEG features elicited during nostalgic exposure predicted them. The present investigation employed SVM regression, which is a widely used method for neurophysiological data. It is a suitable model for the current study due to its capacity to capture nonlinear relationships between predictors and outcomes and its robustness against high-dimensional data (Ghaddar & Naoum-Sawaya, 2018). The SVM model was standardised to guarantee that all features made an equal contribution to the model training. The efficacy of the SVM model was assessed using a Leave-One-Out Cross-Validation (LOOCV). This method is advantageous for models of moderate to small size, as it optimizes the utilisation of available data by establishing one participant's data as the test set within each fold (Bradshaw et al., 2023). To calculate the overall performance metrics, including the coefficient of determination ( $R^2$ ), Pearson correlation ( $r$ ), and Root Mean Square Error (RMSE),

predictions across the creases were aggregated. The contribution of each EEG feature in predicting the outcome variables was analysed using permutation-based feature importance. All SVM-based regression analyses were conducted in MATLAB using the machine learning toolbox.

\*\*\*

## CHAPTER 4

### RESULTS

This chapter presents the outcomes obtained based on the data collected and analysed in an objective and systematic manner. Tables and figures have been used to present the findings in a precise and concise manner in a logical and coherent sequence. This chapter includes the results of the main experiment and presents the sociodemographic characteristics of the participants using descriptive statistics, the internal consistency of the measurement tools used using Intra-rater correlation coefficient, the correlation among the variables studied using Pearson's correlation, the differences in the outcome variables between nostalgic advertising condition and non-nostalgic advertising condition using paired sample *t* test and Cohen's *d* for effect size and finally the prediction of consumer responses from EEG measures in the context of nostalgic advertisements using Support vector Machine.

#### **Descriptive Statistics and Demographic Details of the Participants in the Study**

**Table 1**

*Descriptive Statistics of the Participants' Age in the Main Study*

	N	Mean	SD	Minimum	Maximum
Age (in years)	67	20	1.467	18	24

Table 1 highlights the age of the participants in the main study. The study included a total of 67 participants. The mean age of the participants is 20 (ranging from 18 to 24) with a Standard Deviation (SD) of 1.467.

**Table 2***Summary of the Sociodemographic Characteristics of the Participants*

Variables	N	Percentage
<b>Gender</b>		
Male	33	49.3
Female	34	50.7
<b>Education</b>		
Under-Graduation	53	79.1
Post-Graduation	14	20.9
<b>Religion</b>		
Hindu	55	82.1
Christian	9	13.4
Muslim	2	3.0
Other	1	1.5
<b>Perceived Socio-economic Status</b>		
Middle	53	79.1%
Upper Middle	7	10.4%
Lower Middle	5	7.5%
Lower	1	1.5%
Upper	1	1.5%

Table 2 shows the sociodemographic representation of the participants in the main study. A total of 67 participants were included in the study. The gender distribution was nearly equal, with 33 males (49.3%) and 34 females (50.7%). The majority of participants were pursuing undergraduate education (n = 53, 79.1%), while 14 participants (20.9%) were enrolled in postgraduate programs. Most participants identified as Hindu (n = 55, 82.1%), followed by Christians (n = 9,

13.4%), Muslims (n = 2, 3.0%), and one participant identifying with another religion (1.5%). Participants also reported their perceived socio-economic status, where most identified as middle class (n = 53, 79.1%), followed by upper middle class (n = 7, 10.4%) and lower middle class (n = 5, 7.5%). One participant each identified as belonging to the lower (1.5%) and upper (1.5%) socio-economic strata.

### Psychometric Properties of the Assessment Tools

**Table 3**

*Psychometric Properties of Assessment Tools Used in the Study*

Measures	ICC	95% CI	F	p-Value
Ad-Evoked Nostalgia	0.84	[0.775-0.889]	6.160	0.000
Attitude towards the Advertisement	0.84	[0.773-0.888]	6.099	0.000
Attitude towards the Brand	0.88	[0.827-0.915]	8.015	0.000
Purchase Intention	0.82	[0.746-0.874]	5.440	0.000
Advertisement Relevance	0.89	[0.844-0.923]	8.862	0.000

Using a two-way mixed effects model with average measures and consistency agreement, the reliability of the self-report measures was evaluated by computing intraclass correlation coefficients (ICCs). Table 3 shows the (ICC) scores of the assessment tools used in the study. The scale for ad-evoked nostalgia showed good reliability with ICC = .84, 95% CI [0.775, 0.889], F (66, 1254) = 6.160,  $p < .001$ .

Similarly, the scale for attitude toward the advertisement showed an ICC of .84, 95% CI [0.773, 0.888], F (66, 1254) = 6.099,  $p < .001$ . The Attitude toward the brand scale also showed excellent reliability with ICC = .88, 95% CI [0.827, 0.915], F (66, 1254) = 8.015,  $p < .001$ . The scale measuring Purchase intention also showed good

reliability, ICC = .82, 95% CI [0.746, 0.874],  $F(66, 1254) = 5.440$ ,  $p < .001$ . Finally, the scale measuring advertisement relevance had the highest reliability estimate, ICC = .89, 95% CI [0.844, 0.923],  $F(66, 1254) = 8.862$ ,  $p < .001$ . These findings confirm that the self-report measures used to assess consumer responses were psychometrically sound and internally consistent across repeated measures.

### Intercorrelation of the Variables in the Study

**Table 4**

*Inter-Correlation of the Difference Scores between Nostalgic and Non-Nostalgic Advertisements*

Variables	N	Nostalgia	PI	Aad	Aab	Ad Rel
Nostalgia	67	1				
PI	67	.612**	1			
Aad	67	.553**	.600**	1		
Aab	67	.507**	.836**	.592**	1	
Ad Rel	67	.436**	.646**	.412**	.664**	1

*Note.* \*\* $p < 0.01$ , \*  $p < 0.05$ , PI-Purchase Intention, Aad-Attitude towards the Advertisement, Aab-Attitude towards the brand, Ad Rel-Advertisement relevance.

The correlation of difference scores between nostalgic and non-nostalgic advertisements on Purchase Intention, Attitude towards the Advertisement, Attitude towards the Brand and Advertisement Relevance was computed as a preliminary support for the proposed mediation model. Table 4 shows the correlation coefficients between the difference scores among the variables. Nostalgia was positively and significantly related with Purchase Intention ( $r = .612^{**}$ ,  $p < .01$ ), Attitude towards the

advertisement ( $r = .553^{**}$ ,  $p < .01$ ), Attitude towards the brand ( $r = .507^{**}$ ,  $p < .01$ ) and perceived advertisement relevance, ( $r = .436^{**}$ ,  $p < .01$ ). Similarly, a significant positive correlation was found between Purchase intention and Attitude towards the advertisement ( $r = .600^{**}$ ,  $p < .01$ ), Attitude towards the brand ( $r = .836^{**}$ ,  $p < .01$ ) and perceived advertisement relevance ( $r = .646^{**}$ ,  $p < .01$ ). There was a significant and positive correlation for Attitude towards the advertisement with Attitude towards the brand ( $r = .592^{**}$ ,  $p < .01$ ) and perceived advertisement relevance ( $r = .412^{**}$ ,  $p < .01$ ). Finally, Attitude towards the brand was positively associated with perceived advertisement relevance ( $r = .664^{**}$ ,  $p < .01$ ). This relationship was statistically significant. Thus, the hypothesis stating that there exists a significant association between ad-evoked nostalgia with consumer responses (Aad, Aab, PI) and advertisement relevance is supported.

Table 5 shows the intercorrelation between the variables in the nostalgic condition. A very strong correlation was observed between the various EEG bands. There was a significant and strong positive correlation of frontal alpha with the temporal alpha ( $r = .82^{**}$ ) and parietal alpha ( $r = .79^{**}$ ), both significant at  $p < .01$ . This indicates that as frontal alpha increases, temporal and parietal alpha also increase. Similarly, temporal theta is positively related with temporal alpha ( $r = .77^{**}$ ), parietal alpha ( $r = .72^{**}$ ) and central theta ( $r = .74^{**}$ ). This relationship is found to be significant at  $p < .01$ . There exists a positive relationship between temporal alpha and parietal alpha, as well as temporal alpha and central theta. Pearson's correlation coefficient ( $r$ ) of  $.92^{**}$  and  $.70^{**}$ , respectively, indicates a strong relationship which is also significant at  $p < .01$ . In terms of self-reported consumer responses, attitude towards the brand is positively related with purchase

intention ( $r = .81^{**}$ ) and advertisement relevance ( $r = .74^{**}$ ), which is also statistically significant ( $p < .01$ ). All these variables exhibit a very strong relationship.

Similar to the findings above, several variables exhibited a moderate to strong relationship with Pearson's ' $r$ ', ranging from (-.41 to .65). There exists a negative relationship between beta power bands and frontal alpha ( $r = -.42^{**}$ ), temporal alpha ( $r = -.41^{**}$ ), and parietal alpha ( $r = -.45^{**}$ ), all significant at the  $p < .01$  level. A positive correlation was observed between Frontal Alpha with frontal beta ( $r = .64^{**}$ ), temporal theta ( $r = .58^{**}$ ) and central theta ( $r = .57^{**}$ ). These correlations were found to be statistically significant ( $p < .01$ ). Similarly, frontal beta was positively correlated with temporal theta ( $r = .48^{**}$ ), temporal alpha ( $r = .59^{**}$ ), parietal alpha ( $r = .55^{**}$ ) and central theta ( $r = .48^{**}$ ), and this was statistically significant at  $p < .01$ . There was also a statistically significant ( $p < .01$ ) positive correlation between parietal alpha and central theta ( $r = .65^{**}$ ). Similar observations were made among self-reported consumer responses. Attitude towards the advertisement was positively correlated with attitude towards the brand ( $r = .64^{**}$ ), purchase intention ( $r = .44^{**}$ ), advertisement relevance ( $r = .60^{**}$ ) and ad-evoked nostalgia ( $r = .46^{**}$ ). These correlations were significant at  $p < .01$ . There was a statistically significant ( $p < .01$ ) positive association between ad-evoked nostalgia and attitude towards the brand ( $r = .64^{**}$ ), purchase intention ( $r = .60^{**}$ ) and advertisement relevance ( $r = .54^{**}$ ). Further, advertisement relevance was positively associated with purchase intention ( $r = .61^{**}$ ,  $p < .01$ ).

**Table 5***Inter-Correlation of Variables for the Nostalgic Advertisement*

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Beta													
2. FA	-.42**												
3. FB	-.22	.64**											
4. FMT	-.00	-.16	-.09										
5. TT	-.14	.58**	.48**	-.20									
6. TA	-.41**	.82**	.59**	-.18	.77**								
7. PA	-.45**	.79**	.55**	-.23	.72**	.92**							
8. CT	-.20	.57**	.48**	-.18	.74**	.70**	.65**						
9. Aad	.04	-.04	.03	.08	-.00	-.02	-.06	.10					
10. Aab	.14	-.12	.14	.06	-.00	-.05	-.05	-.01	.64**				
11. PI	.20	-.01	.17	-.10	.17	.06	.05	.09	.44**	.81**			
12. Ad Rel	.26*	-.25*	-.05	-.03	-.07	-.20	-.20	-.10	.60**	.74**	.61**		
13. Skiptime	-.28*	.34**	.25*	-.10	.14	.21	.25*	.08	.00	.16	.08	.07	
14. Nos	.06	.01	.12	-.01	-.00	.08	.07	.11	.46**	.64**	.60**	.54**	.08

*Note.* \*\*  $p < .01$ , \* $p < .05$  (2-tailed). 2. FA = Frontal Alpha, 3. FB = Frontal Beta, 4. FMT = Frontal Midline Theta, 5. TT = Temporal Theta, 6. TA = Temporal Alpha, 7. PA = Parietal Alpha, 8. T = Central Theta, 9. Aad = Attitude toward advertisement; 10. Aab = Attitude toward brand; 11. PI = Purchase intention; 12. Ad Rel = Advertisement relevance; 13. Skiptime = time taken to skip advertisement, 14. Nos = Ad-evoked Nostalgia

There was a weak to moderate correlation among certain variables. Beta was positively correlated with advertisement relevance ( $r = .26^*$ ,  $p < .05$ ) and negatively correlated with time taken to skip an advertisement ( $r = -.28^*$ ,  $p < .05$ ). It is also observed that there is an inverse correlation between frontal alpha and advertisement relevance ( $r = -.25^*$ ,  $p < .05$ ) and a positive correlation between frontal alpha and time taken to skip an advertisement ( $r = .34^{**}$ ,  $p < .01$ ) that was statistically significant. Further frontal beta and parietal alpha was also positively associated with time taken to skip an advertisement. The Pearson's ( $r$ ) for the correlation was  $.25^*$  significant at  $p < .05$ . Apart from this, a few other variables showed weak correlation, which was not statistically significant (see Table 5).

Table 6 presents the intercorrelations among EEG bands and consumer response for the non-nostalgic condition. Beta power showed a significant negative correlation with parietal alpha ( $r = -.34^{**}$ ,  $p < .01$ ), indicating that as beta power increases, parietal alpha decreases. Frontal alpha (FA) and parietal alpha (PA) were strongly positively correlated ( $r = .82^{**}$ ,  $p < .01$ ), as were frontal alpha and temporal alpha (TA) ( $r = .82^{**}$ ,  $p < .01$ ). Similarly, frontal beta (FB) was positively correlated with frontal alpha ( $r = .64^{**}$ ,  $p < .01$ ), temporal theta (TT) ( $r = .48^{**}$ ,  $p < .01$ ), and temporal alpha ( $r = .57^{**}$ ,  $p < .01$ ).

Temporal theta also showed strong positive correlations with temporal alpha ( $r = .77^{**}$ ,  $p < .01$ ) and central theta (CT) ( $r = .75^{**}$ ,  $p < .01$ ). Additionally, parietal alpha exhibited strong positive correlations with temporal alpha ( $r = .88^{**}$ ,  $p < .01$ ) and central theta ( $r = .65^{**}$ ,  $p < .01$ ).

Among consumer response variables, attitude toward the advertisement (Aad) was strongly positively correlated with attitude toward the brand (Aab) ( $r = .75^{**}$ ,  $p < .01$ ), and purchase intention (PI) showed strong positive correlations with both attitude toward the advertisement ( $r = .70^{**}$ ,  $p < .01$ ) and attitude toward the brand ( $r = .77^{**}$ ,  $p < .01$ ). Advertisement relevance (Ad Rel) was also positively associated with attitude toward the advertisement ( $r = .65^{**}$ ,  $p < .01$ ), attitude toward the brand ( $r = .61^{**}$ ,  $p < .01$ ), and purchase intention ( $r = .60^{**}$ ,  $p < .01$ ), reflecting the important role of perceived relevance in consumer responses.

Ad-evoked nostalgia (Nos) was positively correlated with attitude toward the advertisement ( $r = .48^{**}$ ,  $p < .01$ ), attitude toward the brand ( $r = .40^{**}$ ,  $p < .01$ ), and advertisement relevance ( $r = .62^{**}$ ,  $p < .01$ ), suggesting that higher nostalgic feelings are associated with more favourable consumer attitudes and perceived advertisement relevance. Nostalgia showed no significant correlation with time taken to skip the advertisement ( $r = -.16$ ,  $p < .05$ ).

Time taken to skip an advertisement (SkipTime) did not show significant correlations with most EEG or consumer response variables; weak negative correlations were observed with purchase intention ( $r = -.17$ ), attitude toward the brand ( $r = -.15$ ), and advertisement relevance ( $r = -.15$ ), none of which reached statistical significance.

Overall, the correlations indicate strong positive relationships between EEG alpha and theta band powers across different brain regions, and significant positive associations among nostalgic feelings, advertisement relevance, and favourable consumer attitudes and intent

**Table 6***Inter-Correlation of Variables for the Non-Nostalgic Advertisement*

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Beta													
2. FA	-.22												
3. FB	-.10	.64**											
4. FMT	-.07	-.17	-.06										
5. TT	.01	.56**	.48**	-.22									
6. TA	-.18	.82**	.57**	-.17	.77**								
7. PA	-.34**	.82**	.52**	-.21	.66**	.88**							
8. CT	-.02	.62**	.53**	-.19	.75**	.74**	.65**						
9. Aad	.17	-.10	-.13	-.12	.08	-.04	-.11	.01					
10. Aab	.07	-.15	-.07	-.06	.07	-.06	-.10	-.03	.75**				
11. PI	.07	-.05	-.06	*-.27*	.18	.05	.04	.00	.70**	.77**			
12. Ad Rel	.05	-.06	-.08	-.13	.04	.00	-.03	-.03	.65**	.61**	.60**		
13. SkipTime	-.12	.08	.02	.05	-.04	-.05	.00	-.11	-.13	-.15	-.17	-.15	
14. Nos	.13	-.20	-.07	.07	.00	-.05	-.08	.03	.48**	.40**	.46**	.62**	-.16

*Note.* p\*\* < .01, p\* < .05 (2-tailed). 2. FA = Frontal Alpha, 3. FB = Frontal Beta, 4. FMT = Frontal Midline Theta, 5. TT = Temporal Theta, 6. TA = Temporal Alpha, 7. PA = Parietal Alpha, 8. CT = Central Theta, 9. Aad = Attitude toward advertisement; 10. Aab = Attitude toward brand; 11. PI = Purchase intention; 12. Ad Rel = Advertisement relevance; 13. SkipTime = time taken to skip advertisement, Nos = Ad-evoked Nostalgia

**Mediation Analysis****Table 7**

*The Mediating Function of Advertising Relevance in the Association between Purchase Intention and Ad-Evoked Nostalgia*

Effect Type	Path	$\beta$	SE	t	P	95% CI	
						Lower	Upper
Total	Nos $\rightarrow$ PI	0.116	0.0200	5.82	0.000	.0762	.1559
Direct	Nos $\rightarrow$ PI	0.395	0.0185	4.24	.0001	.0414	.1153
Indirect	Nos $\rightarrow$ Ad-Rel $\rightarrow$ PI	0.190	0.0120			.0167	.0643

*Note.* Nos = Ad-Evoked Nostalgia, PI = Purchase Intention, Ad-Rel = Advertisement Relevance,  $\beta$  = Standardised regression coefficient, CI = Class Interval.

