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Unlocking the Brain: Neuromarketing's Impact on Consumer Feelings and Behaviour in the Health and Wellness Food Market

Nikki van Rijswijk

Master Thesis

presented as partial requirement for obtaining a Master's Degree in Data-Driven Marketing

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Instituto Superior de Estatística e Gestão de Informação

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by

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Master Thesis presented as a partial requirement for obtaining the Master's degree in Data-Driven Marketing, with a specialization in Marketing Intelligence.

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STATEMENT OF INTEGRITY

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism, any form of undue use of information or falsification of results along the process leading to its elaboration. I further declare that I have fully acknowledged the Rules of Conduct and Code of Honor from the NOVA Information Management School.

[Lisboa, 13-7-2025]

Nikki van Rijswijk

DEDICATION AND ACKNOWLEDGEMENTS

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ABSTRACT

Despite rising awareness, health issues and obesity remain a global concern. While consumers increasingly seek out healthier options, marketing campaigns often focus on less healthy choices as they tend to be more engaging. To improve eating habits, promoting healthier food alternatives is crucial. This study investigates how neuromarketing principles can be used in advertising to enhance positive feelings and improve consumer purchasing behaviour in the health and wellness food market. By conducting a comprehensive literature review, key neuromarketing principles were identified, including the use of emotional content, attention-grabbing visuals, attractive packaging, subliminal messaging, and goal alignment. Based on these findings, two advertisements for a healthy yoghurt product were developed: one using neuromarketing principles and the other following a traditional, rational marketing approach. Participants were randomly assigned to view one of the campaigns, and their purchase intention, product attitude, and perceived product value were measured through a structured questionnaire. The results of this study show that neuromarketing campaigns have potential, but give no significant evidence to support their advantage over traditional marketing in influencing consumer behaviour in the health and wellness food market. However, the study shows that the neuromarketing campaign generated stronger emotional engagement, which in turn significantly influenced the measured consumer outcomes, indicating the potential important role of neuromarketing. This research therefore contributes to the growing field of neuromarketing and offers accessible, practical insights for marketers aiming to increase consumer engagement and drive purchase decisions. The study demonstrates that key principles from neuromarketing can be applied in advertising campaigns to create higher emotional engagement, which leads to better consumer outcomes, giving access to neuromarketing for smaller companies and startups in the health and wellness food market.

KEYWORDS

neuromarketing; health and wellness food market; consumer behaviour; healthy food; purchase intention; product attitude; perceived product value; emotional engagement; goal alignment; health knowledge; health consciousness; lifestyle

Sustainable Development Goals (SDG):

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LIST OF ABBREVIATIONS AND ACRONYMS

ANOVA	Univariate Analysis Of Variance
ANS	Autonomic Nervous System
EDA	Electrodermal Activity
EEG	Electroencephalography
EFA	Exploratory Factor Analysis
ET	Eye Tracking
fMRI	Functional Magnetic Resonance Imaging
fNIRS	Functional Near-Infrared Spectroscopy
GSR	Galvanic Skin Response
KMO	Kaiser-Meyer-Olkin
MANOVA	Multivariate Analysis Of Variance

1. INTRODUCTION

In recent years, one of the key trends in the food and beverage sector has been the rise of health and wellness foods (Innova Market Insights, 2024; Shah et al., 2025; Wunsch, 2024; Yu & Watson, 2024). Health-conscious content is in high demand, and consumers appear to be in favour of eating healthier (Pancer et al., 2022). This is critical as the world's obesity problem remains a growing concern (Hegewald, 2025). However, many advertisements try to boost engagement with unhealthy food content, potentially normalizing unhealthy eating habits (Pancer et al., 2022). Neuromarketing could play an important role here, by increasing the appeal of healthy food content and promoting healthier lifestyles in an engaging way. Moreover, in the health and wellness food market consumers value trust and alignment with personal health goals (Firoozzare et al., 2024). Neuromarketing principles might help brands better align their messages with individual goals and values (Srivastava & Bag, 2023). This not only improves the relevance of marketing efforts but also has the potential to outperform traditional strategies (Byrne et al., 2022; Yao & Wang, 2024). This study aims to provide evidence for this.

Neuromarketing, the study of how neurological responses influence consumer decision-making, has shown promise for providing a deeper, more fundamental understanding of consumer behaviour (Singh et al., 2023; Srivastava & Bag, 2023). It is an emerging field that leverages neuroscience to comprehend consumer preferences (Georgiadis et al., 2023), offering marketers insights into how to create messages that connect with their target audience on an emotional level (Xu et al., 2023).
Traditional marketing methods often rely on self-reported data, which can be biased or inaccurate (Yao & Wang, 2024). Neuromarketing on the other hand leverages neurological and physiological responses to offer more reliable insights into consumer purchase behaviour and decision-making processes (Byrne et al., 2022). As shown by Chan et al. (2024), neuromarketing results can be used as an extra source of data that self-report tools are not able to obtain. So, as brands increasingly seek to personalize their offerings to align with individual consumer goals and interests (Lambillotte & Poncin, 2022), neuromarketing presents an opportunity for creating effective marketing campaigns (Bhardwaj et al., 2023) in the health and wellness food market.

Although existing literature recognises neuromarketing's potential for understanding consumer behaviour and increasing engagement (Behl et al., 2023; De Jesus et al., 2022; Jai et al., 2020; Kajla et al., 2023; Simonov et al., 2024; Yao & Wang, 2024), there is a noticeable gap in research regarding how neuromarketing principles can be used to improve purchasing behaviour, especially in the growing health and wellness food market. To the best of our knowledge, the literature on neuromarketing that explains how advertisers can use it in practice to promote their products is quite limited, despite the fact that many have conducted research in this area (Dwivedi et al., 2025). There is also a need to make neuromarketing more

accessible and for research that offers practical, real-world applications (Lee et al., 2007). Moreover, little is researched about how neuromarketing-inspired campaigns perform against traditional marketing campaigns. Traditional, self-report techniques have been used in earlier studies to anticipate consumers' decision-making and purchase intentions (Yao & Wang, 2024), frequently falling short in capturing the unconscious behaviour of customers. Neuromarketing offers a promising solution to overcome this constraint (Yao & Wang, 2024). Thus, the present study aims to provide new insights synthesizing neuromarketing literature and to discover key neuromarketing principles that can be used in marketing communications. It also aims to provide evidence on how neuromarketing principles can be used in practice, to enhance positive feelings and increase consumer purchase behaviour in the health and wellness food market, and show how neuromarketing advertisements compare to traditional marketing campaigns.

The objectives of this study are first of all to explore the concept of neuromarketing, its importance, tools and techniques, benefits and applications, limitations, ethical considerations, and extract key principles, through a comprehensive literature review. Furthermore, this paper presents the design and comparison of two advertising campaigns for the health and wellness food market, one created based on neuromarketing principles from literature, and one traditional, information-heavy campaign. By analysing data obtained through a questionnaire, the effectiveness of the neuromarketing-based campaign is compared with the traditional marketing approach, in influencing consumer purchase intention, product attitude, and perceived product value. Also, the mediating influence of emotional engagement and goal alignment are examined, as well as the moderating role of demographic segments.

While neuromarketing is currently widely studied, it is not applied in practice as much, due to the high cost of the equipment (Bhardwaj et al., 2023). The results of this study show that a campaign based on neuromarketing principles shows promise to outperform traditional campaigns, but no conclusive evidence for its advantages were found in the context of the study. However, the study shows that the neuromarketing campaign generated stronger emotional engagement compared to the traditional campaign, which in turn significantly influenced the measured consumer outcomes. This shows the potential important role of neuromarketing in advertising, and that even without the direct use of often expensive neuromarketing equipment, applying these principles can drive stronger consumer engagement.

Thus, the present work contributes to literature by synthesizing neuromarketing findings and demonstrating how these principles could potentially enhance consumers' purchasing behaviour, particularly in the health and wellness food market. It also aids advertisers and those interested in helping consumers make healthier food decisions to increase their impact. It offers marketing managers and (smaller) health and wellness food brands practical insights

on designing emotional campaigns, without incurring high costs. By implementing neuromarketing techniques, these firms could increase their understanding of consumer behaviour and stay competitive in a dynamic, fast-changing market.

The remainder of this paper proceeds as follows. It begins by reviewing the existing body of literature on neuromarketing, developing a comparative table with key neuromarketing principles, followed by the development of the research model and hypotheses. Next, it highlights how these hypotheses are to be tested and what data collection method is applied. Results of the experiment are then presented and discussed before concluding with a summary of theoretical and practical contributions, main limitations of the study, and future research opportunities.

2. LITERATURE REVIEW

2.1 NEUROMARKETING AND HEALTHY FOOD APPLICATIONS

Health and wellness foods are currently one of the major trends (Innova Market Insights, 2024; Shah et al., 2025; Wunsch, 2024; Yu & Watson, 2024). Lifestyles have changed over time and as a result, the demand for healthy foods has grown substantially (García-Salirrosas et al., 2024; Prinyawiwatkul, 2020; Shah et al., 2025). One of the most important elements influencing food choices nowadays is health (Chilón-Troncos et al., 2024). Consumers are also calling for more health-conscious content (Pancer et al., 2022) and businesses are searching for methods to boost sales of healthy foods (Labban et al., 2021). This is critical, as people's eating habits and lack of health awareness have led to obesity and poor nutrition, which has resulted in a rise in health problems for today's population (Hegewald, 2025; Labban et al., 2021). Poor eating continues to be a leading source of illness worldwide (Huangfu et al., 2024). Because of their nutritional content and health advantages, healthy food products are essential to avoid diseases and obtain a balanced lifestyle (García-Salirrosas et al., 2024; Shah et al., 2025). Promoting healthy food can play a crucial role here, as advertising campaigns and other communications affect actual eating habits (Pancer et al., 2022).