A simple mediation analysis was conducted to examine the mediating role of advertisement relevance between ad-evoked nostalgia and purchase intention (see Table 7). It is evident that the total effect of nostalgia on purchase intention was significant ( $\beta = .116$ , SE = .0200,  $t(df) = 5.82$ ,  $p < .001$ , 95% CI [.0762, .1559]). This suggests that ad-evoked nostalgia is positively related to purchase intention. The direct effect of nostalgia on purchase intention showed a  $\beta$  value of 0.395 with a standard error (SE) = .0185. This effect was found to be statistically significant ( $p < .001$ , 95% CI [.0414, .1153]). The indirect effect of ad-evoked nostalgia on purchase intention through advertisement relevance was also significant,  $\beta = .190$ , SE = .0120, 95% CI [.0167, .0643]. This

indicates that higher levels of ad-evoked nostalgia increased perceived advertisement relevance, which in turn enhanced purchase intention. However, since both direct and indirect effects were significant, it shows that advertisement relevance only partially mediates this relationship. Thus, the hypothesis stating that advertisement relevance mediated the relationship between ad-evoked nostalgia and Purchase Intention is supported.

#### Figure 4

*The Mediating Function of Advertising Relevance in the Association between Purchase Intention and Ad-Evoked Nostalgia*

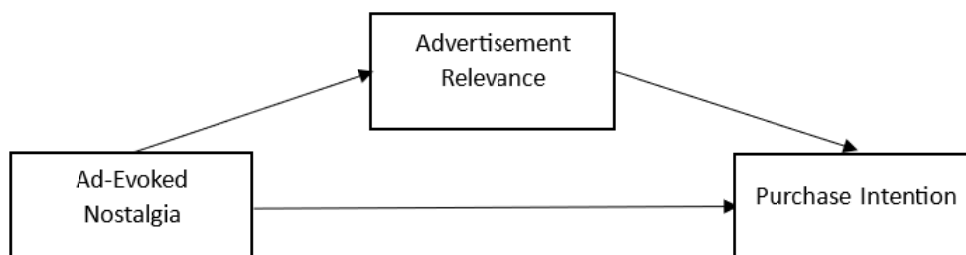


Table 8 shows the results of the mediation analysis between ad-evoked nostalgia and attitude towards the advertisement, with advertisement relevance as the mediator. It is evident that the total effect of nostalgia on attitude towards the advertisement was significant ( $\beta = .449, p < .001$ ). The standard error was (SE) = .0121, and the class interval ranged from 0.0248 to 0.0731. Since the class interval does not include a zero, it suggests that as ad-evoked nostalgia increases, attitude towards the advertisement also increases.

**Table 8**

*The Mediating Function of Advertising Relevance in the Association between Attitude towards the Advertisement and Ad-Evoked Nostalgia*

Effect Type	Path	$\beta$	SE	t	P	95% CI	
						Lower	Upper
Total	Nos → Aad	0.449	0.0121	4.05	.0001	.0248	.0731
Direct	Nos → Aad	0.297	0.0122	2.65	.0101	.0080	.0568
Indirect	Nos → Ad-Rel → Aad	0.152	0.0661			.0332	.2897

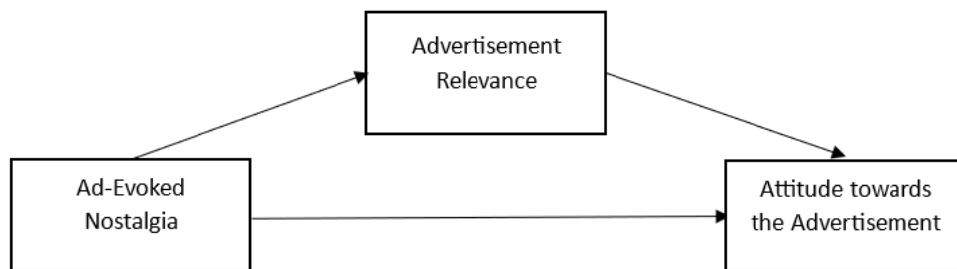
*Note.* Nos = Ad-Evoked Nostalgia, Aad = Attitude towards the Advertisement, Ad-Rel = Advertisement Relevance,  $\beta$  = Standardised regression coefficient, CI = Class Interval.

The direct effect of nostalgia attitude towards the advertisement showed a  $\beta$  value of .297 with standard error (SE) = .0122. This effect was found to be statistically significant ( $p = .0101$ , 95% CI [0.0080, 0.0568]). The indirect effect of ad-evoked nostalgia on attitude towards the advertisement through advertisement relevance was also significant ( $\beta = .152$ , SE = .0661, 95% CI [0.0332, 0.2897]). This indicates that higher levels of ad-evoked nostalgia increased perceived advertisement relevance, which in turn enhanced attitude towards the advertisement. However, since both direct and indirect effects were significant, it shows that advertisement relevance only partially mediates this relationship. Thus, the hypothesis stating that advertisement relevance mediated the

relationship between ad-evoked nostalgia and attitude towards the advertisement is supported.

**Figure 5**

*The Mediating Function of Advertising Relevance in the Association between Attitude towards the Advertisement and Ad-Evoked Nostalgia*



**Table 9**

*The Mediating Function of Advertising Relevance in the Association between Brand Attitude and Ad-Evoked Nostalgia*

Effect Type	Path	$\beta$	SE	t	P	95% CI	
						Lower	Upper
Total	Nos → Aab	0.411	.0248	3.63	.0006	.0406	.1397
Direct	Nos → Aab	0.175	.0219	1.75	.0847	-.0054	.0821
Indirect	Nos → Ad-Rel → Aab	0.236	.0676			.1050	.3702

*Note.* Nos = Ad-Evoked Nostalgia, Aab = Attitude towards the Brand, Ad-Rel = Advertisement Relevance,  $\beta$  = Standardised regression coefficient, CI = Class Interval.

**Figure 6**

*The Mediating Function of Advertising Relevance in the Association between Brand Attitude and Ad-Evoked Nostalgia*

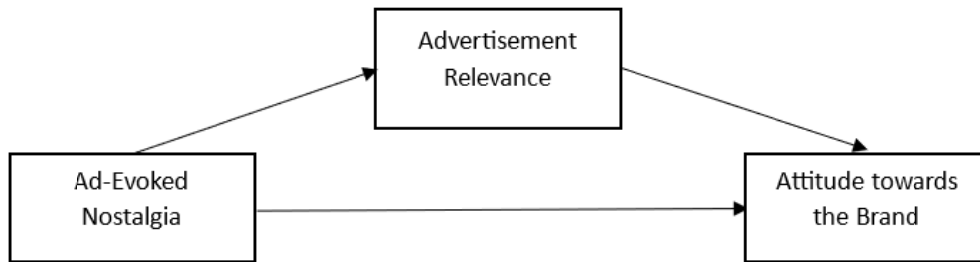


Table 9 shows the results of the mediation analysis between ad-evoked nostalgia and attitude towards the brand, with advertisement relevance as the mediator. It is evident that the total effect of nostalgia on attitude towards the advertisement was significant,  $\beta = 0.411$ ,  $SE = .0248$ ,  $t(df) = 3.63$ ,  $p = .0006$ , 95% CI [.0406, 0.1397]. This indicates that as ad-evoked nostalgia increases, attitude towards the brand also increases. The direct effect of nostalgia attitude towards the brand showed a  $\beta$  value of 0.175 with standard error ( $SE$ ) = .0219. This effect was found to be statistically not significant ( $p = .0847$ , 95% CI [-.0054, .082]) has the class interval includes a zero. The indirect effect of ad-evoked nostalgia on attitude towards the brand through advertisement relevance was significant with a  $\beta$  value of 0.236, standard error ( $SE$ ) .0676, 95% CI [.1050, .3702]. This indicates that higher levels of ad-evoked nostalgia increased perceived advertisement relevance, which in turn enhanced attitude towards the advertisement. Since the direct effect became insignificant while the indirect effect remained significant, this shows that advertisement

relevance fully mediates the relationship between ad-evoked nostalgia and attitude towards the brand.

The hypothesis stating that advertisement relevance mediated the relationship between ad-evoked nostalgia and attitude towards the brand is supported.

### **Differences in the Outcome Variables between Nostalgic and Non-Nostalgic Advertisements**

**Table 10**

*Comparison of the Ad-Evoked Nostalgia Scores between Nostalgic and Non-Nostalgic Advertisements using Paired Samples t Test.*

Variables	Nostalgic		Non-Nostalgic		t	Sig	Effect Size
	Mean	SD	Mean	SD			
Nostalgia	55.76	8.425	41.94	11.457	9.27*	<0.001	1.13

\*  $p < 0.01$

A manipulation check was conducted to examine whether nostalgic advertisements evoked more nostalgia than the non-nostalgic advertisements as intended. A paired samples t-test was conducted for this purpose. From Table 10, it is evident that there was a significant difference in the ad-evoked nostalgia scores between the nostalgic and non-nostalgic advertisements ( $t = 9.27$ ,  $p < 0.001$ ). The strong effect size was observed ( $d = 1.13$ ), indicating that nostalgic manipulation was successful. This suggest that the manipulation of nostalgia using childhood and contemporary advertisements was

successful. Nostalgic advertisements (childhood) elicited higher nostalgia than the non-nostalgic (contemporary) advertisements in the present study.

**Table 11**

*Comparison of the differences in outcome variables between Nostalgic and Non-Nostalgic Advertisements using Paired Samples t Test.*

Variables	Nostalgic		Non-Nostalgic		t	Sig	Effect Size
	Mean	SD	Mean	SD			
Aad	14.01	1.46	13.23	1.42	4.800	0.000	0.586
Aab	21.47	3.20	19.67	3.14	5.537	0.000	0.676
PI	16.26	2.42	14.58	2.57	5.731	0.000	0.700
Ad-Rel	4.99	1.02	4.50	0.93	4.936	0.000	0.603
RT	6.47	5.31	5.65	4.88	1.222	0.226	0.149
Beta	0.35	0.05	0.38	0.03	-4.794	0.000	-0.5856
F Alpha	2.27	5.71	2.58	5.79	-4.452	0.000	-0.5439
F Beta	-2.80	4.99	-2.54	5.09	-3.103	0.003	-0.3791
FM	5.55	4.54	6.26	6.27	-2.339	0.019	-0.2931
Theta							
T Theta	4.52	3.25	4.96	3.33	-6.005	0.000	-0.7336
T Alpha	2.41	3.60	2.81	3.68	-6.403	0.000	-0.7822
P Alpha	1.67	6.00	2.07	6.02	-5.856	0.000	-0.7154
C Theta	-0.73	5.81	-0.47	5.94	-3.755	0.000	-0.4587

*Note.* Aad = Attitude towards the advertisement, Aab = Attitude towards the brand, PI = Purchase intention, Ad\_Rel = Advertisement relevance, RT = Reaction Time, F = Frontal, FM = Frontal Midline, T = Temporal, p = Parietal, C = Central, t = Students' t statistic, Sig = significance value.

To compare the consumer responses and EEG band power between the nostalgic and non-nostalgic conditions, a paired samples t-test was conducted on SPSS (version 25), and the effect size was calculated using JAMOVI (version 2.6.26). A significant difference was observed in self-reported consumer responses. There was a significant difference in the attitude towards the advertisement (Aad) between nostalgic and non-nostalgic advertisement conditions, with a higher mean for the nostalgic condition ( $M = 14.01$ ,  $SD = 1.46$ ). The  $t$  value was 4.80, which was significant at  $p < 0.001$  level and a moderate effect size  $d = 0.59$ . In the nostalgic condition, attitude towards the brand (Aab) ( $M = 21.47$ ,  $SD = 3.20$ ) was significantly higher when compared to the non-nostalgic condition ( $M = 19.67$ ,  $SD = 3.14$ ). The difference was  $t = 5.54$ , which shows a moderate to large effect with  $d = 0.68$ , and it was significant at the 0.001 level. There was a significant increase in purchase intention in the nostalgic condition ( $M = 16.26$ ,  $SD = 2.42$ ) than in the non-nostalgic condition ( $M = 14.58$ ,  $SD = 2.57$ ), and this difference was found to be significant ( $t = 5.73$ ,  $p < .001$ ) with a substantial effect size ( $d = 0.70$ ). Similarly, a significant difference ( $t = 4.94$ ,  $p < .001$ ) was observed in advertisement relevance, with the nostalgic condition showing a higher mean ( $M = 4.99$ ,  $SD = 1.02$ ) than the non-nostalgic condition ( $M = 4.50$ ,  $SD = 0.93$ ). A moderate effect size of  $d = 0.60$  was also observed. The results indicate that there was a significant difference between the nostalgic and non-nostalgic conditions on all attitudinal measures and purchase intention, with moderate to large effect sizes. However, no significant difference ( $t = 1.22$ ,  $p = .23$ ) was observed in the behavioural measure, time taken to skip the advertisements (RT). The mean and standard deviation for the nostalgic condition were  $M = 6.47$ ;  $SD = 5.65$ , and for the non-nostalgic condition were  $M = 5.31$  and  $SD = 4.88$ . Similarly, the effect size

also showed only a small effect ( $d = 0.149$ ). These results support the hypothesis stating that there is a significant difference in attitude towards the advertisement, brand, purchase intention and advertisement relevance in nostalgic advertisements compared to non-nostalgic advertisements. However, the hypothesis, which stated there is a significant difference in time taken to skip the advertisement between nostalgic advertisements and non-nostalgic advertisements, is not supported.

For the electroencephalography measures a significant difference was observed across multiple band powers. Overall beta power was significantly lower during nostalgic conditions ( $M = 0.35$ ,  $SD = 0.05$ ) than during non-nostalgic conditions ( $M = 0.38$ ,  $SD = 0.03$ ). The difference was  $t = -4.79$  and  $p < .001$ , with a moderate effect size ( $d = -0.59$ ). In the frontal region, both frontal alpha and frontal beta powers showed a significant difference. There was a significant reduction in the frontal alpha power in the nostalgic condition ( $M = 2.27$ ,  $SD = 5.71$ ) when compared to the non-nostalgic condition ( $M = 2.58$ ,  $SD = 5.79$ ). The difference value was  $t = -4.45$ , significance  $p < .001$ , exhibiting a moderate effect size ( $d = -0.54$ ). The mean and standard deviation for the frontal beta power in the nostalgic condition were  $M = -2.80$ ,  $SD = 4.99$  and in the non-nostalgic condition were  $M = -2.54$ ,  $SD = 5.09$ . There was a significant reduction in the frontal beta power in the nostalgic condition, as denoted by  $t = -3.10$ ,  $p = .003$ , with a small to moderate effect size ( $d = -0.38$ ). Similarly, the frontal midline theta power showed a small ( $d = -0.29$ ) yet significant difference ( $t = -2.34^*$ ,  $p = .019$ ) between the nostalgic condition ( $M = 5.55$ ,  $SD = 4.54$ ) in relation to the non-nostalgic condition ( $M = 6.26$ ,  $SD = 6.27$ ,  $d = -0.29$ ).

In the temporal region, there was a significant decrease in the temporal theta power for the nostalgic condition ( $M = 4.52$ ,  $SD = 3.25$ ) in comparison to the non-nostalgic condition ( $M = 4.96$ ,  $SD = 3.33$ ). The  $t$  value was  $-6.01$ , with significance,  $p < .001$ , showing a large effect of  $d = -0.73$ . The mean and standard deviation for the temporal theta in the nostalgic condition were  $M = 2.41$ ,  $SD = 3.60$  and in the non-nostalgic condition were  $M = 2.81$ ,  $SD = 3.68$ . The significant difference between the means is denoted by  $t = -6.40$ , significant at  $p < .001$ , indicating a significant reduction in the temporal theta activity in the nostalgic condition with a large effect ( $d = -0.78$ ).

Similar observations were made for the Parietal Alpha and Central Theta. In the nostalgic condition ( $M = 1.67$ ,  $SD = 6.00$ ), the parietal alpha was significantly reduced ( $t = -5.86$ ,  $p < .001$ ) compared to the non-nostalgic condition, which was lower during nostalgic ads compared to non-nostalgic ads ( $M = 2.07$ ,  $SD = 6.02$ ). A large effect size was also observed ( $d = -0.72$ ). For the central theta power, the average and standard deviation were  $M = -0.73$  and  $SD = 5.81$  for the nostalgic condition, and for the non-nostalgic condition, it was ( $M = -0.47$ ,  $SD = 5.94$ ). There was a significant difference in the central theta ( $t = -3.76$ ,  $p < .001$ ) with a moderate effect size ( $d = -0.46$ ). Thus, the hypothesis stating that there is a significant difference in neuro-electrical activity related to attention, autobiographical memory retrieval and cognitive and affective engagement between nostalgic advertisements and non-nostalgic advertisement conditions is supported.

Overall, the results of the paired samples  $t$  test showed that there are significant differences in both EEG power bands and self-report measures of consumer responses for

nostalgic and non-nostalgic advertising conditions. However, there was an exception in the time taken to skip the advertisement.

### Prediction of Consumer Responses from EEG Band Powers

A regression model was run to examine whether EEG band powers could predict consumer responses, namely, purchase intention (PI), attitude toward the ad (Aad), attitude toward the brand (Aab), advertisement relevance, and time taken to skip the advertisement. Performance was evaluated using the leave-one-out cross-validation (LOOCV).

**Table 12**

*LOOCV Regression Performance Metrics for SVM and Baseline Models Predicting Consumer Response*

Outcome	PI		Aad		Aab		Ad-Rel		Skip time	
	Base	SVM	Base	SVM	Base	SVM	Base	SVM	Base	SVM
RMSE	2.64	2.60	1.49	1.42	3.30	3.11	1.01	0.94	5.12	4.89
MAE	2.05	2.04	1.16	1.09	2.62	2.42	0.82	0.78	4.40	3.87
Pearson r	-	0.21	-	0.32	-	0.34	-	0.36	-	0.33
	1.00*		1.00*		1.00*		1.00*		1.00*	
R <sup>2</sup>	-0.02	0.01	-0.02	0.09	-0.02	0.10	-0.02	0.12	-0.02	0.08

*Note.* Pearson correlation for baseline model is -1.00 due to constant prediction values, PI = Purchase Intention, Aad = attitude toward the ad, Aab = attitude toward the brand (Aab), Ad-Rel = advertisement relevance. R<sup>2</sup> = Coefficient of determination, RMSE = Root Mean Squared Error.

The leave-one-out cross-validation (LOOCV) results for the SVM regression models demonstrated modest predictive power of nostalgia-related EEG features on various consumer response variables. Specifically, for purchase intention (PI), the SVM model yielded a root mean squared error (RMSE) of 2.60, a mean absolute error (MAE) of 2.04, a Pearson correlation coefficient ( $r$  of 0.21, and an  $R^2$  of 0.01). Similar patterns were observed for attitude towards the advertisement (Aad), attitude towards the brand (Aab), advertisement relevance (Ad-Rel), and time taken to skip the advertisement (skip time), with RMSE values ranging from 0.94 to 4.89, MAE from 0.78 to 3.87, correlations between 0.32 and 0.36, and  $R^2$  values between 0.08 and 0.12. In contrast, the baseline model, which predicted the mean value of the training set for each outcome, showed consistently higher RMSE and MAE values across all targets (e.g., RMSE = 2.64 for PI, 1.49 for Aad), and negative  $R^2$  values around -0.02, reflecting poor fit. The baseline model's Pearson correlations were -1.00 for all variables, an artefact of constant predictions. These results indicate that the SVM models incorporating EEG features outperformed the baseline model in predicting consumer responses, although the explained variance remained low, suggesting moderate predictive utility. Thus, the hypothesis stating that EEG features elicited during nostalgic exposure will predict purchase intention, advertisement relevance, attitude towards the advertisement, time taken to skip the advertisement and attitude towards the brand, with greater predictive power than compared to a baseline model is supported.

Table 13 presents the mean root mean squared error (RMSE) values and their corresponding 95% confidence intervals (CI) based on bootstrap sampling for the prediction models of consumer response variables.

**Table 13***Bootstrap RMSE Mean and 95% Confidence Intervals for Consumer Response Variables*

<b>Statistic</b>	<b>PI</b>	<b>Aad</b>	<b>Aab</b>	<b>Ad-Rel</b>	<b>SkipTime</b>
Mean RMSE	2.70	1.46	3.32	1.00	5.14
95% CI Lower	2.09	1.11	2.78	0.80	4.28
95% CI Upper	3.19	1.76	3.87	1.16	5.94

*Note.* PI = Purchase Intention, Aad = attitude toward the ad, Aab = attitude toward the brand (Aab), Ad-Rel = advertisement relevance, Mean RMSE = Root Mean Squared Error, CI = Class Interval.

The models yielded a mean RMSE of 2.70 for purchase intention (PI), with a 95% CI ranging from 2.09 to 3.19, indicating moderate variability in model performance across resamples. Attitude toward the advertisement (Aad) showed a lower mean RMSE of 1.46 (95% CI: 1.11 to 1.76), reflecting relatively better prediction accuracy. The prediction of attitude toward the brand (Aab) produced a higher RMSE of 3.32 (95% CI: 2.78 to 3.87), consistent with the complexity of brand-related responses. Advertisement relevance (Ad-Rel) demonstrated the lowest mean RMSE of 1.00 (95% CI: 0.80 to 1.16), suggesting this outcome was predicted with the greatest precision. Finally, time to skip the advertisement had the highest RMSE at 5.14 (95% CI: 4.28 to 5.94), indicating greater error variance in predicting this behavioural measure. These confidence intervals provide a reliable estimate of model stability and suggest the EEG-based models predict advertisement relevance and attitude toward the advertisement with comparatively better consistency.

**Table 14***LOOCV Permutation Feature Importance (%) for Predicting Purchase Intention (PI)*

EEG Feature	Beta	Frontal Alpha	Frontal Beta	Frontal Midline Theta	Temporal Theta	Temporal Alpha	Parietal Alpha	Central Theta
Importance (%)	74.82	2.29	100.00	13.28	41.62	29.93	42.06	30.67

The permutation feature importance analysis for predicting Purchase Intention (PI) via leave-one-out cross-validation (LOOCV) revealed differential contributions of EEG frequency bands across various scalp regions. Frontal Beta emerged as the most critical feature, reaching 100% relative importance, underscoring the central role of frontal beta oscillations in encoding neural processes that predict consumers' intention to purchase. Beta frequency band activity in general also showed high importance at 74.82%, indicating that beta rhythms, commonly linked to active cognitive processing, sensorimotor functions, and decision-making, substantially influence the model's predictive power for purchase intention. Temporal Theta (41.62%) and Parietal Alpha (42.06%) showed moderate importance, suggesting that theta and alpha oscillations in these regions also contribute meaningfully to consumer intention signals. Theta activity, often associated with memory and cognitive control, and parietal alpha, related to attentional processes, may reflect underlying neural mechanisms of evaluating product-related stimuli. Temporal Alpha (29.93%) and Central Thetas (30.67%) presented moderate importance values, implying a supporting role of these rhythms in shaping purchase intention, possibly through attentional engagement or emotional processing.

Mean Frontal Midline Theta had a lower importance of 13.28%, suggesting a more limited yet non-negligible contribution to the prediction model, potentially indicating some involvement of executive control processes. Finally, Frontal Alpha showed minimal importance (2.29%), indicating that alpha activity in the frontal region was the least predictive feature for purchase intention within the model.

**Table 15**

*LOOCV Permutation Feature Importance (%) for Predicting Attitude toward the Advertisement.*

EEG Feature	Beta	Frontal Alpha	Frontal Beta	Frontal Midline Theta	Temporal Theta	Temporal Alpha	Parietal Alpha	Central Theta
Importance (%)	28.41	40.39	83.64	34.08	31.46	17.17	100.00	47.20

The permutation feature importance analysis using leave-one-out cross-validation (LOOCV) for predicting Attitude toward the Advertisement revealed that parietal alpha activity was the most influential EEG feature, achieving a maximum relative importance of 100%. This indicates that alpha oscillations in the parietal region play a pivotal role in neural processing related to how individuals perceive and evaluate advertising stimuli. Frontal Beta also showed high importance at 83.64%, highlighting the relevance of beta-band activity in frontal areas, which is often associated with attention, cognitive control, and decision-making processes during ad evaluation.

Central Theta demonstrated a moderate-to-high importance of 47.20%, and Frontal Alpha followed closely with 40.39%, suggesting that theta and alpha oscillations across frontal and central regions contribute substantially to shaping the attitude toward advertisements. Beta band activity overall accounted for 28.41% importance, indicating a modest but meaningful role in predicting attitude towards the advertisement. Frontal Midline Theta (34.08%) and Temporal Theta (31.46%) also contributed moderately, reflecting the involvement of theta oscillations related to cognitive control and emotional engagement.

Temporal Alpha showed the lowest feature importance at 17.17%, suggesting a relatively smaller influence on attitude towards the advertisement prediction within the model. These findings emphasise the significance of parietal alpha and frontal beta oscillations as neural markers underpinning attitudinal responses to advertisements, supported by theta and alpha activity in other cortical regions.

**Table 16**

*LOOCV Permutation Feature Importance (%) for Predicting Attitude toward the Brand (Aab)*

	Beta	Frontal Alpha	Frontal Beta	Frontal Midline Theta	Temporal Theta	Temporal Alpha	Parietal Alpha	Central Theta
Importance (%)	41.65	31.31	31.52	8.52	57.63	15.40	80.97	100.00

The permutation feature importance analysis for predicting Attitude toward the Brand (Aab) using LOOCV highlighted Central Theta as the most influential EEG feature, with a relative importance of 100%. This finding points to the key role of theta oscillations in central brain regions in shaping brand-related attitudes, potentially reflecting processes related to emotional evaluation and cognitive integration. Parietal Alpha also showed a strong contribution at 80.97%, underscoring the importance of alpha activity in parietal areas, which may relate to attentional and memory mechanisms during brand assessment.

Temporal Theta demonstrated a moderate to high importance at 57.63%, indicating that theta rhythms in temporal regions are also significant contributors to predicting brand attitudes, possibly through memory and emotional engagement networks. Beta band activity showed a moderate importance of 41.65%, suggesting a meaningful role of beta oscillations in cognitive and decision-making processes linked with brand perception. Frontal Alpha (31.31%) and Frontal Beta (31.52%) exhibited similar moderate contributions, highlighting the involvement of frontal lobe oscillatory dynamics in consumer brand evaluation. Temporal Alpha and Frontal Midline Theta showed relatively lower importance values (15.40% and 8.52%, respectively), indicating a more limited role in predicting attitude toward the brand within this EEG feature set. Overall, these results suggest that theta and alpha oscillations, especially in central and parietal areas, alongside beta rhythms, are critical neural markers for understanding consumer attitudes toward brands.

**Table 17***LOOCV Permutation Feature Importance (%) for Predicting Advertisement Relevance*

EEG Feature	Beta	Frontal Alpha	Frontal Beta	Frontal Midline Theta	Temporal Theta	Temporal Alpha	Parietal Alpha	Central Theta
Importance (%)	100.00	65.20	44.39	19.70	73.71	72.67	12.53	82.04

The permutation feature importance analysis with leave-one-out cross-validation (LOOCV) for predicting Advertisement Relevance showed that Beta band activity was the most important EEG feature, with a maximum relative importance of 100%. This indicates that beta oscillations, often linked to active cognitive processing and attentional engagement, play a central role in determining the perceived relevance of advertisements. Central Theta followed closely with an importance of 82.04%, suggesting a strong contribution of theta rhythms in central regions. Theta activity is commonly associated with memory encoding, cognitive control, and emotional processing, which are crucial for evaluating how relevant an ad is to the viewer.

Temporal Theta (73.71%) and Temporal Alpha (72.67%) bands also showed high importance, highlighting the significant involvement of temporal lobe oscillations in processing ad relevance. These frequencies are known to reflect aspects of memory and attentional engagement, supporting their role in the evaluation of advertising content. Frontal Alpha demonstrated moderate importance (65.20%), underscoring the contribution of alpha rhythms in frontal regions, possibly related to top-down attentional

control and cognitive resource allocation during advertisement assessment. Frontal Beta had a moderate influence as well, with an importance value of 44.39%, suggesting that frontal beta activity plays a supportive role in processing advertisement relevance.

Frontal Midline Theta showed a lower contribution (19.70%), while Parietal Alpha had the least importance (12.53%), indicating these features are less predictive of perceived advertisement relevance within the current model. Overall, these findings emphasise the predominance of beta and theta oscillations, especially in beta and central brain regions, in predicting the cognitive and attentional mechanisms underlying advertisement relevance.

**Table 18**

*LOOCV Permutation Feature Importance (%) for Predicting Time to Skip*

EEG Feature	Beta	Frontal Alpha	Frontal Beta	Mean Frontal Midline Theta	Temporal Theta	Temporal Alpha	Parietal Alpha	Central Theta
Importance (%)	67.86	47.66	5.26	21.33	100.00	16.35	14.97	36.09

The permutation feature importance analysis using leave-one-out cross-validation (LOOCV) for predicting Time to Skip demonstrated that Temporal Theta activity was the most critical EEG feature, assigned a relative importance of 100%. This underscores the essential role of theta oscillations in temporal brain regions in predicting how quickly participants chose to skip an advertisement. Temporal theta rhythms are commonly

linked to cognitive processes such as memory and attentional control, which likely influence avoidance behaviour.

Beta band activity showed a substantial importance of 67.86%, suggesting that beta oscillations contribute notably to the neural prediction of skipping behaviour, possibly through sensorimotor or executive processing mechanisms. Frontal Alpha had a moderate importance of 47.66%, indicating that alpha rhythms in frontal areas play a meaningful role in the model, potentially reflecting top-down attentional modulation during ad exposure.

Central Theta were moderately important at 36.09%, further supporting the involvement of theta activity in central regions in shaping skipping decisions. Frontal Midline Theta showed some influence with 21.33% importance, while Temporal Alpha (16.35%) and Parietal Alpha (14.97%) had relatively lower contributions to the prediction model. Notably, Frontal Beta had the lowest importance at 5.26%, suggesting that beta activity in frontal regions was minimally involved in predicting time to skip.

Overall, these findings highlight temporal theta oscillations as the key neural marker underlying ad skipping behaviour, with additional contributions from beta and alpha band activity across multiple regions.

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## **CHAPTER 5**

### **DISCUSSION**

Consumer engagement is bolstered by nostalgic appeals in advertising, which employ positive affect and autobiographical memories (Sujan et al., 1993; Wildschut et al., 2006). It is also considered a credible, persuasive appeal in the advertising industry. The neurophysiological mechanisms that underlie these effects remain largely unexplored, despite the fact that prior studies have provided significant evidence of the beneficial impacts of nostalgia on consumer attitudinal reactions (Muehling & Sprott, 2004; Pascal et al., 2002) (Mukhopadhyay, 2024).

The current research examines the distinctions between nostalgic and non-nostalgic advertising by integrating attitudinal, behavioural, and neuro-electrical evidence, thereby addressing a gap in the existing literature. The results of the current study indicate that the perceived relevance of the advertisement mediated the impact of nostalgia on consumer responses (Aad, Aab, and PI). Increased attention and emotional immersion are indicative of desynchronization in alpha and beta during nostalgic advertisements at the neural level (Klimesch, 1999, 2012; Knyazev, 2007). The persuasive power of nostalgia is substantiated by these neural markers and self-reported findings. The predictive model demonstrated that EEG features were more effective in explaining immediate outcomes, such as Attitude towards the advertisement (Aad) and advertisement relevance, than distal outcomes, such as attitude towards the brand, purchase intention, or advertisement skipping. This is worth noting. This chapter synthesises the results of the current investigation with pertinent empirical and theoretical evidence.

The discussion is organised into several key sections. Initially, the correlations between nostalgia, consumer responses, and EEG frequency regions are examined. Secondly, the mediating function of advertisement relevance in the relationship between nostalgia and consumer responses (Aad, Aab, and PI) is examined. The third point of the discussion pertains to the variations in consumer reactions (Aad, Aab, PI) advertisement-relevance and purchase intention to advertisements that are nostalgic or non-nostalgic. In the fourth section, the distinctions in EEG frequency bands associated with memory, engagement, and attention, which are indicative of nostalgic advertising, are examined. Fifth, the predictive capacity of EEG features for consumer responses is examined.

### **Relationship between Nostalgia, Consumer Responses, and EEG Markers**

The correlation analyses revealed the relationships among the study variables. The findings are discussed in three parts: (a) correlations among consumer responses, (b) correlations among EEG frequency bands and (c) correlations between EEG features and consumer responses.

#### ***Correlations between Consumer Responses***

Similar to the EEG frequency bands, significant correlations were also found between the various consumer responses, including both attitudinal and behavioural measures. Advertisement evoked nostalgia was positively associated with attitude toward the advertisement (Aad), attitude toward the brand (Aab), purchase intention (PI), and perceived advertisement relevance. Similarly, attitude toward the advertisement (Aad), attitude toward the brand (Aab), and purchase intention (PI) were significantly correlated.

Furthermore, positive associations were observed between advertisement relevance and all other consumer responses.

The strong association between nostalgia and attitude toward the advertisement (Aad) aligns with the affect transfer hypothesis. According to this hypothesis, the emotional responses towards the advertisement are transferred to the evaluations of the advertisement (Batra & Ray, 1986). This is substantiated by a large body of existing evidence. For instance, Sadasivan (2019) found that positive affective states, such as pleasure, influenced the attitude towards advertisement (Aad) through a structural equation model. In the context of nostalgic advertisements, the nostalgic cues trigger feelings of warmth, a sense of social connectedness, and autobiographical memories (Wildschut et al., 2006). This, in turn, enhances the positive evaluation of the advertisement. Empirical studies in advertising have consistently shown that nostalgia increases attitude towards the advertisement. For example, Muehling and Sprott (2004) found that nostalgic advertisements generated more nostalgia-related thoughts, which were positively valenced and had an impact on attitude towards the advertisement when compared to the non-nostalgic advertisements. Zhao et al. (2014) also found that consumers' affective state moderates the effect of nostalgic advertisements on consumers' responses. Particularly, for consumers in a positive affective state, nostalgic advertisements triggered more favourable attitudes towards the advertisement. The present findings validate the findings from prior literature and position nostalgia as a powerful emotional strategy that can influence consumer responses.