Nevertheless, people are more likely to engage with unhealthy, high-calorie food content (Pancer et al., 2022) and this unhealthy content is likely to expand its reach, as algorithms tend to favour content that obtains more engagement and ranks it higher (Lee et al., 2018). A study by Murphy et al. (2020) also showed that advertisements for unhealthy foods are more likely to be remembered, recognised, seen, and shared than those for healthy foods. For healthy food content it thus may be more challenging to obtain the necessary views and interaction, making it less visible to the public (Pancer et al., 2022). Moreover, this may lead to content creators progressively changing their material to be unhealthier in order to remain competitive (Pancer et al., 2022). Other research has also found that rising obesity levels are partly due to modern market trends, such as making high-calorie foods cheaper and using marketing strategies to encourage their consumption (Labban et al., 2021). Because of this increased exposure to unhealthy foods, consumers may have a wrong understanding of what constitutes a healthy eating pattern (Pancer et al., 2022; Taylor et al., 2018).

Thus, for a healthier world, it is essential that healthy food content reaches a higher level of engagement and visibility. Neuromarketing could play an important role here, as it may offer guidelines and recommendations for healthy food marketing (Mengual-Recuerda et al., 2020). Moreover, food decisions are mostly influenced by factors that consumers are not entirely aware of, which traditional methods cannot assess (Stasi et al., 2017). Emotions play a crucial role when it comes to decisions about (healthy) food (Khoshghadam & Rajabi, 2024; Prinyawiwatkul, 2020). As neuromarketing can effectively measure emotions (Hadinejad et al., 2018), it could provide crucial insights here and help the food industry to understand

customer behaviour towards food (Misso et al., 2018). By reviewing the existing literature on neuromarketing and examining the effectiveness of neuromarketing principles in health and wellness food marketing, the present work aims to answer this demand.

The early concept of neuromarketing was born in the 1980s out of neuroscience, which aims to understand the biological foundations of behaviour through the study of the neurological system (Plassmann et al., 2012). Neuroscience is a field of medicine that arose from the technological developments that made it possible to create body imaging and scanning technologies (Behl et al., 2023; Bhardwaj et al., 2023). Later, in the 1990s, it became associated with neuroimaging (Bhardwaj et al., 2023; Wilson et al., 2008). In 2002, the term "neuromarketing" was introduced by marketing professor Ale Smidts, defining it as "the study of the brain mechanisms responsible for consumer behaviour in order to improve marketing strategies" (Smidts, 2002, as cited in Boricean, 2009, p. 119).

Several other definitions of neuromarketing have been introduced in literature, including ''an interdisciplinary product of neuroscience and marketing" (Lim, 2018, p. 206), "the application of neuroscientific methods to analyse and understand human behaviour in relation to markets and marketing exchanges" (Lee et al., 2007, p. 200), "neuromarketing applies tools and theories from neuroscience to better understand decision making and related processes" (Casado-Aranda et al., 2023, p. 1738)." Other research described it as "a combination of the traditional marketing methods with neuroscientific approaches'' (De Jesus et al., 2022, p. 2), "the study of the psychological assessment of consumers' sensory responses toward marketing communication" (Singh et al., 2023, p. 2012), and "the application of brain imaging and measurement techniques to identify consumer preferences" (Schneider & Woolgar, 2012, p. 169).

Thus, neuromarketing combines neuroscience and marketing (Bhardwaj et al., 2023), leveraging technological advancements to examine how consumers' brains respond to marketing and communication stimuli (Reimann et al., 2011) analysing consumer behaviour (Lim, 2018), and complementing traditional research approaches (Ariely & Berns, 2010).

Neuromarketing is based on the idea that consumer behaviour and purchasing decisions are influenced by subconscious factors (Bhardwaj et al., 2023). Consumers' buying decisions are driven by concealed information about their true preferences stored in their brains (Ariely & Berns, 2010). By studying the human brain and its instinctive responses to marketing, neuromarketing tries to uncover how unconscious emotions and reactions impact consumers' choices and actions (Behl et al., 2023; Chan et al., 2024; Dwivedi et al., 2025; Singh et al., 2023) and provides otherwise inaccessible information (Ariely & Berns, 2010). Since 95% of purchase decisions are made by the subconscious mind and it is a major influence on consumer behaviour (Bhardwaj et al., 2023), neuromarketing expands traditional marketing research (Ulman et al., 2014), offering deeper insights and providing possibilities to develop more innovative, unique marketing campaigns (Shiv et al., 2005).

A growing number of researchers have examined the underlying neurological processes of consumer attitudes, behaviour, and purchase decisions over the past decade, using the tools and theories of neuroscience and neuromarketing (Ariely and Berns 2010; Casado-Aranda et al., 2022; Venkatraman et al., 2014; Yao & Wang, 2024; Yoon et al., 2012; Zhao et al., 2019). Additionally, neuromarketing has drawn a lot of interest from the business sector (Plassman et al., 2012) and has given rise to a new industry around neuromarketing tools that is expanding quickly (Venkatraman et al., 2015).

2.2 BENEFITS AND APPLICATIONS

Neuromarketing technologies are becoming more affordable and widely available (Baldo et al., 2022; Chan et al., 2024). They provide creative approaches to marketing that can boost and expand the results of marketing strategies (Singh et al., 2023). It impacts segmentation, positioning, targeting, brand equity, loyalty, and many other areas (Dwivedi et al., 2025). For example, neuromarketing intelligence may be used to find new customer segments and target them more precisely (Stanton et al., 2017). Some firms therefore even use neuromarketing techniques as a business strategy (Bhardwaj et al., 2023; Singh et al., 2023).

It also provides academics and marketers with a fresh perspective (Lim, 2018). A study by Behl et al. (2023) revealed that marketers believe neuromarketing may enhance their marketing strategies and reduce costs. By offering insights into underlying mechanisms that are generally challenging to attain using traditional methods, neuromarketing may be used to test, improve, and build on current marketing ideas (Lim, 2018).

With neuromarketing, businesses are able to produce more appealing items (Stanton et al., 2017), optimize product design and development (Ariely & Berns, 2010; Eser et al., 2011; Yao & Wang, 2024), enhance product presentation and packaging (Bhardwaj et al., 2023; Lim, 2018), and promotional materials, overall improving the experiences of consumers (Stanton et al., 2017). Other neuromarketing applications include evaluating marketing stimuli such as advertising (Bhardwaj et al., 2023), website development (De Jesus et al., 2022), understanding consumers' online shopping behaviour (Singh et al., 2023), improving market position through improved consumer understanding (Bhardwaj et al., 2023), and predicting decisions (Singh et al., 2023). It can also be useful to evaluate which advertising campaigns impact consumers, the reasons behind consumers' preference for some brands and items over others, and the ways in which differences in product layout, bundling, and in-store displays influence customers (Dwivedi et al., 2025). By creating more effective ads, ad volume and costs can be lowered (Stanton et al., 2017).

Neuromarketing thus provides a deeper understanding of how consumers make decisions and react to products, advertisements, and promotions (De Jesus et al., 2022). With this knowledge, marketers can better organize their marketing efforts, test and refine campaigns, and introduce products more effectively (Behl et al., 2023; Yao & Wang, 2024).

2.3 NEUROMARKETING TOOLS AND TECHNIQUES

Neuroscientific methodologies measure, document, and map brain and neural activity during behaviour using several tools and techniques to understand reactions in the brain and nervous system brought on by a stimulus (Lim, 2018). Several neuroscience methods used in neuromarketing include biometric measures, such as eye tracking (ET) and galvanic skin response (GSR), FaceReader, electroencephalography (EEG), Functional Magnetic Resonance Imaging (fMRI), and Functional Near-Infrared Spectroscopy (fNIRS) (Baldo et al., 2022; Byrne et al., 2022; Plassman et al., 2015; Yao & Wang, 2024). These tools are briefly covered and compared in this section.

2.3.1 EYE TRACKING

Eye tracking records eye movements while a person is exposed to marketing stimuli, such as advertisements and in-store features. It has a high temporal resolution and can track directly what customers are looking at (Stanton et al., 2017), which information was seen, and the order and duration of this processing (Venkatraman et al., 2015).
Specifically, two different elements are measured with eye tracking: saccades, which occur when the eyes rapidly shift from one visual field to another, and fixations, which occur when the eyes are fixed for around 100-300 milliseconds and focused, on a specific object for example (Casado-Aranda et al., 2022). These elements show a consumer's visual searching behaviour (Casado-Aranda et al., 2023) as well as their attention (Venkatraman et al., 2015). For example, analysing fixations can give an indication of overall attention and interaction with an advertisement (Venkatraman et al., 2015). Also, the quantity of fixations can indicate how well the information in an ad is received (Venkatraman et al., 2014).

Although eye tracking cannot reveal an individual's affective responses or the reason behind their gaze (Casado-Aranda et al., 2023), it has gained a lot of popularity in the business (Stanton et al., 2017). It is relatively inexpensive and versatile (Stanton et al., 2017). Given the current rise in social media and virtual worlds, this is even more important today (Casado-Aranda et al., 2023).