Advertisement evoked nostalgia was also strongly correlated with attitude towards the brand (Aab). This association could be explained through the lens of the expectancy value model (Fishbein & Ajzen, 1975), which posits that attitudes towards the brand are formed through consumers' beliefs that the brand possesses certain attributes that are of value to them. Nostalgia proneness, the inherent tendency to feel nostalgic, could place greater value on nostalgic appeals in advertisements. This enhanced perception of value could lead to a favourable brand attitude. Özhan and Talih Akkaya (2021) empirically tested this and found that nostalgia proneness positively affected attitude towards the brand. Further, the meaning transfer framework explains how cultural meaning related to particularly celebrity endorsers is transferred to the product and eventually to the consumers (McCracken, 1989). In the context of nostalgic advertisements, the embedded personal meaning in such advertisements gets transferred to the brand, enhancing brand attitude. The findings of the present study corroborate those reported in prior research.

Purchase Intention and Advertisement-evoked nostalgia were also strongly correlated. This is consistent with the findings of prior research. Muehling et al. (2014) found that nostalgic advertisements led to greater purchase intention, particularly for individuals who had prior exposure to the brand. Similarly, Lasaleta et al. (2014) found that participants exposed to the nostalgic advertisement condition were willing to pay more for the product when compared to individuals exposed to a neutral condition. This is explained through the lens of sociality of nostalgia. Nostalgia, by evoking increased perceptions of social connection, weakens the desire for money. Consequently, participants are willing to purchase and further pay a higher price for the products.

The substantial correlation between these consumer responses validates the finding of prior work. An important framework that links these constructs is the hierarchy of effects model (Lavidge & Steiner, 1961), which posits that attitude towards the advertisement (Aad) directly enhances attitude towards the brand (Aab), which consequently positively affects purchase intention. In the context of nostalgic advertisements, nostalgic appeals through their personal relevance and positive emotions enhance attitude towards the advertisement, which then influences attitude towards the brand, which in turn influences the purchase intention. This pathway has been consistently validated in advertising literature (Smith et al., 2008; Kite et al., 2018).

Advertisement relevance was strongly correlated with consumer responses (Aad, Aab, and PI). This suggests that advertisements that resonate with consumers' personal experience improve the attitudinal and behavioural responses. According to the self-referencing theory, personally relevant information or information related to oneself is remembered better (Rogers et al., 1977). In the context of advertising, the theory posits that consumers are more likely to engage with or be persuaded by advertisements that have personally relevant information. This is consistent with empirical work showing that relevance enhances persuasion effectiveness. Jiang et al. (2023) found that relevant advertisements were effective in promoting new products. Further, it mediated the relationship between creative advertisements and product newness on purchase intention. Iyer and Mallika (2023) found that self-referential advertisements predicted positive brand perceptions and enhanced attitude towards the advertisement, leading to more favourable perceptions for the brand. Furthermore, the findings indicate that self-

referential advertisements enhance brand attitudes, which in turn lead to greater purchase intention.

The association among consumer response variables provide robust support to the theoretical expectations. It also corroborates the findings of prior research

### ***Correlations between EEG Frequency Bands***

The results show that a significant association exists between multiple EEG frequency bands. It was found that a strong positive correlation exists between frontal, temporal, and parietal alpha activity. These findings suggest that alpha oscillatory activity does not function as a localised inhibitory mechanism, but functions as a global oscillatory pattern that modulates attention regulation across networks (Sadaghiani et al., 2010). The Inhibition timing hypothesis provides an explanation for this. According to this, alpha oscillations work as a regulatory mechanism that helps to filter irrelevant input and synchronise the different brain regions for coordinated activity (Jensen & Mazaheri, 2010; Klimesch, 2012). The regional covariation in the alpha activity suggests that the attentional control while watching advertisements is synchronised across the cortex. This means that when attention is released in one region, it is also released in other regions. This synchronised activity is important when viewers must process all kinds of sensory cues in an advertisement and make evaluations (Foxye & Snyder, 2011).

The results also showed significant positive correlations of temporal theta with central theta and parietal alpha. Theta oscillations are important markers of episodic memory retrieval (Nyhus & Curran, 2010). In the context of advertising, nostalgic

advertisements evoke personally relevant autobiographical memory, which could be explained by theta oscillations (Kessous & Roux, 2013; Vecchiato, Babiloni et al., 2011). The correlation of theta oscillations with parietal alpha suggests that retrieval of memory is often coordinated with an attentional gating mechanism. For instance, when an advertisement presents personally relevant stimuli, the brain, while widening the attentional gates, also activates memory-related circuits.

The global beta activity was negatively correlated with frontal, temporal and parietal alpha. The frontal beta was positively correlated with frontal, temporal and parietal alpha, indicating a localised frontal control mechanism. This suggests that while attentional gates open (marked by alpha decrease), the engagement of monitoring and regulation functions becomes stronger (beta increases)(MacLean et al., 2012). In the context of nostalgic advertising, it indicates that the brain allows the meaningful and relevant information characteristic of nostalgic advertisements (denoted by decreased alpha) to pass through, and the relevance and significance of these stimuli are evaluated, which is denoted by increased global beta activity(Ferez et al., 2025). The frontal beta was also positively correlated with temporal and central theta. This can be explained through the existing studies. Abid et al. (2024) found that positive affect is significantly predicted by theta and beta oscillatory activity. Similarly, Vecchiato, Toppi et al. (2011) found that theta and alpha activity were related to the observation of pleasant advertisements. Given the positive emotional undertones in nostalgia, the positive correlation between these frequency bands is supported by this existing evidence.

The significant correlations between posterior alpha, temporal and central theta, and frontal beta suggest the presence of a triadic oscillatory network. While alpha regulates attentional gating, theta integrates autobiographical and semantic memory, and beta sustains the evaluative process.

### ***Correlations between EEG Frequency Bands and Consumer Responses***

Only a few significant correlations were observed between EEG frequency bands and consumer responses; however, despite their sparsity, these findings hold theoretical significance.

Particularly, frontal alpha suppression negatively correlated with advertisement relevance. This finding is consistent with the inhibition timing hypothesis given by Klimesch (2012). The hypothesis posits that alpha suppression is observed in areas that actively process relevant information. The alpha suppression in this case suggests that cortical areas are more active, allowing more relevant information to be processed. The negative relationship here indicates that participants were paying more attention to the nostalgic advertisements that are inherently relevant.

Both frontal alpha and parietal alpha were positively correlated with the time taken to skip the advertisement. This suggests that the greater the alpha suppression, the longer participants took to skip the advertisement. This could also be explained through the inhibition timing hypothesis (Klimesch, 2012). Alpha suppression is considered an important marker of attentional engagement and active processing of the information (Jensen & Mazaheri, 2010). In the context of nostalgic advertisements, the suppression of

alpha in the frontal and parietal regions indicates that participants were paying attention to these advertisements and actively processing them; this, in turn, could have delayed the decision to skip the advertisement.

Similarly, global beta was positively related to advertisement relevance and negatively related to the time taken to skip the advertisement. Frontal beta was positively related to the time taken to skip the advertisement. Enhanced beta activity is linked to persistence to maintain the status quo and reflects less flexible behavioural and cognitive control (Engel & Fries, 2010). When there is beta suppression, it indicates flexibility in processing and changing cognitive sets (Limpt-Broers et al., 2024). In the present context, stronger global beta suppression would have allowed participants to actively process the advertisement, recognise its relevance and thereby make a decision quickly. This aligns with the findings of a prior empirical work. Libert and Van Hulle (2019), in their study, which predicted skipping behaviour through EEG features, explained that event-related desynchronization is likely to occur in the last few seconds before button pressing, indicating motor-related decisions. Therefore, skipped advertisements or decisions to skip could exhibit beta desynchronization.

### **Mediating Role of Advertisement Relevance**

The mediation analysis explained the role of advertisement relevance as a mechanism through which nostalgia influences consumer responses. In the present study, advertisement relevance significantly mediated the relationship between nostalgia and consumer responses (Aad, Aab and PI).

Although nostalgia had a direct effect on participants' purchase intention, advertisement relevance also partially mediated this relationship. Similarly, advertisement relevance also partially mediated the relationship between advertisement-evoked nostalgia and attitude towards the advertisement. The Elaboration Likelihood Model (Petty & Cacioppo, 1986) explains this process. In the context of nostalgic advertisements, through the central route, participants may actively evaluate the relevance of the advertisement to themselves and then build a favourable attitude towards the advertisement or decide to purchase. On the other hand, through the peripheral route, the emotionality of nostalgic advertisements could also lead to a favourable attitude towards the advertisement or greater purchase intention without an elaborate evaluation of the advertisement. Alalwan (2018) provides empirical support to the findings of this mediational analysis. It was found that perceived personal relevance of social media advertisements led to greater purchase intentions.

For attitude toward the brand (Aab), advertisement relevance fully mediated the relationship between nostalgia and brand attitude. This indicates that nostalgia does not directly shape the attitude towards a brand. It makes the advertisement appear personally meaningful to the individuals, which in turn influences attitude towards the brand. This finding is supported by prior work. For example, De Keyzer et al. (2021) found that perceived advertisement relevance mediated the relationship of personalised advertisements with brand attitude and click intention. This can be explained through the lens of schema congruent theory (Meyers-Levy & Tybout, 1989). According to this theory, the schema stimuli that are congruent with one's schema are easily processed. Nostalgic advertisements are congruent with consumers' schema (through self-continuity

and link to the past), which in turn can increase perceived advertisement relevance and thereby a positive attitude towards the brand.

The mediation analysis highlights the critical role of advertisement relevance in shaping the influence of nostalgic advertisement on consumer responses.

### **Differences in Consumer Responses between Nostalgic and Non-Nostalgic Advertisements**

Significant differences in self-reported consumer responses, behavioural measures, and neural activity were noticed between nostalgic and non-nostalgic advertisements. Differences in each of these outcomes are discussed in detail.

#### ***Advertisement -Evoked Nostalgia***

The manipulation check was conducted to test if the advertisements evoked nostalgia as intended. The findings reveal that the manipulation of nostalgia was valid. That is, nostalgic advertisements should evoke more nostalgia than non-nostalgic advertisements. This finding is consistent with several empirical studies that manipulated nostalgia using diverse cues such as familiar music, references to personally significant events, retro imagery, cultural symbols, and others that have effectively triggered nostalgia (Pascal et.al., 2002; Muehling & Pascal, 2011). The successful manipulation of nostalgia makes the subsequent outcome differences credible, such that the differences could be confidently attributed to the effect of nostalgia.

*Attitude Toward the Advertisement (Aad)*

There was a significant difference in attitude towards the advertisement. The findings indicate that nostalgic advertisements were evaluated more favourably in comparison to non-nostalgic advertisements. The Affect-Transfer Hypothesis is in alignment with the present findings (Batra & Ray, 1986). It posits that emotional reaction towards the advertisement translates into favourable evaluation towards the advertisement. Existing empirical evidence supports this finding. Sadasivan (2019) found that positive affective states, such as pleasure, influenced the attitude towards advertisement (Aad) using a structural equation model. In the nostalgic advertisements, the nostalgic cues evoke positive affect and autobiographical memories, which consequently enhance the positive attitude towards the advertisement. Prior literature on nostalgic advertisements has consistently shown the positive impact of nostalgia on attitude towards advertisements. Consumers' affective state seems to play a role in this effect. Zhao et al. (2014) revealed that the effect of nostalgia on attitude towards the advertisement is moderated by consumers' affective states. The type of nostalgia also plays a role in this impact. (Muehling & Pascal, 2011) found that personal nostalgic advertisements evoked a more favourable attitude towards the advertisements than historical and non-nostalgic advertisements. Given the personal nostalgic nature of the

advertisements used in the present study, the present results validate the findings of prior work.

### ***Attitude Toward the Brand (Aab)***

Significant difference was also observed for attitude toward the brand (Aab) between nostalgic and non-nostalgic responses. The expectancy value model aligns with this finding (Fishbein & Ajzen, 1975). It posits that consumers' belief that the brand possesses certain valuable attributes transforms into a positive evaluation of the brand. Nostalgia proneness, the inherent tendency to feel nostalgic, could place greater value on nostalgic appeals in advertisements. This enhanced perceived value could lead to a favourable brand attitude. This view is empirically supported by Özhan and Talih Akkaya (2021), who found that there was a positive impact of nostalgia proneness on brand attitude. Moreover, the meaning transfer framework posits that meaning attached to celebrity endorsers is transferred to the product and eventually to the consumers (McCracken, 1989). In the context of nostalgic advertisements, the personally meaningful nature of nostalgia translates to the brand, enhancing brand attitude. Furthermore, the dual mediation hypothesis states that attitude towards the advertisement can both directly and indirectly influence attitude towards the brand through brand cognition (Kamble, 2014).

### ***Purchase Intention (PI)***

There was a significant difference in Purchase intention, such that it was greater for nostalgic advertisements than non-nostalgic advertisements. The findings could be

explained through the lens of Processing Fluency Theory (Reber et al., 2004). It states that individuals ultimately prefer and positively evaluate the information that is easily processed. In the context of advertising, the ease with which individuals process the advertisement is associated with positive evaluations of the advertisement, which in turn leads to greater behavioural intention, specifically purchase intent. Storme et al. (2015) found that processing fluency predicted consumer responses. Specifically, processing depth mediated the effect of processing fluency on brand attitude and purchase intention. The results substantiate the findings of prior nostalgia advertising research. Ju, Kim, Chang et al. (2016) found that there was a significant difference in the purchase intention between the nostalgic and present-focused advertising messages. Similarly, Ju et al. (2018) found that the past-focused advertisements enhance nostalgic feelings in consumers, which in turn led to greater purchase intention. However, there are boundary conditions to this effect. Wang and Chao (2020) found that nostalgic consumers exhibited lesser intention to purchase green products and past orientation mediated this effect. Given that nostalgia is largely a past oriented emotion, it interferes with consumer responses particularly purchase intention for future oriented products such as newer technology, environment friendly products etc. Individuals who are highly nostalgic would prefer traditional or nostalgic products instead. Furthermore, Rasika and Janani, (2025) found that only 16% of the participants reported that they will definitely buy the product shown in the nostalgic advertisement, whereas 51% indicated that they would buy depending on the product and 26% reported that they would purchase only if there is smaller price difference between products shown in nostalgic and non-nostalgic advertisements.

### ***Advertisement Relevance (Ad Rel)***

A significant difference was observed in advertisement relevance between the nostalgic and non-nostalgic advertisements. As nostalgic advertisements evoke memories from the past, which is inherently meaningful, they can enhance the perceived advertisement relevance. Despite advertisement relevance not being directly explored in the context of nostalgia, the role of relevance through other constructs, such as Diachronic relevance, the importance given to a time in life and the reminiscence bump, the time period during which a large proportion of memories is remembered has been examined. Ju, Choi, Morris et al. (2016) found that advertisements that utilised cues from individuals' reminiscence bump years were found to be more diachronically relevant. Further diachronic relevance mediated the relationship between reminiscence bump years and purchase intention. Furthermore, by conceptualising personal relevance as an important predictor of advertisement involvement, Muehling and Pascal (2012) found that personal nostalgic advertisements enhanced advertisement involvement when compared to historical and non-nostalgic advertisements. Thus, the findings of the present study corroborate and extend the prior evidence by directly examining the impact of nostalgic advertisements on advertisement relevance.

### ***Time taken to Skip Advertisements***

In contrast to other outcomes, no significant difference was observed in the time taken to skip an advertisement among nostalgic and non-nostalgic conditions. This finding is crucial as it suggests that while nostalgia enhances attitudes and intentions, it does not necessarily reduce avoidance behaviours. Although prior evidence suggests that

emotional appeal can favourably influence advertisement skipping behaviour (Jeon et al., 2022). The present finding is consistent with Advertising Avoidance Theory (Speck & Elliott, 1997), which highlights the role of other structural and situational factors that influence advertisement avoidance, rather than content alone. In the context of digital media, Jeon et al. (2019) found that other features such as advertisement length, timer, and availability of the skip button influenced consumers' irritability towards the advertisement and subsequent skipping behaviour. The insignificant difference may indicate that other such factors could have played a role. For example, digital advertisements are usually viewed while engaging with other content such as videos, posts, etc. The present study only exposed the participants to a series of advertisements, which could impact the skipping behaviour. Furthermore, despite the insignificant difference, the results reveal that participants took more time to skip the nostalgic advertisement, which warrants future exploration.

Overall, the results demonstrate that nostalgic advertising consistently enhances affective, cognitive and intentional outcomes, while leaving behavioural avoidance largely unaffected.

### **Differences in EEG Band Power Patterns between Nostalgic and Non-nostalgic Advertisements**

The significant difference between EEG band powers, specifically in alpha, beta and theta bands, provides an insight into the underlying cognitive and affective mechanisms engaged by nostalgia.

Significant reduction in the band power was observed in frontal, temporal and parietal alpha, global and frontal beta, temporal and central theta during exposure to nostalgic advertisements. This indicates that nostalgia alters attentional allocation, memory retrieval, and emotional engagement processes at the neural level.

***Alpha Power as an Attentional Engagement in Nostalgic Advertisements.***

The alpha suppression or desynchronization in the frontal and parietal regions indicates that nostalgia increases attentional demands. According to the inhibition–timing hypothesis, alpha desynchronization indicates greater activity in the cortical networks and release of attentional inhibition. This ultimately results in enhanced sensory and cognitive processing (Klimesch, 2012). In other words, alpha suppression reflects increased attention allocation, information processing and engagement with stimuli. Keil and Heim (2009) found strong evidence for greater allocation of resources to the target stimulus, which was indexed by alpha suppression. Moreover, greater alpha suppression was found during the exposure of conditioned evocative stimuli (Bacigalupo & Luck, 2022). Thus, the alpha suppression found in the present study could be due to participants paying greater attention and engaging with nostalgic advertisements, which are inherently evocative. Furthermore, Parish et al. (2018) linked neocortical alpha suppression to successful memory formation. Thus, the alpha desynchronization observed in the present study could reflect the recruitment of memory-related systems required to process nostalgic content. In advertising contexts, prior neurophysiological research has demonstrated that reduced alpha power accompanies advertisements that elicit higher involvement, relevance, and emotional resonance (Vecchiato et al., 2009). Therefore, the

current findings corroborate behavioural evidence that nostalgic advertisements are perceived as more relevant and engaging, while also demonstrating that this effect has a measurable neural basis.

***The role of Theta Power in the Context of Nostalgic Advertisements.***

Theta oscillations, particularly in temporal and central regions, are strongly linked to episodic and autobiographical memory retrieval (Nyhus & Curran, 2010). Given that theta is often associated with increased memory activity, the reduction in the temporal and central theta power during nostalgic advertisements may appear counterintuitive. However, the theta suppression observed here may reflect greater fluency and automaticity of memory retrieval when exposed to familiar, emotionally salient stimuli. Existing evidence on emotional memory suggests that highly familiar or affectively congruent stimuli require less executive monitoring, leading to reduced theta compared to novel or ambiguous stimuli (Li, Lin et al., 2025). From a neural perspective, this suggests that nostalgia may rely less on theta-mediated working-memory mechanisms and more on alpha or beta desynchronization processes, which have been associated with efficient cortical information flow during memory retrieval (Hanslmayr et al., 2012; Staresina et al., 2016).

Another plausible interpretation relates to nostalgia's emotion-regulatory function. Nostalgia is widely recognised as a psychological resource that reduces anxiety, bolsters self-continuity, and fosters social connectedness (Sedikides et al., 2008; Batcho, 2013). Given that theta synchronisation has been associated with anxiety and heightened emotional arousal (Mitchell et al., 2008; Li, Sun et al., 2025), the observed theta decrease

in this study may indicate a dampening of anxiety-related neural activity. In this sense, the nostalgic condition may have not only reduced cognitive strain but also facilitated a more comforting and self-soothing processing mode. At the same time, the correlation analyses indicated significant positive associations between self-reported nostalgia and theta oscillations in some regions. Taken together, these results suggest that nostalgic advertisements are processed with less cognitive effort and lower anxiety-related neural engagement, distinguishing them from non-nostalgic ads. This aligns with theoretical propositions that position nostalgia as both a fluent retrieval state and an emotion-regulatory mechanism.

### ***Beta Activity and Emotional Regulation***

In the present study, frontal beta activity decreased when participants viewed nostalgic advertisements. This finding can be understood in light of EEG research linking beta power to emotion regulation and affective states. For example, the study by Abid et al. (2024) showed that frontal beta power was negatively related to positive affect and that lower beta indirectly increased positive affect through greater use of cognitive reappraisal. In contrast, higher beta reflected more rigid control and less adaptive regulation. Furthermore, Karlsson et al. (2020) found that both alpha and beta desynchronization were linked to successful recognition and recall. Applying this to nostalgic advertising, beta suppression may reflect a release from rigid top-down control, allowing participants to engage more openly with the emotional and autobiographical content of nostalgic advertisements. Nostalgia often involves reappraisal of past experiences in a positive light (Sedikides et al., 2008). Thus, the decrease in frontal beta

in this context may indicate that viewers were using adaptive regulation strategies, such as reappraisal, which foster more positive affective responses.

Overall, the frontal beta decrease observed in nostalgic ad viewing is consistent with the broader literature suggesting that beta suppression is linked to adaptive affective processing and reappraisal. This neural signature may explain why nostalgic advertisements successfully evoke warmth, positivity, and emotional engagement.

### ***Frontal Midline Theta and Cognitive–Affective Integration***

A significant reduction in frontal midline theta was also observed during nostalgic advertisements. Frontal midline theta is widely regarded as a neural marker of executive control, conflict monitoring, and sustained attention (Cavanagh & Frank, 2014). Reduced activity in this band may reflect decreased demands for executive monitoring when processing nostalgia-evoking ads, as the content may be affectively congruent and familiar, reducing the need for controlled evaluation. This interpretation is consistent with the processing fluency theory, which suggests that familiar and emotionally congruent stimuli are processed with greater ease and require less cognitive effort (Reber et al., 2004). Thus, nostalgia may act to reduce the “cognitive load” of evaluating advertisements, freeing attentional and emotional resources to enhance engagement and positive appraisal.

The neural evidence demonstrates that nostalgia engages distributed cortical networks associated with attention, memory, and emotional processing. Alpha desynchronization indicates increased attentional allocation; theta modulations suggest

facilitated autobiographical memory retrieval; and beta suppression reflects heightened emotional immersion and reduced external vigilance. These findings converge with self-reported results showing enhanced Aad, Aab, and PI, thereby providing physiological support for nostalgia's persuasive power.

### **Predictive Value of EEG Features for Consumer Responses**

The machine learning based predictive analysis examined whether EEG band-power features could predict consumer responses, specifically purchase intention (PI), attitude toward the advertisement (Aad), attitude toward the brand (Aab), advertisement relevance (Ad Rel), and time taken to skip an advertisement. Using a Support Vector Machine (SVM) based nonlinear regression along with leave-one-out cross-validation (LOOCV), the results revealed that the models could consistently outperform a baseline mean predictor, although the explained variance remained modest. Despite the modest predictive ability, the results hold theoretical and practical significance.

The results revealed that immediate evaluative outcomes, such as advertisement relevance, attitude towards the brand and attitude towards the advertisement, were predicted with the greatest accuracy. The distal cognitive and behavioural outcomes, such as purchase intention and time taken to skip the advertisement, were less reliably predicted. This pattern is consistent with persuasion theories such as the Elaboration Likelihood Model (ELM) (Petty & Cacioppo, 1986). Accordingly, immediate evaluative outcomes such as attitudes are quickly processed through the peripheral route based on the personally evocative nature of nostalgic advertisements. In contrast, distal outcomes such as purchase intention and time taken to skip the advertisement involve active

decision-making processes through the central route by incorporating broader considerations such as prior brand knowledge, competing preferences, and social norms (Fishbein & Ajzen, 2010; Leclercq-Machado et al., 2022).

This distinction is also substantiated by the Aad–Ab–PI framework (MacKenzie et al., 1986). This posits that attitude towards the advertisement (Aad) influences attitude towards the brand (Aab), which in turn influences purchase intention (PI). EEG features appear most sensitive to the initial evaluative stage (Aad), with predictability reducing as responses move toward behavioural outcomes.

### ***Neural Predictors of Consumer Responses***

Feature importance analysis revealed distinctive neural signatures for each outcome. The frontal beta activity strongly predicted the purchase intention, which indicates sustained attention and decision-related cognitive control (Engel & Fries, 2010). Xu and Liu (2024) found that an SVM-based classification model predicted purchase behaviour accurately in comparison to other methods. Furthermore, the beta frequency band was the second most important predictor. The results of the present study corroborate this existing evidence, highlighting the crucial role of beta activity in predicting purchase intention. The results also align with neuroimaging studies showing that activity in decision-making circuits, such as the medial prefrontal cortex and insula, is predictive of the likelihood of purchase (Knutson et al., 2007). The role of parietal alpha and temporal theta further suggests that attentional control and memory-based processing contribute to intention formation. Saffari et al. (2023) found that reduced power in parietal alpha is linked to unplanned purchase decisions. This aligns with the

current results, given that purchase intention for hedonic products is higher in nostalgic advertising, often characterised by unplanned purchasing behaviour (Langaro et al., 2020).

Attitude towards the advertisement was predominantly predicted by parietal alpha. This corroborates existing evidence. Benedek et al. (2011) revealed that higher internal attention was linked to higher activity in the parietal alpha, specifically in the right lobe. Alpha suppression has been consistently associated with attentional allocation and deeper perceptual integration (Klimesch, 2012). In advertisement literature, Byrne et al. (2022) reported that alpha desynchronization has been consistently linked with self-reported preference for the advertisements. In the present context, nostalgic advertisements could have demanded greater attentional engagement, which in turn led to the positive evaluations of the advertisement. Frontal beta was the next important predictor after parietal alpha. Beta activity, which is consistently linked to attention and reward processing, was also found to be linked to individual preference for movies (Boksem & Smidts, 2015). Additionally, Madani et al (2025) found a positive correlation between frontal alpha and beta with attitude towards the advertisements. The results of the present study substantiate this evidence by demonstrating that alpha and beta modulation is highly pivotal in advertisement-level evaluations.

Central theta and parietal alpha best predicted attitude toward the brand (Aab), indicating involvement of memory retrieval and integration processes. Theta oscillations have been linked to episodic memory and emotional evaluation (Nyhus & Curran, 2010), suggesting that brand attitudes are shaped by the neural mechanisms underlying memory-

based associations. This resonates with neuromarketing studies showing that central theta and frontal-temporal interactions predict brand recall and preference (Astolfi et al., 2008).

Beta and theta activity, primarily predicted advertisement relevance, underpinning the importance of both controlled attention and mnemonic resonance. Within the ELM, relevance represents the motivational gateway to elaborative processing, and the neural data suggest that beta-band control processes and theta-based memory resonance underpin this judgment. Similar findings were reported by Guixeres et al. (2017), who demonstrated that EEG features in beta and theta bands significantly predicted perceived relevance and engagement with advertising stimuli.

Finally, the time taken to skip was most closely predicted by temporal theta activity. While the model explained relatively little variance, the salience of temporal theta suggests that avoidance behaviour may be triggered by memory or semantic processing when advertisement content does not align with viewers' expectations or goals. This is consistent with advertising avoidance research, which highlights the role of perceived relevance and congruity in driving ad-avoidance decisions (Belanche et al., 2017). However, unlike attitude towards the advertisement or purchase intention, skipping behaviour may be heavily influenced by contextual factors such as the affordances of digital platforms, that fall outside the scope of neural oscillatory predictors.

The predictive findings provide evidence that EEG can forecast advertisement effectiveness better than chance. For example, Venkatraman et al. (2015) demonstrated that neural measures predicted population-level advertisement success more accurately

than self-reports, while Boksem and Smidts (2015) showed that frontal EEG asymmetry contributed to predictions of consumer choice. The present study aligns with these findings by showing incremental predictive validity of EEG features over baseline models.

However, the explained variance in the present study was relatively small compared to some prior reports. This divergence can be explained by methodological differences. First, many neuromarketing studies integrate multiple physiological measures (EEG, fMRI, eye-tracking, GSR), which together provide richer predictive power (Falk et al., 2012). Second, prior studies often predict aggregate advertisement outcomes (e.g., population-level sales or advertisement shareability), where neural signals averaged across individuals map more strongly onto collective behaviour. By contrast, the present study sought to predict individual-level responses, which are inherently noisier and influenced by idiosyncratic factors. Finally, the reliance on mean band-power features, while parsimonious, excludes potentially informative markers such as event-related potentials (e.g., LPP, P3), phase synchrony, or frontal-temporal connectivity, all of which have been shown to predict advertising effectiveness (Pozharliev et al., 2015).

Taken together, the predictive analyses reinforce the view that nostalgia's impact on consumer responses is underpinned by measurable neural mechanisms, particularly oscillatory activity in alpha, beta, and theta bands. The results support the dual-process framework of persuasion wherein immediate advertisement-focused judgments are neurally proximal and therefore predictable from band-power features, whereas distal

outcomes (Aab, PI) are shaped by additional external influences, diluting predictive precision. Moreover, the salience of parietal alpha, frontal beta, and central theta across outcomes suggests that nostalgia recruits attentional and memory-based systems in ways that shape evaluative and intentional responses.

The present study examined the role of nostalgia in advertising by combining behavioural, attitudinal, and neurophysiological measures. The findings provide strong evidence that nostalgic advertising exerts a persuasive influence, enhancing consumer responses (Aad, Aab, and PI) and perceptions of advertisement relevance. These results are consistent with prior research highlighting the affective and cognitive power of nostalgia in marketing contexts (Muehling & Sprott, 2004; Pascal et al., 2002). Importantly, the study extends this body of knowledge by demonstrating that nostalgia's effects are not limited to affective enhancement but are also transmitted through cognitive pathways, particularly advertisement relevance, which consistently mediated the relationship between nostalgia and consumer evaluations and demonstrating neural signals can facilitate more personalised, data-driven marketing strategies (Petty & Cacioppo, 1986).

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## **CHAPTER – 6**

### **SUMMARY AND CONCLUSION**

#### **Summary**

This study set out to investigate how nostalgic advertisements influence consumer responses across attitudinal, behavioural, and neurophysiological domains. In doing so, it aimed not only to test the effectiveness of nostalgic appeals but also to uncover the mechanisms through which such appeals operate. Nostalgia has been widely recognised as a persuasive strategy that draws upon autobiographical memory, affective warmth, and identity-based meanings to evoke favourable evaluations (Sedikides et al., 2008). Yet, despite substantial evidence that nostalgic advertising enhances attitudes and purchase intentions, less is known about the cognitive and neural processes underlying these effects.

To address this gap, the present research integrated multiple levels of analysis: self-reported evaluations, behavioural engagement, and electroencephalographic (EEG) patterns. In addition, predictive modelling was employed to assess whether EEG features could reliably predict consumer outcomes. For this purpose, data were collected from 67 participants using a within-subject experimental design. This multi-method approach allowed for a more comprehensive understanding of how nostalgia operates effectively as a crucial persuasion strategy in advertising. Based on the analysis of this data, the results reveal crucial insight into the neuro-electrical, self-reported and behavioural responses of nostalgia in the context of advertising. The major findings of the study are presented below.

*Major Findings*

- Ad-evoked Nostalgia was significantly positively related to attitude towards the advertisement, attitude towards the brand, advertisement relevance and purchase intention.
- There was a significant positive correlation among multiple EEG features, specifically, frontal alpha, frontal beta, parietal alpha, temporal alpha, temporal theta and central theta.
- There was a positive association between EEG features and consumer responses, including global beta, frontal alpha, frontal beta and parietal alpha, with advertisement relevance and time taken to skip the advertisement.
- Advertisement relevance significantly, yet partially mediated the relationship between ad-evoked nostalgia and attitude towards the advertisement. Nostalgic advertisements evoked a more favourable attitude towards the advertisement in comparison to non-nostalgic advertisements.
- Advertisement relevance significantly, yet partially mediated the relationship between ad-evoked nostalgia and purchase intention. Nostalgic advertisements evoked a greater purchase intention in comparison to non-nostalgic advertisements.
- Advertisement relevance significantly, and fully mediated the relationship between ad-evoked nostalgia and attitude towards the advertisement.

Nostalgic advertisements evoked a more favourable attitude towards the brand in comparison to non-nostalgic advertisements.

- There was a statistically significant difference in advertisement relevance in nostalgic advertisements when compared to non-nostalgic advertisements.
- Although the time taken to skip the advertisement was higher in the nostalgic condition, this difference was not statistically significant.
- There was a significant reduction in alpha activity across frontal, temporal, and parietal regions for the nostalgic advertisements relative to the non-nostalgic advertisements.
- There was a significant reduction in beta activity both globally and in the frontal region for the nostalgic advertisement relative to the non-nostalgic advertisement
- There was a significant reduction in theta activity in both the temporal and central regions for the nostalgic advertisement relative to the non-nostalgic advertisement.
- EEG features predicted consumer responses, specifically attitude towards the advertisement, attitude towards the brand, purchase intention, advertisement relevance and time taken to skip the advertisement with greater explanatory power in comparison to the baseline models, although with modest predictive power.
- EEG features predicted proximal outcomes, such as advertisement relevance and attitude towards the advertisement, better than distal

outcomes, such as Purchase Intention, and time taken to skip the advertisement.

- Attitude toward the advertisement was best predicted by parietal alpha, attitude toward the brand was linked to activity in the central theta and advertisement relevance was predicted by a combination of theta and beta activity.