2.3.2 GALVANIC SKIN RESPONSE

Galvanic Skin Response (GSR) is a measurement of the electricity the skin conducts (Yang et al., 2021). This changes based on the activeness of sweat glands, structures in the skin that produce sweat, controlled by the Autonomic Nervous System (ANS) (Baldo et al., 2022; Yang et al., 2021). The ANS gets more active when someone is excited, stressed, or emotionally aroused, causing them to sweat more (De Paula et al., 2022; Yang et al., 2021). This sweat makes the skin better at conducting electricity (Baldo et al., 2022), which a GSR sensor can detect. GSR is usually measured with wearable devices on the wrist and fingers that track changes in the skin's electrical conductance over time (Dehzangi et al., 2018; Goshvarpour &

Goshvarpour, 2019; Yang et al., 2021). In this way, emotional and psychological reactions can be understood (De Paula et al., 2022; Goshvarpour & Goshvarpour, 2019). One common way to interpret GSR is by looking at the amplitude of the skin conductance response, which reflects emotional arousal, attention, anticipation, or mental effort (Baldo et al., 2022). So, in marketing, GSR can help measure how strongly people react to ads or products (Baldo et al., 2022). However, it cannot tell you why an emotion is happening or distinguish between different emotions. Still, GSR is widely used, as it is relatively affordable, non-intrusive, and not too difficult to use or comprehend (Verhulst et al., 2020).

2.3.3 FACEREADER

FaceReader is used to identify the emotional reactions that marketing stimuli evoke (Hadinejad et al., 2018). It is a software that analyses facial movements (Pichierri et al., 2021) by identifying faces and detecting mouth and eye corner motions (Landmann, 2023). FaceReader was created to recognise facial expressions in real time and separate them into different categories of emotion (Hadinejad et al., 2018). Researchers can use it to examine valence and emotional arousal (Hadinejad et al., 2018; Pichierri et al., 2021). Benefits include its high accuracy rate in determining emotions and its non-intrusive way of collecting data (Pichierri et al., 2021). However, it also has some limitations, including sensitivity to lighting, dependency on high-quality cameras, and potential bias as respondents may overreact their expressions (Hadinejad et al., 2018).

2.3.4 ELECTROENCEPHALOGRAPHY

Electroencephalography (EEG) is a non-invasive method that uses electrodes positioned at various points on the scalp to assess the electrical activity of the brain (Enax et al., 2015; Yao & Wang, 2024). By examining and documenting variations in electrical currents in the form of brain waves, EEG can offer important insights into brain activity (Yadava et al., 2017). As a frequently applied method in marketing contexts (Baldo et al., 2022) and advertising research (Venkatraman et al., 2015), it can for example be used to record participants' arousal and engagement over time as they watch advertisements (Pozharliev et al., 2015; Yao & Wang, 2024).

High, millisecond temporal resolution is an important benefit of EEG, which enables it to precisely record changes in brain processes as they happen (Casado-Aranda et al., 2023; Yao & Wang, 2024). It is also relatively less costly and easy to implement (Byrne et al., 2022; Verhulst et al., 2020). However, EEG is unable to directly measure the regions of the brain that are located beneath the cerebral cortex, which play an important role in emotion and decision-making (Casado-Aranda et al., 2023; Enax et al., 2015). Thus, because it can only measure activity in cortical (surface-level) brain regions, it has the disadvantage of a low spatial resolution (Venkatraman et al., 2015).

2.3.5 fMRI

Functional Magnetic Resonance Imaging (fMRI) on the other hand has high spatial resolutions and is now the primary method for assessing brain activity in cognitive neuroscience (Yao & Wang, 2024). It is a non-invasive method that locates and monitors variations in blood oxygenation (Venkatraman et al., 2015) and ‘’maps blood flow to different areas of the brain’’ (Eser et al., 2011, p. 855). fMRI can be used by researchers to investigate the processes involved in purchasing. According to the theory, when the brain's "buy" areas activate, they pull more blood which can be seen on an fMRI scan (Eser et al., 2011). This could be used in marketing efforts.

Because of its high spatial and temporal resolution (Yoon et al., 2006), fMRI can accurately identify brain activity in the deeper brain regions (Yao & Wang, 2024). This enables the assessment of the entire brain while presenting marketing stimuli, which may be predictive of consumer behaviour and conversion (Casado-Aranda et al., 2023). However, marketers may encounter difficulties and be limited in their ability to use fMRI due to its high cost, motion restrictions, need for a controlled experimental setting, complex study design and data analysis methodology (Casado-Aranda et al., 2023; Yao & Wang, 2024).

2.3.6 fNIRS

The last discussed frequently used method is fNIRS, a non-invasive method that uses near-infrared (NIR) light, which can pass through human tissues, to study brain activity (Yao & Wang, 2024). It measures how NIR light interacts with hemoglobin (a protein responsible for transporting oxygen), helping researchers estimate neural activity in specific areas of the brain (Ferrari & Quaresima, 2012; Yao & Wang, 2024). This can then be used to forecast preferences and study consumer behaviour (He et al., 2021; Yao & Wang, 2024).

fNIRS is relatively affordable, mobile, and usable for real-life contexts. It is also less sensitive to the movement of participants (Casado-Aranda et al., 2023; He et al., 2021; Yao & Wang, 2024). It lacks the high temporal resolution of EEG and fMRI as it can only measure activity in cortical areas (He et al., 2021), which gives interpretation challenges (Casado-Aranda et al., 2023) but has a higher spatial resolution in comparison to EEG, which means it can more precisely locate brain activity (Yao & Wang, 2024).

To conclude, combining these methods can give marketing research even deeper insights and significant predictive value (Stanton et al., 2017).

2.4 NEUROMARKETING VS. TRADITIONAL MARKETING

For academics and marketers, accurately forecasting buying decisions continues to be vital (Yao & Wang, 2024). To measure consumer preferences and predict their behaviour, researchers have long used traditional, self-report methods (Byrne et al., 2022; Venkatraman et al., 2015). These methods, such as surveys and interviews, are relatively affordable, easily available, practical in large-scale data collection, and fairly straightforward to analyse (Venkatraman et al., 2015; Yao & Wang, 2024). The idea behind these tools is that consumers can effectively communicate their inner thoughts and feelings, which marketers can then utilize to create and improve advertisements (Casado-Aranda et al., 2022). However, this is not accurate, as traditional methods are not able to adequately reflect the deepest levels of consumer thoughts, emotions, and behaviour (Casado-Aranda et al., 2022; Dwivedi et al., 2025) because they only record conscious opinions (Venkatraman et al., 2015). It misses a customer's subconscious reactions (Bhardwaj et al., 2023; Yao & Wang, 2024). These methods may also provide data that is inaccurate since individuals might not recall their experiences correctly (Byrne et al., 2022) and are susceptible to biases like social desirability and subjectivity, further limiting their effectiveness (Casado-Aranda et al., 2022; Yao & Wang, 2024).

Neuromarketing, on the other hand, provides new insights that traditional methods are unable to deliver (Chan et al., 2024; Singh et al., 2023) by recording responses that consumers might be unaware of or reluctant to share (Byrne et al., 2022). It can help figure out what makes people feel and act a certain way when they see an ad, by examining the emotional impact (Byrne et al., 2022) and how well an ad performs in terms of attention, memorability, and desirability (Lim, 2018). It can improve marketing theory and practice (Stanton et al., 2017) and, sometimes paired with conventional methods, increase the precision of forecasts of customer preferences and behaviour (Dwivedi et al., 2025; Eser et al., 2017; Stanton et al., 2017; Venkatraman et al., 2015). Here, neuromarketing methods are more dependable (Bhardwaj et al., 2023; Plassman et al., 2012) and it has therefore become a type of market research that offers significant benefits over traditional methods (Eser et al., 2011; Yoon et al., 2006).

Also, it is possible to distinguish between rational and emotional advertising. The first type relates to the traditional form of advertising, where factual, logical information is promoted. The second refers to the promotion of emotional, subconscious information, relating to ideas based on neuromarketing (Venkatraman et al., 2015). Consumer behaviour shifts rapidly, reducing the effectiveness of traditional marketing campaigns (Mengual-Recuerda et al., 2020). Consumers are more and more searching for personalised marketing, which makes understanding a person’s mind and emotions key in marketing efforts (Bhardwaj et al., 2023). Recognising how customers perceive brands intuitively is crucial (Mengual-Recuerda et al., 2020). Using neuromarketing tools will be the only effective way to achieve this (Bhardwaj et al., 2023; Singh et al., 2023). Businesses may create deeper, more emotional customer

relationships by using neuromarketing principles in advertising over traditional methods (Mengual-Recuerda et al., 2020). Neuromarketing tools are also becoming more widely used and accessible, so the application of its principles is expected to expand in the future (Casado-Aranda et al., 2023).

2.5 LIMITATIONS AND ETHICAL CONSIDERATIONS

2.5.1 LIMITATIONS AND CHALLENGES

Neuromarketing also presents some limitations and challenges. The most commonly reported disadvantages are the high cost of neuromarketing tools, discomfort and distrust experienced by participants, sampling issues, and lack of real-life environments (Ariely & Berns, 2010; Casado-Aranda et al., 2022; Eser et al., 2011; Lim, 2018).