### **Conclusion**

Nostalgic appeals in advertisements are a compelling advertising strategy that has consistently influenced consumer responses. By investigating the impact of nostalgic advertisements at multiple levels, specifically, neuro-electrical, attitudinal and behavioural, the findings of the present study confirm that nostalgia is a powerful persuasive appeal. Nostalgic advertisements consistently improved consumer responses (Aad, Aab and PI), substantiating the prior evidence. Notably, advertisement relevance emerged as an important mediator providing an insight into nostalgia's functional mechanism. At the neural level, nostalgic advertisements elicited unique oscillatory signatures marked by suppression in alpha, beta and theta powers in comparison to non-nostalgic advertisements. This indicated heightened attention, fluent memory retrieval and emotion immersion in the nostalgic advertisement. These findings corroborate with self-report responses, showing that nostalgia enhances evaluative responses while also engaging distributed neural systems. Furthermore, predictive modelling exhibited that EEG features could predict immediate advertisement-related outcomes, although their predictive power for behavioural responses remains limited. This implies that nostalgic advertisements are an effective strategy for boosting advertisement and brand

evaluations. However, advertisers and marketers should ensure that such advertisements evoke personally meaningful memories and should be targeted to a specific group of audience and context. Furthermore, the integration of self-reports, behavioural measures, EEG, and predictive modelling demonstrates the value of multimodal approaches in providing a comprehensive insight into a phenomenon. Together, these findings advance understanding of nostalgic advertising and provide guidance for its effective application.

### **Implications**

The present findings offer important theoretical, practical and methodological implications.

#### ***Theoretical Implications***

One of the major theoretical contributions of this study is corroborating the findings of the present study into the well-established models of persuasion and advertisement effectiveness, such as the dual mediation hypothesis, affect transfer hypothesis, expectancy value model, self-referencing theory, and elaboration likelihood model, among others.

By examining the mediating role of advertisement relevance, the present findings add to the existing theories by extending the functional mechanism of nostalgia's influence on consumer responses. The mediation analysis has demonstrated that while nostalgia could directly enhance affective evaluations of advertisements, it can indirectly influence brand attitudes and intention through heightened perceptions of advertisement relevance. This implies that nostalgic cues do not merely evoke fleeting emotional states

but enhance the personal significance of the advertisement, highlighting the role of self-referencing theory.

Furthermore, the EEG results substantiate the processes included in the three-stage model of nostalgic marketing by highlighting the unique oscillatory signatures elicited by nostalgic advertisements. The attentional engagement, emotional immersion and fluent memory retrieval provide neuro-electrical evidence to the model, particularly for the emotional and cognitive reaction stages. Finally, the EEG features could predict the immediate evaluative outcomes more reliably than distant behavioural outcomes. This highlights an important theoretical boundary. The existing neural theories of persuasion should differentiate between neural signatures for immediate outcomes and distal outcomes.

### ***Practical Implications***

The present findings provide actionable insights to advertisers and marketers by highlighting the strengths and boundaries of nostalgic appeal.

The findings emphasise the effective role of nostalgia in influencing evaluative outcomes such as attitudes. Brands can significantly enhance attitudes towards the advertisement, brand perceptions and purchase intention by incorporating nostalgic cues. Thus, for advertisement campaigns that aim to build an emotional connection with consumers and reinforce brand heritage, nostalgic cues could be particularly beneficial.

Nostalgia's ability to enhance advertisement relevance is of practical significance. The current digital landscape is cluttered by numerous advertisements. In this context, relevance is a critical factor that can grab consumers' attention. By activating

autobiographical memory and self-referencing, nostalgic advertisements are perceived as personally meaningful. Thus, practitioners should ensure that nostalgic cues are not used superficially. It should be strategically tailored to resonate with the experiences of the target audience. Furthermore, generational targeting is crucial.

The present study used advertisements from the participants' childhood years to evoke nostalgia and tested them against contemporary advertisements. This offers important practical insights to the advertisers. The findings demonstrated that consumer responses were consistently favourable for advertisements from childhood years. Given the costs incurred in creating newer advertisements, practitioners can use older advertisements and thereby reduce the costs associated with advertising. However, such usage should be specifically targeted to a certain audience and for particular products.

In the present study, although nostalgic advertisements influenced the majority of consumers' responses, there was no time taken to skip the advertisement. This suggests that nostalgia can influence perceptions of the advertisement, but it cannot override consumers' motivation to avoid interruptions. This means that nostalgia should be paired with other strategies that influence advertisement avoidance.

Furthermore, the findings from predictive modelling, although modest, suggest that EEG features could predict consumer responses. Thus, advertisers could employ neurophysiological tools while testing the advertisement campaign alongside other traditional methods such as focus groups and surveys.

### ***Implications for Consumers***

The present findings also provide an important implication for consumers. Although nostalgia is found to be a highly persuasive strategy, there is a limit to its influence. The findings show that nostalgia does not override the practical behaviours, such as advertisement avoidance. Further, the predictive modelling also suggests that even EEG features related to attention, engagement and emotions could not predict behavioural outcomes such as purchase likelihood. This implies that consumers retain the agency to decide when and how to engage with persuasive advertisements despite them evoking positive reactions.

Furthermore, casual encounters with nostalgic advertisements, specifically from one's past, can evoke positive emotions and more personally meaningful experiences for the consumer. Such nostalgic feelings have been found to have psychological benefits in prior literature.

### ***Methodological Implications***

The present findings also carry important methodological insights for consumer neuroscience and advertising research. The findings highlight the value of integrating multiple methods of data collection and analysis. By employing self-report, behavioural and neuro-electrical measures, the findings provided a richer insight into the nostalgia's impact at various levels.

However, the methodological approach also emphasises the importance of ethical considerations in neuromarketing. While EEG provides valuable insights, its predictive use raises questions about consumer autonomy and informed consent. Researchers and

practitioners must ensure that neural data are used responsibly, transparently, and with respect for privacy.

### **Limitations of the Study and Avenues for Future Research**

It is crucial to recognise this study's limitations despite its contributions. The present study used only the EEG frequency band to study the neuro-electrical activity. While it provides crucial insights into the neural signatures of nostalgia in the context of advertising, it excludes other important neural markers. Future studies should employ neural markers such as event-related potentials (ERP) or connectivity measures to get a deeper understanding of the temporal and network-level interaction of nostalgic processing.

Furthermore, the predictive modelling in the present study only exhibited modest predictive ability and employed a small dataset. Machine learning models usually require a large dataset for better prediction. Therefore, future studies exploring the predictive ability of EEG features for nostalgia should use a larger dataset and also incorporate other approaches, such as eye tracking and galvanic skin response, as complementary measures.

The present study examined only the immediate responses of the consumers to advertisement exposure. Longitudinal studies will provide insight into whether nostalgia's influence will persist over time and influence brand loyalty. Therefore, future research should examine the long-term impact of nostalgic advertising on consumer responses.

The sample employed in the present research is young adults in the age group of 18 to 25 years. Although existing evidence provides support for examining nostalgia's impact in the young adult sample, future studies should explore the differences in neural activity across multiple generations to get a better insight into the function of age in the perception and processing of nostalgic stimuli.

The present research examined advertisement skipping behaviour by exposing participants to multiple advertisements. However, in a realistic setting, advertisement skipping occurs when consumers are already engaged with other content, such as videos, posts, music, etc. Future studies should employ such a realistic paradigm while exploring advertisement skipping behaviour.

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## CENTRAL UNIVERSITY OF KARNATAKA

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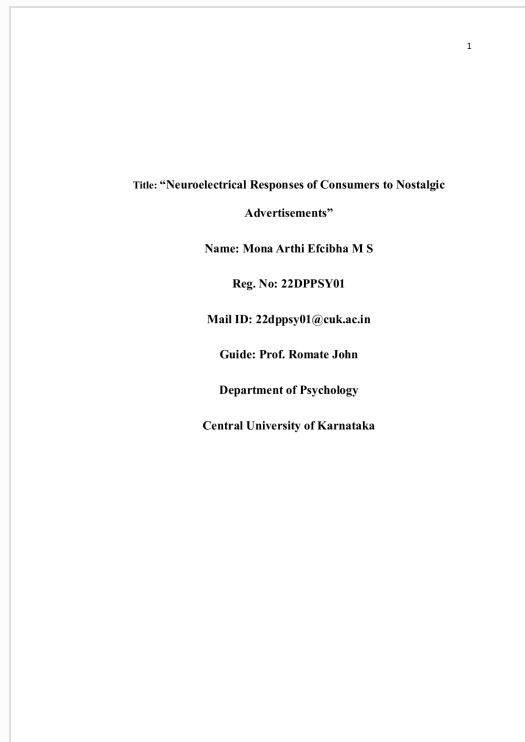


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**Reg. No: 22DPPSY01**

**Mail ID: 22dppsy01@cuk.ac.in**




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**Department of Psychology**

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## **Appendix A**

### **Informed Consent**

Greetings,

I am Mona Arthi Efcibha M S, a Ph.D. scholar in Psychology from Central University of Karnataka. As part of my thesis work, I am conducting an EEG study titled **‘Neuroelectrical Responses of Consumers to Nostalgic Advertisement’**

You would be required to watch a few videos while your brain activity is recorded using an EEG, followed by answering a set of questions related to the advertisements. **The entire study will not take more than 120 minutes of your time.**

If you agree to participate, please read the instructions carefully at each section and answer every question.

Since the study is not funded by any agency, **no monetary benefits would be given for your participation.** However, your contribution will provide valuable insights into the topic under study. **Any information that you provide will remain confidential** and will be used solely for research purposes. The results of the study may be presented at scientific meetings or in publications; however, your identity will not be disclosed in any form.

**Your participation is completely voluntary,** and if you experience any discomfort during the study, you are free to withdraw at any time without any consequences.

**Contact details for any queries related to the research.**

If you have any queries related to the study, feel free to contact the researcher at [mona.ms.work@gmail.com](mailto:mona.ms.work@gmail.com).

**Consent to participate**

*“You may select YES if you agree to participate in the research after reading and understanding the above-mentioned information”*

## Appendix B

### Personal and Sociodemographic Data Sheet

1. Name/Initials:.....  
 ...
2. Age and Date of Birth: .....
3. Gender: Male  Female  Non-Binary  Prefer Not to Say
4. Email ID:.....
5. Phone No: .....
6. Education Qualification (Currently Pursuing): UG  PG  Other
7. Religion: Hindu  Muslim  Christian  Sikh  Buddhist  Other
8. Place of Residence: Urban  Semi-urban  Rural
9. Duration of Residence: .....
10. Perceived Socio-Economic Status: Upper  Upper-Middle  Middle   
 Lower-Middle  Lower
11. What is the education of the head of the family? .....
12. What is the occupation of the head of the family? .....
13. What is your family's monthly income? .....
14. How often do you watch advertisements in a month? (TV, Mobile phones,  
 Laptops or other devices)  
 Rarely  Sometime  Often  Daily

## Appendix C

### Screening Form

1. Do you have normal or corrected vision? Yes  No
2. Are you right-handed? Yes  No
3. Can you understand the Hindi language? Yes  No
4. Are you diagnosed with any neurological or psychiatric disorders (e.g., epilepsy, major depressive disorder, schizophrenia)? Yes  No
5. Are you currently on medication for any neurological or psychiatric disorders?  
Yes  No
6. Do you use any psychoactive substances or have a history of substance abuse?  
Yes  No
7. Do you have any auditory impairments? Yes  No
8. Are there any metal implants or pacemakers on your body? Yes  No

## Appendix D

### The Evoked Nostalgia Scale (Pascal et al., 2002)

1 = *Strongly Disagree*, 7 = *Strongly Agree*

<i>“Nostalgia is a sentimental longing or wistful affection for a period in the past”</i>								
Please watch the advertisements carefully and answer the questions honestly.								
SINo.	Items	1	2	3	4	5	6	7
1	The ad reminds me of the past							
2	The ad helps me recall pleasant memories							
3	The ad makes me feel nostalgic							
4	The ad makes me reminisce about a previous time							
5	The ad makes me think about when I was younger							
6	The ad evokes fond memories							
7	The ad is a pleasant reminder of the past							
8	The ad brings back memories of good times from the past							
9	The ad reminds me of the good old days							
10	The ad reminds me of good times in the past							







## Appendix H

### Advertisement Relevance (Hühn et al., 2017)

1 = *Strongly Disagree*, 7 = *Strongly Agree*

Sl No.	Items	1	2	3	4	5	6	7
1	When I saw the ad, I thought the ad was relevant to me.							

## Appendix I

### Instructions to Participants Before Data Recording

Dear participant,

Thank you for consenting to participate in my study. The data will be recorded using a 64-channel EEG machine by placing electrodes on the scalp of the participant. To ensure a smooth data recording, I request you to kindly follow the instructions mentioned below.

Before data collection-

- Please don't apply oil to your hair and ensure that you have a clean scalp on the day of data recording
- Avoid wearing any metal objects on your body, such as a watch, jewellery and a belt, as this will interfere with data signals.
- Ensure that you have a good night's rest the day before data recording.

After data collection-

- Please be ready to wash your hair after the experiment.

#### *What can you expect during the data collection?*

- You'll feel little or no discomfort during an EEG. The electrodes don't transmit any

sensations. They just record your brain waves.

Here are some things you can expect to happen during an EEG:

- The experimenter will measure your head and put a cap according to your scalp size
- The experimenter will place the electrodes on your scalp using a special electrode gel. Placing Electrodes may take 45-50 minutes
- Once the electrodes are in place, the experiment usually takes between 40 and 50 minutes, during which you will be watching a few videos and then responding to questionnaires.

Ensure you reach the lab tomorrow on time.

Thank you.

## **Appendix J**

### **Selection and Validation of the Advertisement Stimulus**

This phase of the study encompasses the selection and validation of the advertisement stimulus. The following subsections detail the aim, objectives and other procedures employed for the selection and validation of the advertisement stimulus.

#### **Aim**

The primary aim of this phase of the research is to systematically identify, list, select and validate a set of memorable advertisements among the young Indians who have been used to watching them in their early adolescence. The rationale for this exercise is the experimental investigation that will be carried out in the second and third phases of this research.

#### **Objectives**

The key objectives of the first phase of this research are:

1. To identify and locate a set of memorable early television advertisements that the present-day young Indians used to watch during their childhood and early adolescence.
2. To identify a set of contemporary advertisements that resembles those early advertisements that the present-day young Indians used to watch in their early adolescence.
3. To validate the selected set of advertisements that were procured from the early advertisements and the contemporary advertisements based on a pre-determined criterion to ensure that they are comparable and avoid any chance of confounding the two sets of data.

#### **Operational Definitions of Variables**

The two key terms used in this phase of study include memorable childhood advertisements and contemporary advertisements. This section defines these key terms to convey the exact sense in which these terms are used in this study.

### ***Memorable Childhood Advertisements***

In the context of this study, memorable childhood advertisements refer to all such television advertisements that the participants of this study were exposed to in their childhood and early adolescence and still exist in their memory due to their positive emotional impact (Batcho, 2013).

### ***Contemporary Advertisements***

In the context of this study, contemporary television advertisements refer to those television advertisements that were released within the past three years, and at the same time, the participants enjoyed them casually but without creating nostalgic or emotionally meaningful memories associated with their lives (Hu Shuxiang et al., 2025).

### **Research Design**

The researcher employed a cross-sectional research design in this phase of the study. The adoption of this research design helps the researchers capture various aspects of research, such as the characteristics, behaviours, or outcomes of interest across different groups simultaneously without manipulating any variables (Cummings, 2017). Since this study had to collect data from a diverse and broad group of individuals at a single time, the researcher identified that a cross-sectional research design is suitable for this phase.

### **Population and Sample**

The population of this study comprises young adults from colleges or universities across India who belong to the age group of 18 to 25 years. The selection of the population within this age group allowed this study to ensure the accommodation of a diverse population, which comprises participants from various regions, cultural backgrounds and institutions. It also provides the scope for the generalizability of the findings. Previous studies have established that studies on nostalgia recruiting younger generations have better response rates. A recent study has found that 15% of the Generation Z and 14% of the Millennial participants who were surveyed preferred to think about the past rather than the future (Daszkiewicz, 2024). It is primarily because the young generation of contemporary society is nostalgic and follows such trends that recall their past experiences or memories (Harlow, 2023).

### ***Sampling***

The study in this phase employed a mixed sampling method, where a combination of convenience sampling and volunteer sampling was used. This subsequently helped the researcher to use snowball sampling to expand the participant pool. Previous studies have shown that in survey-based research, the use of multiple sampling techniques is beneficial as the focus is to explore patterns or generate preliminary insights rather than producing statistically generalisable findings (Etikan et al., 2016).

### ***Inclusion Criteria***

Based on the objectives and research design for this phase of the study, the researcher set three inclusion criteria. Through this, she could decide who can who can participate in this study. Only those candidates who fulfilled all the inclusion criteria were selected for this study. The inclusion criteria used for the screening of the population in this study include:

- Young adults in the age group of 18–25 years, belonging to colleges or universities in India.
- Individuals who grew up in India and were exposed to television advertisements from 2010 to 2020 (during the childhood and early adolescent period of the participants).
- Only those participants who were proficient in the English language (reading, writing and speaking) were recruited.

### ***Exclusion Criteria:***

The researcher additionally set two exclusion criteria to ensure that the study population is appropriate and homogeneous. The exclusion criteria were used to ensure that only the right population was included in this study. The researcher used the following exclusion criteria:

- Participants who were unable to recall advertisements from their childhood were excluded from the study.

- Participants who were diagnosed with any psychiatric disorders were excluded.

### **Assessment Instruments**

In order to systematically collect the data to measure the variable most reliably, the researcher used the following assessment instruments:

#### ***Personal and Socio-demographic Data Sheet***

The first assessment instrument used in this phase is a basic socio-demographic form. Employing this instrument, the study collected data on the relevant personal and socio-demographic details of the participants, such as age, sex, educational level, and state of residence.

#### ***Childhood Advertisement Survey Form***

The study employed a childhood advertisement survey form to procure data from the participants. Using this, the researcher requested the participants to mention at least five pleasant and memorable advertisements that they could recall from their childhood or in the past.

#### ***Expert Validation Form***

The study used an expert validation form to validate the selected advertisements based on pre-determined criteria. It was formulated with the help of an advertising expert. The form consisted of seven items, which were related to popularity and familiarity of the brand, product categories, ad duration and auditory and visual quality of the advertisements. It contained questions such as '*Do both ads belong to comparable product categories?*' The experts responded 'yes' or 'no' to ensure similarity between the nostalgic advertisements and non-nostalgic advertisements based on pre-determined criteria.

### **Validation Procedure**

The stimulus validation procedure of this study consisted of three steps: identifying and selecting childhood advertisements, identifying and selecting contemporary advertisements, and validating each pair of ads based on a pre-determined criterion. In order to ensure logical sequence and standard in the selection

of stimulus, the researcher adopted the stimulus-selection and validation procedure developed by Kessous et al. (2015) and Hu Shuxiang et al. (2025).

### ***Identifying and Selecting Childhood Advertisements***

To determine the right advertisements, the researcher published an open invitation on social media platforms such as Instagram and WhatsApp. This invitation requested the potential participants to participate in the online survey. Apart from this, the researcher approached students from the Central University of Karnataka and two colleges in Bangalore, inviting them to participate in the survey. From among those who volunteered to participate in the survey, eligible participants were requested to fill out the online survey form through a Google Form. The online survey consisted of three parts: (1) an informed consent form, (2) a basic socio-demographic information sheet, and (3) a form for participants to list at least five memorable advertisements that they could recall from their childhood.

### ***Identifying and Selecting Contemporary Advertisements***

In order to identify non-nostalgic advertisements, the researcher approached two advertisement experts. These experts suggested a list of contemporary advertisements that were similar to the selected nostalgic advertisements in terms of brand familiarity, popularity, and product category. From this list, only those advertisements that were released within the past three years were included in the study. The three-year criterion was fixed to ensure that the participants had casually encountered these advertisements and had not been exposed to them for an extended period to develop a nostalgic association with them.

### ***Expert Validation of the Selected Advertisements***

In order to validate the selected advertisements, the researcher recruited six experts from the field of advertising. They were requested to validate the chosen pairs of childhood and contemporary advertisements. The experts watched the advertisement pairs and then responded to seven questions in a dichotomous response format (Yes or No), to indicate their agreement or disagreement with each item. The questions assessed the similarity of each advertisement pair in terms of brand familiarity and popularity, product category, advertisement duration and audio-visual complexity.

## Data Analysis

For the data analysis, the study used the Statistical Package for Social Sciences (SPSS) version 26.0 (Trial version) for all types of quantitative analysis.

The socio-demographic data obtained for this study were analysed, described and summarised using descriptive statistical methods. It was further employed to summarise frequencies and percentages. It was also used to calculate categorical variables such as gender, educational qualification, and region of residence. Further, measures of central tendency and dispersion (mean and standard deviation) were computed for continuous variables such as age. This analysis provided a comprehensive profile of the participants and facilitated an understanding of the demographic composition of the study sample.

The data collected from the third part of the questionnaire, which comprises participants' lists of memorable advertisements from childhood, was subjected to frequency analysis. As the first step, all responses were reviewed to achieve familiarity with the data. Following this, frequency counts were conducted, enabling the identification and selection of the most frequently recalled memorable childhood advertisements among the participants. Only those advertisements that were recalled by a minimum of five participants were considered for the next step.

To ensure consistency in expert evaluations of the advertisement pairs, inter-rater reliability was assessed using Fleiss' Kappa. Fleiss' kappa was used as a statistical measure to determine the reliability of agreement between multiple raters when assigning categorical ratings to a fixed number of items (Fleiss, 1971). An online software tool was utilised to calculate Fleiss's Kappa (Randolph, 2008).

## Results

### *Descriptive Statistics and Demographic Details of the Participants*

**Table 1**

#### *Descriptive Statistics of the Participants' Age*

	N	Mean	SD	Minimum	Maximum
Age (in years)	164	20.73	1.841	18	25

Table 1 highlights the age of the participants in this phase of the study. A total of 173 participants had responded to the survey. After removing nine responses due to missing data, a total of N=164 participants were included in this phase. The mean age of the participants was 20.73 years (ranging from 18 to 25) with a Standard Deviation (SD) of 1.841.

**Table 2**

*Sociodemographic Characteristics of the Participants in Phase One*

Variables	N	Percentage
<b>Gender</b>		
Male	42	25.6
Female	121	73.8
Non-Binary	1	0.6
<b>Education</b>		
Under-Graduation	106	64.6
Post-Graduation	48	29.3
Other	10	6.1
<b>Religion</b>		
Hindu	123	75
Christian	23	14
Muslim	13	7.9
Sikh	1	0.6
Other	4	2.4
<b>Perceived Socio-Economic Status</b>		
Lower	1	0.6
Lower Middle	10	6.1
Middle	116	70.7
Upper Middle	32	19.5
Upper	5	3.0

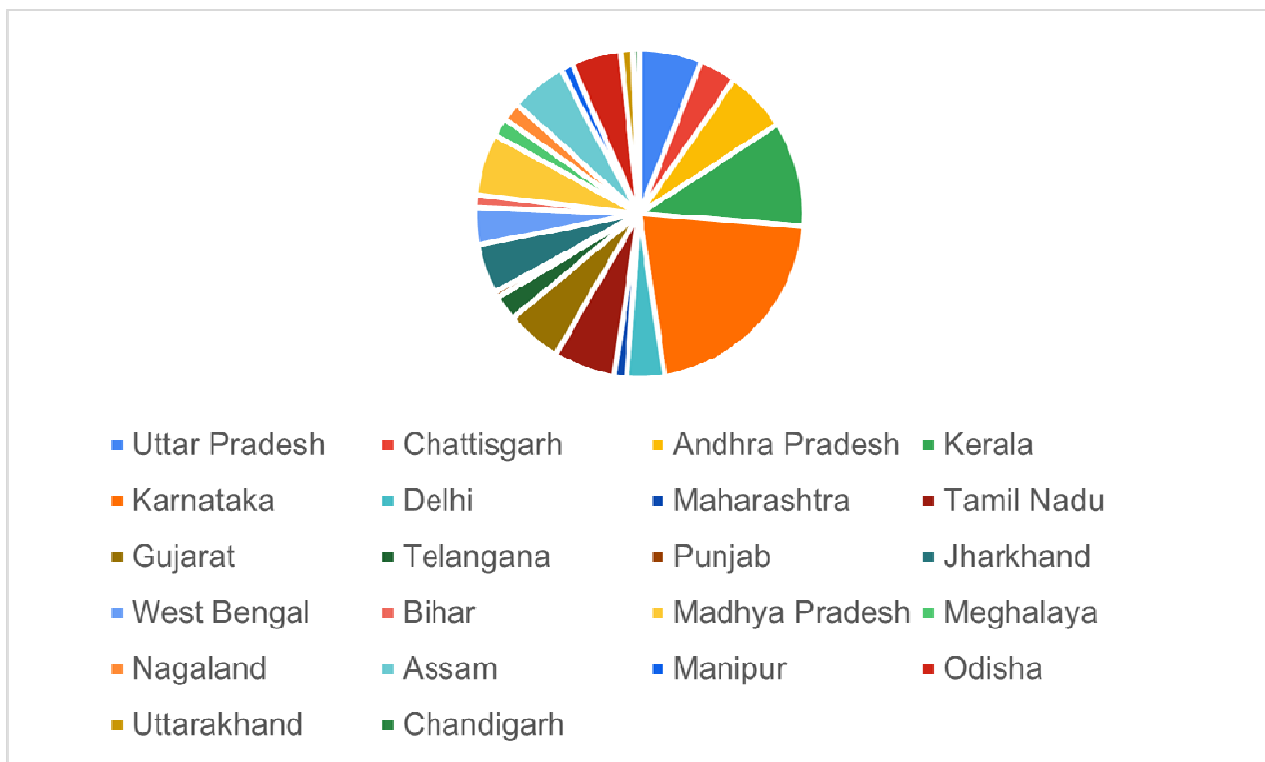
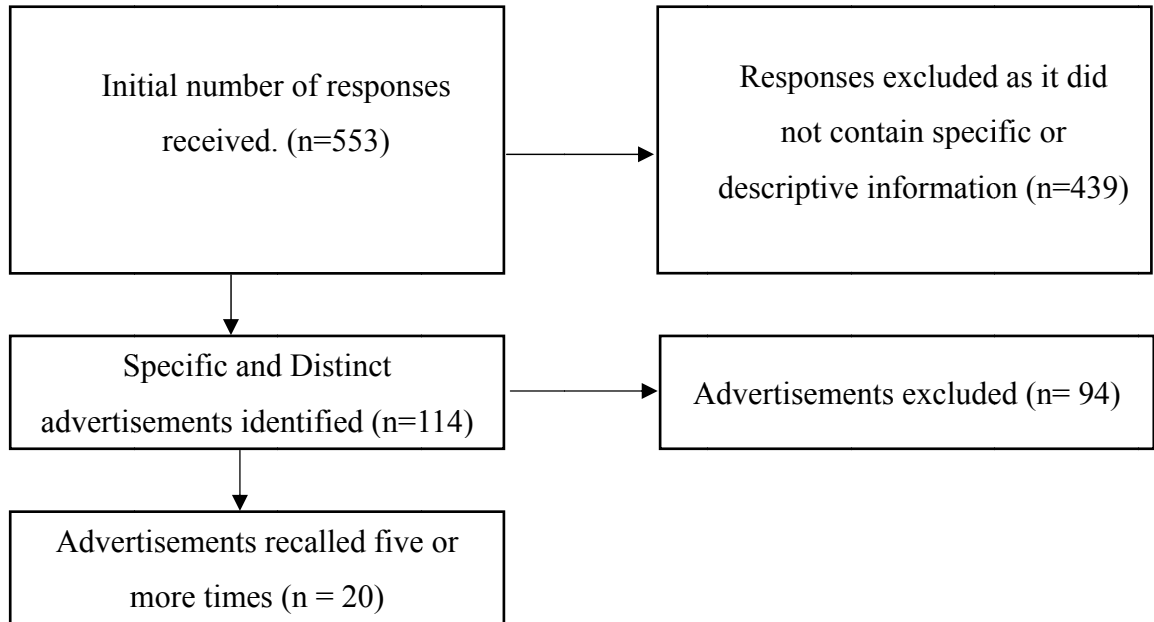
**Figure 1***State-wise Distribution of the Participants in Phase One*

Table 2 shows the total number and percentage distribution of the participants in the study. Out of the 164 participants, 25.6% are males, 73.8% are females and 0.6% identified as non-binary. 64.6% of the participants were currently pursuing their undergraduate studies, whereas 29.3% were pursuing post-graduation, and 6.1% indicated pursuing other courses. In terms of religious distribution, 75% of the participants are Hindus, 14 % Christians, 7.9% Muslims, 0.6% Sikhs and 2.4% reported following other religions. The majority of the participants (70.7%) identified as belonging to the middle-income group, followed by the upper middle group (19.5%), the lower middle group (6.1%), the upper group (3%) and the lower group (0.6%), respectively.

Figure 1 shows the state-wise geographical distribution of the participants. The participants in this phase represented 20 states and two union territories of India, reflecting a diverse sample.

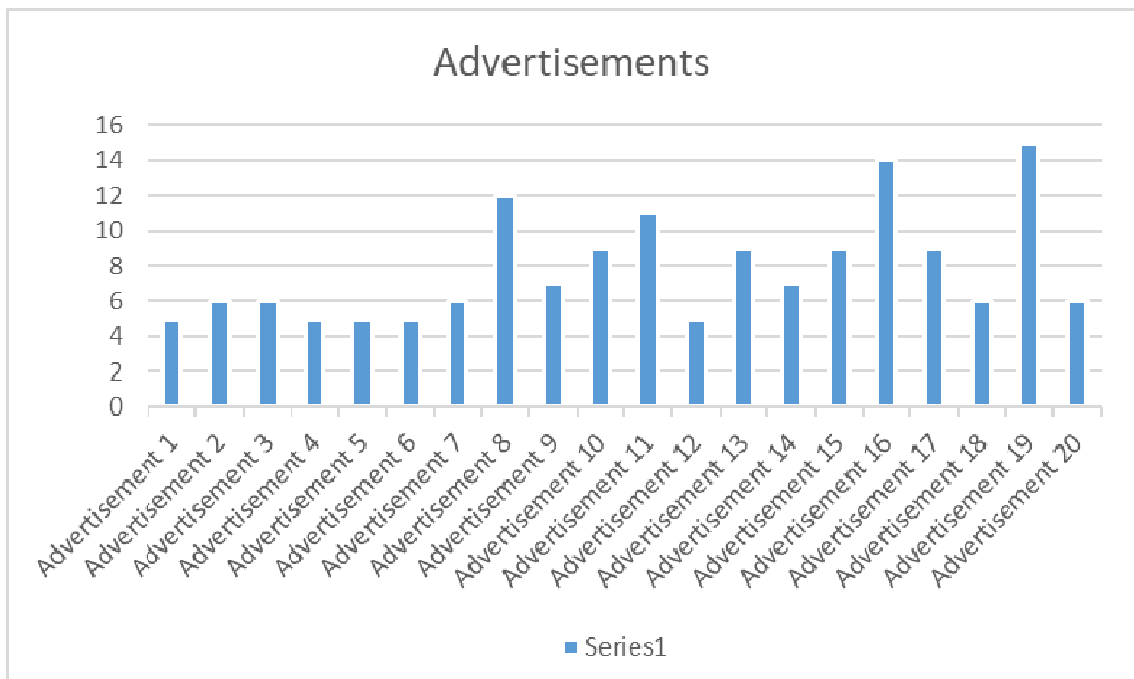
**Figure 2**

*Stepwise Filtering and Selection of Advertisements Derived from the Initial Survey Data.*



**Figure 3**

*Advertisements recalled more than Five Times by the participants*



During the initial screening of the survey responses, a total of 553 responses were received from the 164 participants. Out of these, 114 distinct advertisements were identified based on the detailed description or the web links to the advertisements shared by the participants. 439 responses were excluded as they contained only generic information such as ‘Parle G’ or ‘Cadbury’, which did not allow for the identification of a particular advertisement for that brand. From the 114 distinct and specific advertisements that were identified, only those that were recalled five or times were included in the next step, which accounted for 20, as seen in figure 2. The frequency distribution of each of the 20 advertisements is shown in Figure 3.

Based on the 20 advertisements that participants recalled from their childhood, 20 contemporary advertisements that were released within the last three years and had a viewership of more than 10 lakh were selected with the help of advertising experts.

**Table 4**

*Inter-rater Agreement measured by Fleiss’ Kappa for Expert Evaluation of Ad Pairs*

Criteria	Percentage	Fleiss’ Kappa (k)	95% CI
Similarity in brand familiarity	86.67%	0.73	[0.59 – 0.88]
Similarity in brand popularity in the current market	79%	0.58	[0.38 – 0.78]
Similarity in product category	76.33%	0.53	[0.36 – 0.69]
Similarity in cultural relevance	86%	0.72	[0.52 – 0.92]
Similarity in advertisement duration	52.33%	0.05	[-0.11 – 0.20]
Similarity in visual and auditory complexity	49%	-0.02	[-0.14 -0.10]
Overall Suitability for Comparison	74.67%	0.49	[0.31 – 0.68]

Table 4 presents the expert ratings of the nostalgic and non-nostalgic advertisement sets. Similarity in brand familiarity had the highest level of agreement (86.67%,  $\kappa = 0.73$ , 95% CI [0.59, 0.88]) followed by cultural relevance (86%,  $\kappa = 0.72$ , 95% CI [0.52, 0.92]). This indicated that there is substantial inter-rater reliability and suggests that the pairs were well matched. There was moderate agreement for brand popularity in the current market (79%,  $\kappa = 0.58$ , 95% CI [0.38, 0.78]) and product category (76.33%,  $\kappa = 0.53$ , 95% CI [0.36, 0.69]) supporting comparability for these dimensions. However, there was lower agreement for advertisement duration (52.33%,  $\kappa = 0.05$ , 95% CI [-0.11, 0.20]) and visual and auditory complexity (49%,  $\kappa = -0.02$ , 95% CI [-0.14, 0.10]). The corresponding kappa values indicate poor inter-rater reliability. There was a moderate agreement for the overall suitability of the advertisements for comparison (74.67%,  $\kappa = 0.49$ , 95% CI [0.31, 0.68]), reflecting fair agreement on the comparability of the advertisement sets as a whole.

## **Appendix K**

### **Pretesting the selected stimuli**

In this phase of the study, the researcher pretested the selected advertisements to determine whether they evoked the desired nostalgic responses. It was with the motive to identify whether those advertisements evoke nostalgic emotions and to be included in the experimental group.

#### **Aim**

The primary aim of this phase of the study was to examine whether the selected advertisements effectively evoke the desired nostalgic responses in participants.

#### **Objectives**

The key objectives in this phase of the study are:

1. To assess if there is a significant difference in self-reported nostalgia between each of the matched television advertisement pairs.
2. To assess if there is a significant difference in self-reported nostalgia between nostalgic and non-nostalgic television advertisements.
3. To finalise the advertisement stimulus to be used in the next phase

#### **Operational Definition of Variables**

The key variables used in this phase of the study include nostalgic advertisements, non-nostalgic advertisements, young adults and ad-evoked nostalgia. The definitions of each of these variables as used in this study are described below:

##### ***Nostalgic Advertisements***

In the context of this study, nostalgic advertisements refer to the memorable childhood television advertisements that were selected through the screening in phase one of the study.