Firstly, costs present one of the main obstacles (Yao & Wang, 2024). Performing neuromarketing research is often expensive (Stanton et al., 2017), and neuromarketing tools require advanced technologies which are costly (Bhardwaj et al., 2023). The cost of a medium-sized neuromarketing study ranges from around €90.000 to €180.000 (Eser et al., 2011). As a result, products or services might be priced higher and this can negatively impact consumers' purchasing decisions (Bhardwaj et al., 2023; Stanton et al., 2017).

Moreover, the majority of neuromarketing techniques need controlled environments (Yao & Wang, 2024), particularly fMRI, and equipment can be large and immobile (Lim, 2018). These environments might not accurately reflect what customers encounter in the real world and consequently, the results might not be useful in actual marketing settings (Yao & Wang, 2024).

Also, compared to traditional methods, neuromarketing research is often limited to smaller sample sizes (Plassmann et al., 2015). This can impact the reliability of the findings and lower the generalizability of the results (Yao & Wang, 2024). Moreover, finding participants for a study can prove difficult (Eser et al., 2011), as consumers can feel discomfort being subjected to techniques such as fMRI, EEG, or GSR (Stanton et al., 2017) and some brain imaging tools have an unfavourable image (Eser et al., 2011).

2.5.2 ETHICAL CONSIDERATIONS

Potential unethical characteristics of research procedures, technologies, and consumer manipulation mostly affect the adoption of neuromarketing among researchers and marketers, despite its potential (Bhardwaj et al., 2023; Stanton et al., 2017). Several possible ethical issues should be taken into account.

One of the issues relates to the protection of participants (Lim, 2018). Even with informed consent, there is worry that participants may not fully understand how their neurological data

is used, potentially enabling unregulated exploitation or manipulation of this data by companies (Stanton et al., 2017; Ulman et al., 2015). Neuromarketing tools may be invading the privacy of consumers (Eser et al., 2011) and could undermine their autonomy (Lim, 2018). These issues can be addressed by developing guidelines for the ethical management of neuromarketing research. Participants should be adequately protected, the study's objectives, methods, and risks should be fully disclosed, informed consent procedures should be followed, and participant rights, confidentiality, and privacy should be guaranteed (Lim, 2018).

Moreover, there is concern that neuromarketing may make customer decisions predictable. By gathering subconscious information from the brain, that consumers are unaware of, it might predict choices before they are made (Ariely & Berns, 2010; Stanton et al., 2017). Some worry that it goes even further and neuromarketing may be used to influence decisions (Stanton et al., 2017). Consumers may lose control, and the promoted product becomes irresistible (Stanton et al., 2017), which is even more problematic when it makes them buy an otherwise unwanted product (Eser et al., 2011). Neuromarketing can increase the impact of ads that stimulate consumer desires beyond what is beneficial and raise the probability of buying things that are not needed (Stanton et al., 2017). Additionally, people's health may be impacted if firms that manufacture unhealthy products such as alcohol or fast food adopt neuromarketing to make advertisements more persuasive (Eser et al., 2011). However, the opposite is also true: by forecasting consumer preferences, neuromarketing can assist customers in acquiring the items that they need and desire (Stanton et al., 2017). In addition, it has not been demonstrated that neuromarketing hinders the ability to control behaviour, so consumers are still able to make their own decisions (Stanton et al., 2017).

Additionally, the competence of the marketing researcher who conducts the neuromarketing study raises ethical concerns (Lim, 2018; Ulman et al., 2015). Even when marketers hire neuromarketing companies, it is unlikely that they have the necessary expertise to assess the techniques used to gather and examine the data (Stanton et al., 2017). Neuromarketing firms also do not undergo peer review before reporting results to customers and are not monitored by a review board to verify ethical research procedures are being followed (Stanton et al., 2017). This is problematic, because suboptimal research techniques or analysis methods and smaller samples may be used by these neuromarketing firms to stay cost-effective (Stanton et al., 2017; Ulman et al., 2015). Additionally, neuromarketing companies typically do not disclose or share their data collection methods (Stanton et al., 2017). To minimize these issues, marketers could increase their understanding of neuromarketing through recognised courses and programs (Lim, 2018). Third-party quality certifications that guarantee the protection and ethical treatment of participants may also be valuable (Stanton et al., 2017).

2.6 NEUROMARKETING PRINCIPLES

While neuromarketing research has gained popularity in the past decade, it is still relatively unknown what findings work best and when to apply them (Byrne et al., 2022). To understand how neuromarketing can be applied in future advertising campaigns, a review of existing studies and experiments was done. It reveals neuromarketing strategies and principles that have proven to be successful in influencing consumers' feelings and (purchasing) behaviour. These insights may provide evidence that can inform the design of effective advertising campaigns. Table 1 summarizes the identified neuromarketing principles and best-practices.

Table 1.
Neuromarketing principles from literature

Source	Neuro-marketing method	Main findings
Baldo et al. (2022)	GSR	Arousal increases with suspense, motion, and outcome uncertainty.
Casado-Aranda et al. (2022)	fMRI	Hedonic advertisements (ads focused on pleasure and joy) are more successful in creating affect and feelings of relevance, which might result in actual purchasing behaviour.
Casado-Aranda et al. (2023)	ET	Images are more visually appealing than text and logos, and the same is true for larger versus smaller images as well as for unique, creative messages compared to common ones.
Chan et al. (2024)	fMRI	To draw in viewers, an advertisement should have both an emotionally compelling introduction and a continuing storyline.
Chua et al. (2011)	fMRI	Positive attitudes and the likelihood a promoted product will be bought can be increased by designing advertisements with a message or product that is personally meaningful or connected to a consumer's identity, experiences, or goals.
De Paula et al. (2022)	EEG, GSR, and ET	Advertisements that include human faces tend to have a higher visit duration, as they are the focus of visual attention. By placing the brand name or product close to these faces, marketers can draw more attention to them.
Fehse et al. (2017)	fMRI	Emotional storytelling and highlighting familiar, cultural, and rewarding elements could increase the appeal of popular brands. Organic brands can benefit from emphasizing clear messages about long-term value, rational arguments and ethical narratives.
Ferrer-Lopez (2020) as cited in De Jesus et al. (2022)	EDA	Including famous people and/or influencers in advertisements increases engagement and emotional responses.
Garczarek-Bąk et al. (2021)	EEG, EDA, and ET	Marketers should consider integrating Electrodermal Activity into advertising research to predict consumer responses effectively. Advertisements that use strong stories or images to get people emotionally involved can help people remember them and want to buy them.
Hsu and Chen (2020)	EEG	After being exposed to subliminal messaging in advertisements, consumers are more likely to make purchases.
Jai et al. (2020)	fMRI	Videos with zooming and rotation make evaluation easier and increase viewer interest. Advertisements that let people use their senses minimise cognitive barriers, which could lead to fewer returns and more satisfaction.
McClure et al. (2004)	fMRI	When advertisements include images and other forms of emotional association, the brain lights up, which influences preferences.

Moya et al. (2020)	EEG, GSR, and ET	Attracting attention is crucial. The image and label of a product attract the most attention and the attractiveness of packaging highly influences product choice.
Plassman and Weber (2015)	fMRI	Price tags, brand labelling, and health claims are marketing tools that can change how useful a product seems to customers. Marketing strategies that create positive expectations (e.g. premium pricing to show quality, expertise or authenticity, health claims) can make people perceive the product as better, make them enjoy it more, and change their brains responses.
Pozharliev et al., 2015	EEG	Advertisements for luxury products that show the product being used or shown in social settings, particularly in public, among peers, or within high-status groups, are more neurologically engaging because these contexts increase attention and emotional impact.
Reimann et al. (2010)	fMRI	Consumers are likely to prefer products with attractive packaging over well-known brands with uniform packaging, even if these are more expensive.
Russo et al. (2022)	EEG	Advertisements that go from negative to positive emotions are more effective than advertisements focused on positive emotions only. Ads should highlight how products can solve specific issues rather than only showing product benefits.
Simonov et al. (2024)	ET	Ads are slightly more effective on mobile devices than desktops. Mobile readers are less likely to avoid ads, and mobile ad placements tend to attract more attention.
Teixeira et al. (2011)	ET	Advertisements that contain joy and surprise elements receive more attention and tend to be skipped less.
Venkatraman et al., 2015	ET, EEG, fMRI	Ads that are emotionally engaging and contain reward-driven content are more likely to change behaviour and lead to actual buying intentions.
Xu et al. (2023)	EEG and GSR	Consumers are neurologically more drawn to brands with engaging or sincere personalities, and thus advertisements are likely to be more successful. Advertisements that highlight trust, enjoyment, or energy and emphasize excitement create approach behaviour, which is essential for brand loyalty and purchase intention.
Yoon et al. (2006)	fMRI	Brands can have more success when advertisers humanize them, by giving the brand a personality, human traits, or relatable stories.

By leveraging these principles, such as attention-grabbing visuals, attractive packaging, the use of influencers, subliminal messaging, goal alignment, and emotionally resonant content, marketers may be able to design campaigns that more effectively engage consumers and drive purchase decisions. Examining whether these principles result in successful advertising in the real world is crucial (De Jesus et al., 2022; Venkatraman et al., 2015). However, there is little research that examines the practical application of neuromarketing findings and how marketers can implement these inside advertisements and marketing efforts (Dwivedi et al., 2025; Singh et al., 2023). This study aims to fill this gap and answer the call to ''explore the role and impact of neuromarketing as a marketing strategy'' (Bhardwaj et al., 2023, p. 10). The principles outlined here will serve as the foundation for the design of the neuromarketing-based campaign in the experimental study discussed in the following sections.

3. MODEL AND HYPOTHESES DEVELOPMENT

Building on the insights from the literature review, this section presents the conceptual model guiding the study and outlines the hypotheses.

Previous studies reveal that traditionally, market research studies that analyse information gathered from sources such as surveys and focus groups have served as the basis for the majority of marketing decisions (Bhardwaj et al., 2023; Venkatraman et al., 2014; Yao & Wang, 2024). As these tools mainly identify self-reported behaviour, there is a risk that they do not provide a complete understanding of the underlying, subconscious processes of consumer behaviour, which might result in a lack of knowledge of how consumers make decisions (Casado-Aranda et al., 2022). However, traditional marketing methods do mostly use this form of data, which records a consumer's conscious behaviour, and thus these marketing methods are questioned by experts (Bhardwaj et al., 2023, Weber et al., 2015). Moreover, a number of studies have pointed out that traditional methods introduce biases among marketers, which frequently lead to unsuccessful products and advertising campaigns (Bhardwaj et al., 2023; Casado-Aranda et al., 2023; Vecchiato & Tempesta, 2015; Yao & Wang, 2024).

As a result, there is a demand to understand both conscious and subconscious consumer behaviour, which has led to the use of neuroscience equipment in marketing (Bhardwaj et al., 2023; Chan et al., 2024). With its technology and methodology, neuromarketing might understand and forecast behaviour before sales (Bhardwaj et al., 2023; Plassmann et al., 2012). Therefore, it is essential to gain a better understanding of whether neuromarketing-based campaigns can outperform traditional marketing campaigns.

With this in mind, the study compares the impact of a neuromarketing-based advertisement with a traditional marketing advertisement for a healthy food product. The conceptual model (Figure 1) shows that the type of marketing campaign (neuromarketing vs. traditional) serves as the independent variable, while purchase intention, product attitude, and perceived product value represent the dependent variables. Emotional engagement and goal alignment are included as mediators. Additionally, demographic segments based on health knowledge, health consciousness, lifestyle, age, and gender are added to see if they moderate the effectiveness of neuromarketing-based campaigns.

The following sections highlight the hypotheses that are proposed to test these relationships.

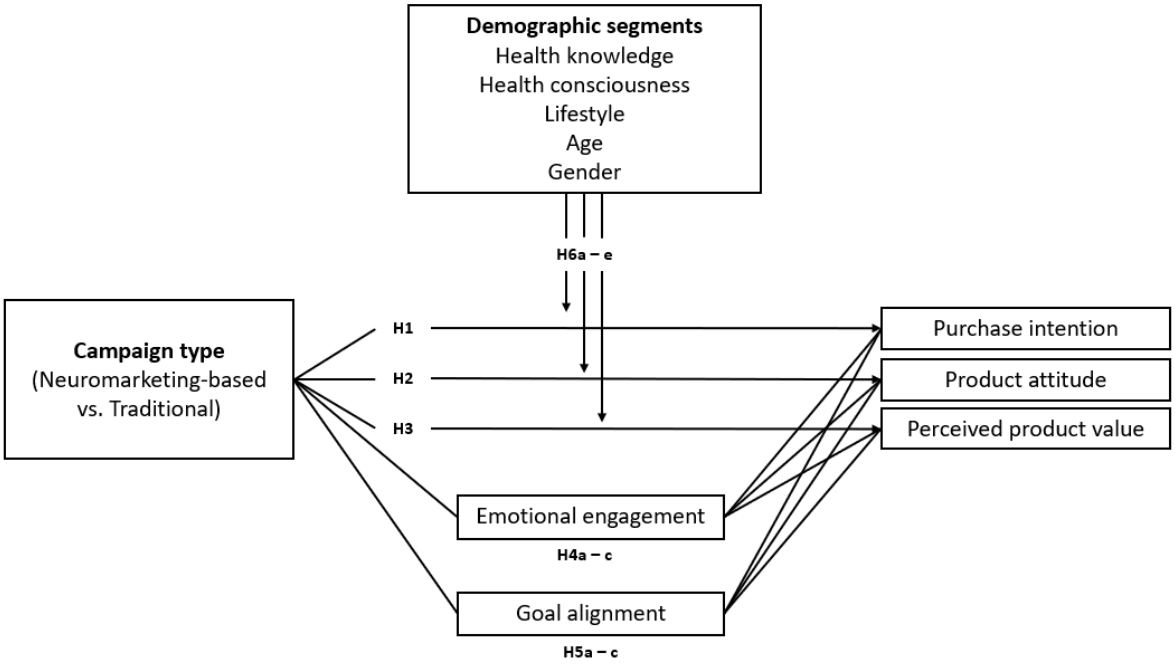

Figure 1. *Conceptual model*

3.1 DIRECT EFFECTS

Purchase intention, product attitude, and perceived product value are among the essential metrics for evaluating the success of marketing strategies (Sampaio et al., 2010; Venkatraman et al., 2015). For that reason, the focus will be on examining the direct effects of the advertising campaign type, neuromarketing-based versus traditional, on these key consumer outcomes. Purchase intention can be defined as an individual's plan to buy a product or brand (Lee et al., 2019). It shows how likely someone is to buy something in the near future and to choose the same products or brands again (Calvo-Porral & Lévy-Mangin, 2017). As a key indicator of future buying behaviour, it helps researchers understand and predict consumer decisions (Lee et al., 2019). Product attitude reflects ''individuals' evaluations and perceptions of a specific product" (Ajzen & Fishbein, 1980, as cited in Feng et al., 2023, p. 11), while perceived product value can be defined as the ''consumer's overall assessment of the utility of a product (or service) based on perceptions of what is received and what is given" (Zeithaml, 1988, as cited in Sweeney & Soutar, 2001, p. 204).

As discussed in the literature review, neuromarketing combines neuroscience and psychology to understand consumer decision-making at a subconscious level (Plassmann et al., 2012). An important neuromarketing finding is that a consumer's decision-making process is not only rational, but also strongly influenced by automatic, emotional and subconscious factors (Bhardwaj et al., 2023). Neuromarketing campaigns leverage this by including emotionally engaging content, subliminal messaging, and storytelling for example, which triggers deep, positive feelings by activating brain areas associated with joy and pleasure (Hsu & Chen, 2020; Teixeria et al., 2011). Marketers can create effective campaigns with an intuitive appeal that makes them more persuasive. Consumers develop favourable perceptions towards the

product, improving attitudes toward it, and view it as meaningful, unique, and worth the cost (Chan et al., 2024). This is particularly relevant in the context of food products where consumers tend to make emotional decisions (Pancer et al., 2021). Traditional marketing campaigns, in contrast, tend to show rational, factual information, functional attributes and direct product benefits (e.g., price, features, functionality). Though these campaigns are informative, they do not connect with the customer on a deeper level, making them less effective (Lindstrom, 2010) and less likely to generate engagement (Kite et al., 2016).

Therefore, three expectations can be formulated.

Firstly, neuromarketing-based campaigns stimulate purchase intention more than traditional campaigns. Studies using neuromarketing equipment such as fMRI and EEG have shown that successful marketing campaigns activate brain areas associated with the processing of emotions (the amygdala) and decision-making (e.g., the ventromedial prefrontal cortex) (Venkatraman et al., 2015). Brain activity in these areas has been linked to higher intention to purchase and was also able to predict purchase intention in several studies (Casado-Aranda et al., 2022; Levallois et al., 2019; Yao & Wang, 2024). Neuromarketing-based campaigns are thus likely to increase purchase intention, as they are emotional, stimulate these important brain areas and create a motivation to act (Clithero et al., 2024; McClure et al., 2004). Traditional campaigns on the other hand, as discussed before, are mostly informative and do not connect with the consumer on a deeper, neurological level. Thus, the following is hypothesized:
H1: Advertising campaigns based on neuromarketing principles will create a higher purchase intention than traditional marketing campaigns in the health and wellness food market.

Second, neuromarketing campaigns might create more positive product attitudes. Because of the emotional appeal and attention-grabbing content, they are more likely to create a favourable impression of the product than traditional, fact-only advertisements (Dwivedi et al., 2025; Garczarek-Bąk et al., 2021), which leads to the second hypothesis:
H2: Advertising campaigns based on neuromarketing principles will create a more positive product attitude than traditional marketing campaigns in the health and wellness food market.

Third, neuromarketing campaigns are expected to create higher perceived product value than traditional campaigns. While traditional campaigns often highlight functional aspects of a product, neuromarketing can go a step further. Neuromarketing campaigns can be designed to get better responses by implementing personal meaning, emotional connection, storytelling and sensory stimulation, factors that increase perceived value (Lindstrom, 2010). Thus, the following is hypothesized:
H3: Advertising campaigns based on neuromarketing principles will create a higher perceived product value than traditional marketing campaigns in the health and wellness food market.

3.2 MEDIATING EFFECTS

Underlying the mediators in the proposed model are the Feeling Economy by Rust & Huang (2021) and the Goal Theory based on Chartrand et al. (2008). This section will start by discussing the role of emotional engagement and conclude with goal alignment.