##### ***Non-nostalgic Advertisements***

In the context of this study, non-nostalgic advertisements refer to contemporary television advertisements that were selected through screening in phase one of the study.

### ***Young Adults***

In the context of this study, young adults are individuals who belong to the age group of 18 to 25 years and are studying in colleges or universities in India.

### ***Ad-Evoked Nostalgia***

In the context of this study, it refers to the subjective experience of nostalgia triggered by the television advertisement, which is measured using a validated nostalgia scale administered immediately after each ad.

### **Research Design**

The research design employed in the second phase of this study is the between-group experimental design, also known as the between-subjects design. Under this research design, the study utilised quantitative survey methods. The researcher chose this particular research design as she found it suitable to empirically validate the ability of the selected advertisements to evoke the desired nostalgic response among the target population prior to the experimental phase.

### **Population and Sample**

The population for the present study included young adults, particularly university-going students who are 18 to 25 years old. The participants for this phase were recruited from the Central University of Karnataka. The participants were chosen from this institution, as it was the setting for the third phase of this study, the experimental phase. The selection of this study setting helped the researcher maintain consistency with the experimental phase by ensuring that the characteristics of the same population were applied across both stages of the study. It allowed consistency and accuracy in comparison in both phases of the study. Previous studies have shown that this type of approach helps the researchers control for contextual and demographic variables that could influence nostalgia, thereby enhancing internal validity (Kaya, 2015). Additionally, recruiting from the same study setting improved the logistical efficiency.

### ***Sampling***

This phase of the study employed convenience sampling, where random assignment was used. This approach was found suitable as it allows efficient and

practical recruitment of participants from the Central University of Karnataka, which is also the same setting designated for the experimental phase.

### ***Inclusion Criteria***

Based on the objectives and research design developed for this phase of the study, the researcher set three inclusion criteria.

- Only young adults who are college-going students belong to the age group 18 to 25 years.
- Individuals who grew up in India and were exposed to television advertisements from 2010 to 2020 (during the childhood and early adolescent period of the participants).
- Participants are required to be proficient in the English Language, including reading, writing and speaking.
- Participants are required to have at least basic knowledge of the Hindi language.

### ***Exclusion Criteria***

The researcher set two exclusion criteria in the second phase to avoid any chance of bias.

- Participants who have already participated in phase one of the study are required to minimise potential bias due to repeated exposure.
- Participants diagnosed with any psychiatric disorders.

### **Assessment Instruments**

To systematically collect the data and to measure the variable most reliably, the researcher used the following assessment instruments:

#### ***Personal and Socio-demographic Data Sheet***

In this phase of the study, the researcher collected personal and socio-demographic details of the participants, including their age, sex, educational level, and state of residence, using a basic socio-demographic form similar to the one used in phase one of the study.

### ***The Evoked Nostalgia Scale***

In this phase of the study, the researcher used the Evoked Nostalgia Scale developed by Pascal et al. (2002) to measure the advertisement-evoked nostalgia in the participants. The scale consisted of ten items on evoked nostalgia, in which the participants responded on a five-point scale. The responses included responses from 1 'Strongly Disagree' to 5 'Strongly Agree.' Items included statements such as "Reminds me of the past" and "Makes me feel nostalgic." Higher scores indicated higher levels of evoked nostalgia in the participants. The Cronbach's Alpha score was reported to be 0.96, indicating a good reliability (Pascal et al., 2002).

### **Procedure of Recruitment**

The researcher contacted the Head of Department (HOD) of various academic departments of the Central University of Karnataka in person and sought permission to conduct the study; however, permission was granted only for two classes. The participants were visited during the class hours and informed about the study. Those who were eligible and consented to participate were included in the study. One class was randomly assigned to view the set of nostalgic television advertisements, while the other class was assigned to view the set of non-nostalgic television advertisements. Participants in each class watched each advertisement and completed the Evoked Nostalgia Scale. This group assignment allowed for a between-group comparison of nostalgia responses while utilising intact classes for practical convenience.

### **Data Analysis**

For the analysis of the data, this phase of the study used descriptive statistics and inferential statistics. Descriptive statistics, particularly Mean, Standard Deviation and Frequency, were used to analyse the socio-demographic profile of the participants. To assess if there is a difference in the levels of nostalgia between the two sets, an independent samples t-test was conducted. Only those advertisements with a significant mean difference and moderate to large effect sizes were included in the main study.

## Results: Pretesting of the Advertisement Stimulus.

**Table 1**

*Age profile of Participants in Phase Two*

	N	Mean	Standard Deviation	Minimum	Maximum
Age (in years)	59	21.17	1.085	19	25

Table 1 shows the age of the participants in this phase of the study. A total of 59 participants was included in this phase to pre-test the advertisement stimulus. With 32 in the nostalgic advertisement group and 27 in the non-nostalgic advertisement group. The mean age of the participants in this phase was 21.17 and standard deviation is 1.085. The participants ranged from 19 to 25 years.

**Table 2**

*Sociodemographic Characteristics of the Participants in Phase Two*

Variables	N	Percentage
Gender		
Male	27	45.8
Female	31	52.5
Non-Binary	1	1.7
Education		
Under-Graduation	18	30.5
Post-Graduation	41	69.5
Religion		
Hindu	43	72.9
Christian	4	6.8
Muslim	10	16.9
Buddhist	2	3.4
Perceived Socio-Economic Status		
Lower	4	6.8
Lower Middle	10	16.9
Middle	39	66.1
Upper Middle	6	10.2

Table 2 highlights the sociodemographic characteristics of the participants in this phase. Majority of the participants were female (52.5%), pursuing post-graduation (69.5%), Hindus (43%) and belonged to the middle-income group (66.1%).

**Table 3**

*Comparison of Average Nostalgia Scores Between Nostalgic and Non-Nostalgic Advertisement Groups for Each Advertisement Pair Using Independent Samples t-Test*

Advertisement Pairs	Nostalgic Advertisements Group (N=32)		Non-Nostalgic Advertisement Group (N=27)		t-Value	Sig.	Effect size (Cohen's D)
	Mean	SD	Mean	SD			
Ad Pair 1	33.31	1.925	34.33	1.861	-2.067	0.043	-0.538
Ad Pair 2	2.56	3.110	44.33	3.234	-2.139	0.037	-0.559
Ad Pair 3	85.13	6.220	88.67	6.469	-2.139	0.037	-0.559
Ad Pair 4	35.75	10.860	25.93	11.286	3.400	0.001	0.889
Ad Pair 5	37.94	9.401	28.70	11.006	3.476	0.001	0.908
Ad Pair 6	40.84	7.406	24.89	9.597	7.203	0.000	1.882
Ad Pair 7	31.56	11.731	25.52	9.740	2.128	0.038	0.556
Ad Pair 8	38.44	9.896	29.81	11.858	3.045	0.004	0.796
Ad Pair 9	39.63	7.766	35.33	10.470	1.805	0.076	0.472
Ad Pair 10	41.03	10.040	32.74	9.218	3.304	0.002	0.857
Ad Pair 11	37.69	9.451	31.37	9.564	2.544	0.014	0.665
Ad Pair 12	38.88	9.079	33.11	11.574	20143	0.036	0.560
Ad Pair 13	26.84	6.835	29.00	9.471	-1.013	0.315	-0.265
Ad Pair 14	40.06	8.832	37.96	10.486	0.835	0.407	0.218
Ad Pair 15	35.50	10.485	30.33	10.329	1.901	0.062	0.496
Ad Pair 16	36.72	10.126	23.63	9.212	5.153	0.000	1.347
Ad Pair 17	40.34	9.651	35.19	11.143	1.906	0.62	0.498
Ad Pair 18	40.13	8.366	30.93	11.977	3.460	0.001	0.904
Ad Pair 19	34.97	10.891	31.59	10.375	1.212	0.230	0.317
Ad Pair 20	37.06	7.931	27.37	10.263	4.090	0.000	1.069

Table 3 presents the differences in nostalgia scores between nostalgic and non-nostalgic advertisement groups for each advertisement pair using independent samples t-test. Statistical analysis revealed both significant and non-significant differences between the nostalgic advertisement group (N=32) and the non-nostalgic advertisement group (N=27) across the 20 advertisement pairs. Further, effect sizes were calculated using Cohen's 'd' in order to assess the magnitude of differences

There were several advertisement pairs that demonstrated significant differences between the two groups and showed large effect sizes (Cohen's  $d = 0.80$ ). Seven advertisements showed higher mean scores in nostalgic advertisements when compared to non-nostalgic advertisement group. In advertisement pair four, the mean for nostalgic advertisement group and non-nostalgic advertisement group was  $M=35.75$  ( $SD=10.86$ ) and  $M=25.93$  ( $SD=11.29$ ) respectively. The mean difference was found to be significant, ( $t = 3.400^{**}$ ,  $p = .001$ ) with a large effect size  $d = 0.889$ . Similarly, there was a significant difference ( $t = 3.476^{**}$ ,  $p = .001$ ) between the nostalgic advertisement group ( $M = 37.94$ ,  $SD = 9.40$ ) and the non-nostalgic group ( $M = 28.70$ ,  $SD = 11.01$ ) with a large effect size  $d = 0.908$  in the advertisement pair five. In advertisement pair six, participants exposed to the nostalgic advertisements reported higher mean scores ( $M = 40.84$ ,  $SD = 7.41$ ) compared to the non-nostalgic group ( $M = 24.89$ ,  $SD = 9.60$ ), with a significant difference and large effect size ( $t = 7.203^{**}$ ,  $p < .001$ ), (Cohen's  $d = 1.882$ ) respectively. There was a significant difference ( $t = 3.304^{**}$ ,  $p = .002$ ) between the two groups ( $M = 41.03$ ,  $SD = 10.04$  for nostalgic advertisements;  $M = 32.74$ ,  $SD = 9.22$ , for non-nostalgic advertisement group) with effect size Cohen's  $d = 0.857$  in the advertisement pair 10. In the advertisement pair 16, there was a large effect size (Cohen's  $d = 1.347$ ) with significant differences ( $t = 5.153^{**}$ ,  $p < .001$ ) between the nostalgic group ( $M = 36.72$ ,  $SD = 10.13$ ) and non-nostalgic group ( $M = 23.63$ ,  $SD = 9.21$ ). In advertisement pair 18, significantly higher score was observed in the nostalgic condition ( $M = 40.13$ ,  $SD = 8.37$ ) than non-nostalgic condition ( $M = 30.93$ ,  $SD = 11.98$ ), with significant difference ( $t = 3.460^{**}$ ,  $p = .001$ ) and large effect size (Cohen's  $d = 0.904$ ). Similarly, participants in the nostalgic condition ( $M = 37.06$ ,  $SD = 7.93$ ) scored higher than those in the non-nostalgic group ( $M = 27.37$ ,  $SD = 10.26$ ;  $t = 4.090^{**}$ ,  $p < .001$ ) with Cohen's  $d = 1.069$  in advertisement pair 20.

Some advertisement pairs showed significant differences in the nostalgia scores with moderate effect sizes. In Advertisement Pair eight, the nostalgic

advertisement ( $M = 38.44$ ,  $SD = 9.90$ ) elicited significantly higher mean scores than the non-nostalgic advertisements ( $M = 29.81$ ,  $SD = 11.86$ ), ( $t = 3.045^{**}$ ,  $p = .004$ ), with an effect size (Cohen's  $d = 0.796$ ). A similar pattern was noticed in Advertisement Pair 11, where the nostalgic advertisement group ( $M = 37.69$ ,  $SD = 9.45$ ) significantly outperformed the non-nostalgic advertisement group ( $M = 31.37$ ,  $SD = 9.56$ ), where the mean difference was  $t = 2.544^{**}$ , ( $p = .014$ ) and Cohen's  $d = 0.665$ . Advertisement Pair 12 also had higher scores in the nostalgic condition ( $M = 38.88$ ,  $SD = 9.08$ ) over the non-nostalgic one ( $M = 33.11$ ,  $SD = 11.57$ ) with significant difference and moderate effect size ( $t = 2.143^*$ ,  $p = .036$ ,  $d = 0.560$ ). In Advertisement Pair seven, nostalgic advertisements ( $M = 31.56$ ,  $SD = 11.73$ ) again showed significantly higher ratings than non-nostalgic advertisements ( $M = 25.52$ ,  $SD = 9.74$ ), ( $t = 2.128^*$ ,  $p = .038$ ), with a moderate effect size (Cohen's  $d = 0.556$ ). However, there was reversal of this trend in Advertisement Pair two, where nostalgic advertisements ( $M = 2.56$ ,  $SD = 3.11$ ) were rated significantly lower than non-nostalgic ads ( $M = 44.33$ ,  $SD = 3.23$ ), with mean difference  $t = -2.139^*$  ( $p = .037$ ) and Cohen's  $d = -0.559$ . A similar negative effect (Cohen's  $d = -0.538$ ) appeared in advertisement pair one, with nostalgic group ( $M = 33.31$ ,  $SD = 1.93$ ) showing lower scores than the non-nostalgic group ( $M = 34.33$ ,  $SD = 1.86$ ), with mean difference  $t = -2.067^*$ , ( $p = .043$ ). In Advertisement pair three the nostalgic condition ( $M = 85.13$ ,  $SD = 6.22$ ) was rated significantly lower than the non-nostalgic condition ( $M = 88.67$ ,  $SD = 6.47$ ), with mean difference,  $t = -2.139^*$ , ( $p = .037$ ), with a moderate negative effect size ( $d = -0.559$ )

In some advertisement pairs although there was a small to moderate effect size ( $0.20 \leq d < 0.50$ ), there was no statistically significant difference. For instance, in advertisement pair 15, the nostalgic advertisement ( $M = 35.50$ ,  $SD = 10.49$ ) showed higher ratings than the non-nostalgic advertisement ( $M = 30.33$ ,  $SD = 10.33$ ), with a moderate effect size ( $d = 0.496$ ) however there was no statistically significant difference ( $t = 1.901$ ,  $p = .062$ ). A similar marginal difference was observed in advertisement pair 17, where nostalgic advertisement ( $M = 40.34$ ,  $SD = 9.65$ ) scored more than non-nostalgic advertisement ( $M = 35.19$ ,  $SD = 11.14$ ), with mean difference,  $t = 1.906$  ( $p = .062$ ) and effect size,  $d = 0.498$ . In advertisement Pair nine participants rated nostalgic advertisement ( $M = 39.63$ ,  $SD = 7.77$ ) more favourably than non-nostalgic advertisement ( $M = 35.33$ ,  $SD = 10.47$ ), with a moderate effect size (Cohen's  $d = 0.472$ ) though the difference was not statistically significant ( $t =$

1.805,  $p = .076$ ). Meanwhile, advertisement pair 19 showed a smaller, non-significant difference ( $t = 1.212$ ,  $p = .230$ ) between nostalgic ( $M = 34.97$ ,  $SD = 10.89$ ) and non-nostalgic ads ( $M = 31.59$ ,  $SD = 10.38$ ), with effect size,  $d = 0.317$ . Lastly, Advertisement Pair 14 revealed only a slight difference in favor of the nostalgic ad ( $M = 40.06$ ,  $SD = 8.83$ ) compared to the non-nostalgic version ( $M = 37.96$ ,  $SD = 10.49$ ), which was not statistically significant ( $t = 0.835$ ,  $p = .407$ ) with a small effect size,  $d = 0.218$ . Although these findings were not statistically significant, the effect sizes indicate more favourable evaluations for nostalgic advertisement.

One advertisement pair showed non-significant difference with negligible effect. Advertisement Pair 13 exhibited no significant difference ( $t = -1.013$ ,  $p = .315$ ), between nostalgic ( $M = 26.84$ ,  $SD = 6.84$ ) and non-nostalgic ( $M = 29.00$ ,  $SD = 9.47$ ) advertisements, with a small, non-significant effect size ( $d = -0.265$ ) indicating a negligible impact of nostalgia in this pair.

**Table 4**

*Comparison of Average Nostalgia Scores Between Nostalgic and Non-Nostalgic Advertisement Groups Using Independent Samples t-Test*

Variables	Nostalgic		Non-Nostalgic		t- Value	Sig.	Effect size (Cohen's D)
	Advertisements		Advertisement				
	Group (N=32)		Group (N=27)				
	Mean	SD	Mean	SD			
Nostalgia	39.71	5.65	34.04	5.76	3.807	0.000	0.996

Table 4 presents the differences in nostalgia scores between nostalgic and non-nostalgic advertisement groups using independent samples t-test and shows the corresponding effect sizes using Cohen's  $d$ . There was a significant difference in the level of nostalgia evoked between the nostalgic and non-nostalgic advertisement groups ( $t = 3.807$ ,  $p < .001$ ). Participants who viewed nostalgic advertisements reported substantially higher nostalgia scores ( $M = 39.71$ ,  $SD = 5.65$ ) compared to those exposed to non-nostalgic advertisements ( $M = 34.04$ ,  $SD = 5.76$ ). The effect size was large (Cohen's  $d = 0.996$ ). These findings confirm that the nostalgic advertisements were successful in evoking nostalgia among the participants when compared to non-nostalgic advertisements.