3.2.1 EMOTIONAL ENGAGEMENT

The Feeling Economy framework by Rust & Huang (2021) suggests that consumers increasingly value emotionally fulfilling experiences, so businesses should prioritize creating emotional engagement with their offerings. Compared to factual content, emotional messages create more brand favouritism (Heath, 2009). Thus, marketing campaigns that generate strong emotions can enhance engagement and drive consumer purchasing behaviour (Rust & Huang, 2021). Chan et al. (2024) also show that consumer reactions to advertising are significantly influenced by emotion, and emotions can affect individuals' attention to ads (De Paula et al., 2022). Through higher visual attention, these emotions influence the desire or intention to buy a product (De Paula et al., 2022) and the positive attitude towards a brand (Saada et al., 2022). Reinforcing the emotional component also strengthens a consumer-brand relationship, which in turn boosts purchase intention and perceived product value (Saada et al., 2022).

Moreover, affect, a general term for anything emotional (Barrett & Bliss-Moreau, 2009; Venkatraman et al., 2015), has been recognised as one of the main factors influencing online food media by Pancer et al. (2022). The affect-as-information model (Schwarz, 1989) outlines that a consumer's emotions can impact their judgments (Albarracín & Kumkale, 2003; Wang et al., 2020), which in turn can affect their attitudes and future behaviours (Pancer et al., 2022). Research by Saada et al. (2022) in the food and beverage market also shows that a positive attitude towards an emotional advertisement leads to positive emotions and actions towards the brand. Additional research further demonstrated that the relation between advertisements and attitudes is mediated by emotional reactions (Holbrook and Batra 1987; Holbrook and O'Shaughnessy 1984, as cited in Chan et al., 2024). According to neuromarketing research in the fashion sector by Krishna (2011), highly emotional ads cause consumers' brains to react more strongly, which increases brand recall and purchase intention, showing the importance of emotional engagement (Dwivedi et al., 2025).

These findings highlight the significance of emotional engagement in influencing consumer behaviour. This is particularly relevant in decision-making processes related to health and well-being (Pancer et al., 2022). Health-related decisions, such as eating healthier, often involve uncertainty, long-term implications, and personal values, making these decisions very emotional (Agrawal et al., 2007). Emotional triggers can be used to guide healthier choices (Krishen & Bui, 2015) and healthy food campaigns are more effective when they emotionally resonate with individuals (Brückner et al., 2024).

Since neuromarketing techniques can be effective in producing and measuring emotions (Vences et al., 2020) and neuromarketing-based advertising campaigns are likely to be highly

emotional (Garczarek-Bąk et al., 2021; McClure et al., 2004; Venkatraman et al. 2015), neuromarketing-based healthy food advertisements may create strong feelings of affect, which in turn drives consumer purchasing behaviour (Heath, 2009). Thus, the following is hypothesized:

H4a: Emotional engagement mediates the relationship between neuromarketing-based campaigns (vs traditional campaigns) and purchase intention in the health and wellness food market.

H4b: Emotional engagement mediates the relationship between neuromarketing-based campaigns (vs traditional campaigns) and product attitude in the health and wellness food market.

H4c: Emotional engagement mediates the relationship between neuromarketing-based campaigns (vs traditional campaigns) and perceived product value in the health and wellness food market.

3.2.2 GOAL ALIGNMENT

The Goal Theory by Chartrand et al. (2008) highlights how important individual objectives are, such as personal health goals, in influencing the attitudes and actions of consumers. Many of these goals are activated and pursued subconsciously and can be primed by environmental cues (Chartrand et al., 2008). For example, viewing an advertisement for a healthy food product may unconsciously motivate to eat healthier.

Marketing stimuli are perceived more favourably and more convincing when they are connected to consumer's goals, because consumers are more likely to see value in a product that fits their needs (Van de Sanden et al., 2020; Wu & Dodoo, 2017). Consumers pay more attention to advertisements that are useful to achieve an objective than to ones that are unrelated to their goals (Lee et al., 2010; Van de Sanden et al., 2020). Goal-aligned advertisements are also processed more deeply because they resonate with existing motivations. This leads to better recall and a more favourable attitude towards the product, making purchase more likely (Rayner et al., 2007; Wu & Dodoo, 2017). Customers also interact more with ads that relate to their own goals and objectives (Pieters & Wedel, 2007). Moreover, when an ad aligns with a consumer's personal goals, it increases perceived relevance. This heightened relevance can make a product more appealing and could in turn increase purchase intention (Chua et al., 2011; Van de Sanden et al., 2020).

This is especially relevant in the health and wellness food market, where consumers value trust and alignment with personal goals (Firoozzare et al., 2024). Consumers can be sceptical of health claims, so advertisements that align with their values and provide credible information could influence purchasing decisions positively (Chaudhary et al., 2024). Many consumers seek foods that align with their personal health objectives (e.g. weight loss, gut health) (Batat & Addis, 2021; Pancer et al., 2022). Buying these healthy foods often involves

careful evaluation and consumers want reassurance that a product aligns with their health needs (Shah et al., 2025). If an advertisement emphasizes how a product supports these goals, it can increase a positive attitude and purchase intention (Niu & Ma, 2024). Moreover, for many, healthy eating is not just a habit but part of their identity (McCarthy et al., 2017). Ads that align with health goals can thus help create a stronger connection, which might increase a positive attitude towards a product and higher perceived product value (Ahn et al., 2021).

With neuromarketing, campaigns can be designed to align with subconscious, health-related goals and neuromarketing principles can help brands adapt their messages to better align with individual objectives and values (Srivastava & Bag, 2023). Similarly, traditional advertisements can include goal-related, factual, and informative health information. For example, advertisers can highlight how their product provides health benefits (e.g., increased energy, improved mental focus), or prevents negative outcomes (e.g., specific diseases, fatigue) (Ahn et al., 2021). Moreover, neuromarketing tools allow marketers to measure the emotional and cognitive responses of consumers, enabling them to make campaigns that resonate with consumers and their goals more deeply (Bhardwaj et al., 2023). Thus, we hypothesize:

H5a: Goal alignment mediates the relationship between campaign type (neuromarketing vs traditional) and purchase intention in the health and wellness food market.

H5b: Goal alignment mediates the relationship between campaign type (neuromarketing vs traditional) and product attitude in the health and wellness food market.

H5c: Goal alignment mediates the relationship between campaign type (neuromarketing vs traditional) and perceived product value in the health and wellness food market.

3.3 MODERATING EFFECTS

The effectiveness of neuromarketing-based campaigns in influencing consumer feelings and behaviour within the health and wellness food market is expected to vary across several demographic segments. This study examines the impact of health knowledge, health consciousness, lifestyle, age, and gender.

3.3.1 HEALTH KNOWLEDGE

Health knowledge has a significant impact on how people behave, including how they eat (Singh & Verma, 2017). Health knowledge can be defined as an individual's understanding and awareness of health-related information and influences how people choose the food they consume (Mamun et al., 2020; Menozzi et al., 2015). Lower levels of knowledge often lead to unhealthier eating patterns (Mamun et al., 2020; Menozzi et al., 2015), while greater knowledge can increase the consumption of healthy foods (Mamun et al., 2020; Singh & Verma, 2017).

Therefore, the following is hypothesized:
H6a: The effect of campaign type on the dependent variables is moderated by health knowledge, with consumers with higher health knowledge responding more favourably to the advertised healthy food product.

3.3.2 HEALTH CONSCIOUSNESS

A person's level of care for their health and preparedness to take health-related measures is expressed through their health consciousness (Lee et al., 2013; Simão et al., 2022). Health-conscious consumers value their well-being and tend to change their behaviour to improve or maintain their health (Jin et al., 2017; Lee et al., 2013; Simão et al., 2022). One example of this behaviour is buying healthier food items, even at higher prices (Menozzi et al., 2015). Personal health consciousness enhances the desire to consume healthy foods (Hoque et al., 2018) and contributes to the development of a healthy diet (Mamun et al., 2020). A study by Bower et al. (2003) also showed that people who are more concerned with their health are more likely to purchase and pay more for meals that are good for them. Hence, we propose the following:
H6b: The effect of campaign type on the dependent variables is moderated by health consciousness, with consumers with higher health consciousness responding more favourably to the advertised healthy food product.

3.3.3 LIFESTYLE

Lifestyle is reflected by a person's perception of the value of health in their everyday activities (Mamun et al., 2020). It shows their readiness to have a healthy diet, physical activity, good habits, and an overall healthy way of life (Nguyen et al., 2017; Suki, 2013). Here, healthy foods are essential to provide the proteins and minerals required to improve health and lower the chance of illness (Singh & Verma, 2017). A healthy lifestyle might increase the choice and consumption of healthy foods. A study by Akkaya (2021) showed that lifestyle has a significant impact on purchasing behaviour, as there is a strong relationship between a consumer's lifestyle and their product preferences. Thus, the following is hypothesized:
H6c: The effect of campaign type on the dependent variables is moderated by lifestyle, with consumers with an active, healthy lifestyle responding more favourably to the advertised healthy food product.

3.3.4 AGE

Eating patterns change during life (Helldán et al., 2011). After retirement, lifestyle considerations related to health become more significant since one's ability to function and maintain good health is not guaranteed (Helldán et al., 2011). Healthier dietary choices later in life may lower the effects of several diseases that become more common as people age, including high blood pressure, diabetes, heart disease, and some types of cancer (Miller &

Cassady, 2012). An experiment by Adebayo et al. (2017) also showed that older participants appeared to have healthier food consumption patterns. Thus, the following is hypothesized:
H6d: The effect of campaign type on the dependent variables is moderated by age, with older consumers responding more favourably to the advertised healthy food product.

3.3.5 GENDER

Gender has a significant role in determining eating habits. Women often eat healthier than men (Helldán et al., 2011). A study by Lee and Allen (2020) also showed that young women, compared to young men, had healthier eating habits. Females were less likely than males to consume fast food, and they were more likely to regularly eat fruit. In general, young males had unhealthier eating patterns (Lee & Allen, 2020). Several other studies have also reported that males consume more soft drinks than women, eat less fruits and vegetables, and select fewer items high in fiber and low in fat (Ansari et al., 2012; Helldán et al., 2011; Wardle et al., 2004). Women's higher frequency of dieting and more concern for weight may also be factors contributing to gender variations in healthy food choice (Wardle et al., 2004).
Thus, we propose the following:
H6e: The effect of campaign type on the dependent variables is moderated by gender, with women responding more favourably to the advertised healthy food product.

4. EMPIRICAL STUDY

The present study aims to compare the effects of a neuromarketing-based advertisement with a traditional advertisement for the health and wellness food market. A comparative, between-subjects experimental design is used to examine the impact on consumers' purchase intention, product attitude, and perceived product value. Additionally, emotional engagement and goal alignment are included as mediators, while demographic segments based on health knowledge, health consciousness, lifestyle, age, and gender are examined as moderators.

This section discusses study design and method, procedure, measurement items, respondent selection, and data collection.

4.1 STUDY DESIGN AND METHOD

Similar to De Paula et al. (2022), Pancer et al. (2022), and Pozharliev et al. (2015), this study used a between-subjects design to test the hypotheses discussed in Section 3. Participants were randomly assigned to one of two conditions (neuromarketing-based advertisement vs. traditional advertisement), allowing for a comparison of the effects of the two types of advertising (Charness et al., 2011) on purchase intention, product attitude, and perceived product value.

Two campaigns were developed for yoghurt, as it is a food product that consumers typically view as healthy (Labban et al., 2021). The graphic designs were created with Canva and Adobe Photoshop. To avoid bias, a neutral brand was chosen for both advertisements, ''Yoghurt'', and price was not included (Casado-Aranda et al., 2022).

As discussed before, traditional advertising campaigns are generally factual and rational, while neuromarketing campaigns focus on more emotional, engaging content (Kite et al., 2016; Venkatraman et al., 2015). The traditional version of the advertisement features a clear, static image of a cup of yoghurt (Figure 2). It is information-heavy, includes rational messaging and highlights key factual, nutritional benefits (e.g. 12g protein, rich in probiotics, 0,5% fat). The aim was to make the product look clean and attractive, and focus on logical, factual persuasion.

When designing the neuromarketing-based campaign, the neuromarketing principles described in Section 2.6 of the present work were followed. Participants assigned to this condition saw a colourful, emotionally engaging and stimulating advertisement for an attractively packaged cup of yoghurt (Figure 3). It features a smiling influencer in activewear, showing joy and pleasure, with the aim to grab attention and create emotional arousal. It also includes statements related to feelings (e.g. 'Feel good inside and out') that can be perceived as meaningful, rewarding, or connected to personal goals.

Figure 2. *Traditional advertisement*

Figure 3. *Neuromarketing-based advertisement*

4.2 Procedure

After exposure to one of the campaigns, participants answered a questionnaire. The questionnaire was administered online and conducted with the Qualtrics™ platform. Before publishing, the study was registered on AsPredicted (#201997, Appendix A) and validated by the NOVA IMS institutional ethics committee (Appendix B). The questionnaire was active from January 12, 2025, until April 15, 2025.

The questionnaire composed of three main sections. After giving informed consent, participants were randomly assigned to view one of the two campaigns described above. The second section focused on measuring all constructs. The third and final section assessed the participants' demographic characteristics.

4.2.1 Measures

The questionnaire starts with an introductory paragraph that explains the purpose of the study and a statement of consent. Then, participants were randomly assigned to one of the conditions, in which they either view the neuromarketing-based campaign or the traditional campaign, and are asked to take a moment to resonate with the advertisement.

To construct the remainder of the questionnaire, existing scales were used for all variables. Respondents assessed purchase intention (three items, Simão et al., 2022), product attitude (ten items, Batra & Stayman, 1990), and perceived product value (ten items, Sweeney & Soutar, 2001). To examine the mediating effects, respondents first evaluated how the advertisement made them feel with items such as '*good*', '*positive*', and '*interested*' to indicate emotional engagement (eight items, Zhang et al., 2014). Following, participants indicated how strongly the advertised yoghurt product matches their health goals, with items such as '*The product supports my health goals*', to evaluate goal alignment (six items, Gerow et al., 2014). Moreover, considering that demographic segments might moderate the

relationship, three scales were included to assess respondents' health knowledge (six items, Mamum et al., 2020), health consciousness (three items, Mai & Hoffmann, 2015), and lifestyle (six items, Mamun et al., 2020). Participants for example indicated how familiar they are with healthy foods and the impact of unhealthy foods, and their attentiveness to and focus on their health. All constructs were measured on a 9-point Likert scale. Details of the measurement items and their origins are provided in Table 2.

Table 2.
Scales and measurement items

Construct	Items	Measurement items	Factor loadings	References
Purchase Intention	PI1	I would consider purchasing the advertised product	.77	Adapted from Simão et al. (2022)
	PI2	I intend to try the advertised product	.84	
	PI3	I am likely to buy the advertised product	.77	
Product Attitude	PA1	unpleasant - pleasant	.68	Adapted from Batra & Stayman (1990)
	PA2	bad - good	.84	
	PA3	negative - positive	.923	
	PA4	unfavorable - favorable	.91	
	PA5	dislike – like	.91	
	PA6	useless - useful	.82	
	PA7	low quality - high quality	.85	
	PA8	not beneficial - beneficial	.799	
	PA9	worthless - valuable	.895	
	PA10	disagreeable – agreeable	.89	
Perceived Product Value	PPV1	The product would arouse positive feelings in me	.65	Adapted from Sweeney & Soutar (2001)
	PPV2	I would like the product	.69	
	PPV3	The product would be approved of by others	.56	
	PPV4	The product would make me perform well	.44	
	PPV5	If I bought or used the product, it would create a favorable perception of me among other people	.53	
	PPV6	The product has a positive social image	.57	
	PPV7	I would be willing to buy the product at the store	.63	
	PPV8	The product is a good choice	.43	
	PPV9	I would recommend the product to friends or relatives	.41	
	PPV10	I would not expect any problems with the product*	.26	
Emotional Engagement	EE1	good	0.696	Adapted from Zhang et al. (2014)
	EE2	happy	0.82	
	EE3	relaxed	0.61	
	EE4	positive	0.87	
	EE5	cheerful	0.89	
	EE6	content	0.64	
	EE7	touched	0.52	
	EE8	interested	0.40	

Goal Alignment	GA1	The product supports my health goals	0.79	Adapted from Gerow et al. (2014)
	GA2	I can adapt the product to my health goals	0.799	
	GA3	My health goals and the product match each other	0.89	
	GA4	I identify a fit between my health goals and the product	0.87	
	GA5	My health goals and the product correspond to each other	0.895	
	GA6	My health goals align with the product	0.91	
Health Knowledge	HK1	I am familiar with healthy foods	0.66	Adapted from Mamun et al. (2020)
	HK2	I am knowledgeable about the impact of unhealthy food	0.85	
	HK3	I am interested in finding out more about healthy foods	0.41	
	HK4	I am informed that the healthy foods contain fewer harmful chemicals than unhealthy foods	0.55	
	HK5	I am informed that the consumption of unhealthy food is harmful for health	0.86	
	HK6	Reading of production and expiration date on food package is important	0.47	
Health Consciousness	HC1	I reflect a lot about my health	0.81	Adapted from Mai & Hoffmann (2015)
	HC2	I am very self-conscious about my health	0.66	
	HC3	I'm generally attentive to my feelings about my health	0.81	
Lifestyle	LS1	I choose food carefully to ensure good health	0.88	Adapted from Mamun et al. (2020)
	LS2	I consider myself as a health-conscious consumer	0.81	
	LS3	I often think about health-related issues	0.78	
	LS4	I am prepared to do anything that is good to health	0.65	
	LS5	I often focus on my health	0.85	
	LS6	I think that I take health into account a lot in my life	0.86	

** excluded from analysis after further examination*

The questionnaire included an attention check (''*Please select '3' for this item to show that you are paying attention*") to identify respondents who were not reading the questions carefully. Participants who fail this attention check are excluded. Moreover, a manipulation check was included to evaluate whether respondents correctly identified the type of advertisement they were exposed to. Participants were asked to indicate which advertisement they saw by choosing if they viewed a colourful ad of a smiling individual in activewear eating a yoghurt product, or a neutral ad of a yoghurt product surrounded by nutritional information.

The final section collected respondents' demographics; age, gender, and nationality.

4.2.2 RESPONDENT SELECTION AND DATA COLLECTION

The target population for this study included any adult with potential interest in the health and wellness food market, as they represent the primary audience for health-oriented marketing campaigns. The study specifically aimed to reach individuals over 18 years old because they are legally allowed to make independent purchasing decisions and are likely to engage in lifestyle and health-related choices. The population was not restricted to a specific geographic region.

The questionnaire was pretested to verify its understandability with 20 participants with similar backgrounds as the target study population. Following their feedback and insights, some modifications were made before the survey was published online. For example, phrasing and wording of several items was adapted to ensure clarity and understandability (e.g. *dwell on* to *focus on*), and a scale with two items was removed because of redundancy.

The final sample size was determined using the G*Power tool (version 3.1.9.4) (Faul et al., 2007). A power analysis was conducted to determine the minimum required sample size. For an independent-samples t-test with a medium effect size (d = 0.5), alpha at 0.05, and power ($1 - \beta$) set at 0.80, as it is the widely accepted standard in behavioural science (Collins & Watt, 2021), the required sample size was calculated to be 100 participants (50 per condition). Another power analysis using G*Power was conducted for an F-test (ANOVA), with a medium effect size (f = 0.25), α = 0.05, and power ($1 - \beta$) = 0.80. The required sample size was estimated to be 128. Therefore, the minimum number of participants required was set to 128 participants.

Respondents were approached using a simple random sampling method, which is often used in surveys. This method was chosen because participants have an equal chance to take part in the study, which is likely to give generalizable findings (Rahi, 2017). The questionnaire was distributed via social networking platforms (e.g., Facebook, Instagram), Survey Circle, SurveySwap, and university mail, with an eligibility criteria included being over 18 years old. Respondents completed the questionnaire voluntarily and any incomplete responses are not included in the study.

After, the data collected with the questionnaire are analyzed using the statistical program SPSS. After data cleaning and preparation, scales are validated, and the characteristics of the sample are examined. Moreover, several analyses are done to examine the effectiveness of the neuromarketing campaign versus the traditional campaign, such as independent samples t-tests, multivariate analysis of variance, and regression analysis. Also, the mediating roles of emotional engagement and goal alignment are examined using PROCESS Model 4 (Hayes, 2018), as well as the moderating effects of health knowledge, health consciousness, lifestyle, age, and gender, using PROCESS Model 1 (Hayes, 2018).

5. RESULTS AND DISCUSSION

This section presents the results of the study, starting with data cleaning and preparation, followed by discussing several statistical analyses done to examine the effects of the neuromarketing campaign versus the traditional campaign, and to explore the mediating roles of emotional engagement and goal alignment, as well as potential moderating effects of demographic segments.

5.1 PRE-ANALYSIS

Before analysing the data obtained, it was cleaned, prepared, and explored, which will be discussed in the following sections.

5.1.1 DATA CLEANING

Of the 264 responses collected, 99 were excluded due to incompletion (n = 78) or failing the attention check (n = 21). As part of the data quality checks, survey completion times were reviewed to identify responses completed in an unrealistically short time. Based on the number of items, the threshold was set to 90 seconds. One participant completed the survey in under 90 seconds; however, this response also failed the attention check and was therefore excluded on that basis.

During further data screening, two additional responses were excluded due to age entries of 2 and 10 years old. As the study requires respondents to be 18 years or older to participate in the questionnaire, these responses (n = 2) were removed from the dataset before analysis.

Moreover, a manipulation check was included in the questionnaire to ensure that participants accurately recalled the type of advertisement they viewed. As discussed before, this was assessed through a multiple-choice question asking participants to indicate whether they had seen the neuromarketing or the traditional advertisement. All responses were verified against their assigned condition. Participants who selected a campaign different from the one they were actually assigned to were considered to have failed the manipulation check. These respondents (n = 6) were excluded from further analysis to ensure internal validity.
Lastly, no missing values were detected.

This resulted in a final dataset of 157 valid responses.

5.1.2 SCALE VALIDATION

5.1.2.1 RELIABILITY TESTING

Scale reliability was tested with Cronbach's alpha. All constructs demonstrated good to excellent internal consistency (Cronbach's α = .84 – .97), as can be seen in Table 3.

Table 3.
Reliability tests with Cronbach's alpha

Construct	Cronbach's alpha
purchase intention	.93
product attitude	.97
perceived product value	.92
emotional engagement	.94
goal alignment	.98
health knowledge	.84
health consciousness	.88
lifestyle	.93

As some constructs show very high values, inter-item correlations were checked to ensure items are not redundant. Correlations between the product attitude and goal alignment items were high, suggesting potential redundancy between the items. This will be examined more in depth in Subsection 5.1.2.2. The other constructs showed no alarming correlations amongst the items.

5.1.2.2 EXPLORATORY FACTOR ANALYSIS

To further examine scale validity, Exploratory Factor Analysis (EFA) was performed in SPSS. The KMO value of .91, and the significant Bartlett's Test of Sphericity ($\chi^2(1326) = 9170.51$, $p < .001$) indicated that the data were suitable for factor analysis (Table D1, Appendix D).
A total of eight factors were extracted based on eigenvalues greater than 1 (Table D2, Appendix D), and supported by the scree plot (Figure D1, Appendix D), accounting for 77.4% of the total variance. EFA thus revealed a factor structure consistent with the eight identified theoretical constructs. Most items loaded above .60 on a single factor, supporting construct validity. Some items showed a relatively lower loading (0.40-0.60) but were kept to maintain content validity and ensure a complete representation of the construct (Table D3, Appendix D).

Although both product attitude and goal alignment scales had high Cronbach's alpha values (.97 and .98, respectively), EFA confirmed that each set of items loaded cleanly on a single factor. This supports the unidimensionality of the constructs and suggests that the high internal consistency shows cohesion rather than redundancy.

The 10-item perceived product value scale demonstrated excellent internal consistency (Cronbach's α = .922). Though, EFA indicated a multidimensional structure, with items loading

across three different factors. The one negatively worded item from the perceived product value scale loaded on a separate factor (.26), possibly because of misinterpretation by respondents. It was therefore excluded from further analysis. Removal of the item slightly improved reliability (α = .924) and supported a cleaner factor structure. Given the theoretical relevance and strong reliability, the other items were retained for analysis.

Items for the constructs health consciousness and lifestyle loaded onto the same factor in the Exploratory Factor Analysis, which indicates that these constructs might be measuring the same underlying concept. However, from Subsections 3.3.2 and 3.3.3 follows that the constructs are related but slightly different. As EFA captures strong shared variance, not nuance, it was decided to keep them as separate constructs.

5.1.3 NORMALITY TESTS

Normality testing was performed to ensure the data meets the assumptions for the parametric tests that are intended to follow.

Kolmogorov–Smirnov tests for normality were significant for all constructs (p < .001), with D values ranging from .111 to .168, suggesting moderate deviation from a normal distribution (Table E1, Appendix E). However, most skewness and kurtosis values were within acceptable limits (±2, Table E2, Appendix E), and Q–Q plots indicated approximate normality. Therefore, the data was considered suitable for parametric analyses.

5.2 SAMPLE CHARACTERISTICS

5.2.1 DEMOGRAPHICS

As discussed before, a total of 157 valid responses resulted after data cleaning. The sample comprised 28% male, 70.7% female and 1.3% non-binary participants. Ages ranged from 18 to 64 years (M_{age} = 30.12 years old, SD = 10.6), with the largest age group being 18 to 24 (43.95%). Participants represented 38 different countries, with the majority residing in Portugal (29.9%), followed by the Netherlands (12.7%) and the United Kingdom (11.5%).

Participants were randomly assigned to one of two conditions: 78 viewed the neuromarketing-based advertisement and 79 viewed the traditional marketing advertisement.

5.2.2 DESCRIPTIVES FOR KEY VARIABLES

Descriptive statistics were analyzed separately for each condition. Table 4 summarizes the mean values, standard deviation, minimum, maximum and range for the constructs.

Table 4.
Descriptive statistics

		Mean	SD	Min	Max	Range
Neuromarketing campaign	purchase intention	6.00	1.93	1	9	8
	product attitude	6.25	2.96	2	9	8
	perceived product value	6.02	1.43	1	9	8
	emotional engagement	6.00	1.45	2	9	7
	goal alignment	5.98	1.93	1	9	8
	health knowledge	7.75	.88	6	9	3
	health consciousness	7.14	1.45	2	9	7
	lifestyle	6.54	1.52	2	9	8
Traditional campaign	purchase intention	5.84	2.02	1	9	8
	product attitude	5.98	2.05	1	9	8
	perceived product value	5.77	1.53	1	9	8
	emotional engagement	5.29	1.64	1	9	8
	goal alignment	6.54	1.97	1	9	8
	health knowledge	7.66	1.24	3	9	6
	health consciousness	7.26	1.46	1	9	8
	lifestyle	6.77	1.48	1	9	8

In the neuromarketing condition, participants reported a slightly higher average purchase intention ($M_{\text{neuromarketing}}$ = 6.00, *SD* = 1.93) compared to those in the traditional marketing condition ($M_{\text{traditional}}$ = 5.84, *SD* = 2.02). A similar pattern can be seen for product attitude ($M_{\text{neuromarketing}}$ = 6.25, *SD* = 1.96; $M_{\text{traditional}}$ = 5.98, *SD* = 2.05) and perceived product value ($M_{\text{neuromarketing}}$ = 6.02, *SD* = 1.43; $M_{\text{traditional}}$ = 5.77, *SD* = 1.53). These initial findings suggest that participants who viewed the neuromarketing advertisement perceived the yoghurt product more positively and were more inclined to purchase it, which supports prior research on the effectiveness of emotional and subconscious cues (e.g. Venkatraman et al., 2015). However, although the mean values were slightly higher in the neuromarketing condition compared to the traditional marketing condition, the differences are small. The descriptive data do not show a substantial difference in consumer responses between the two marketing campaigns. Further statistical testing is necessary to determine whether the observed differences are statistically significant. Thus, at this stage, the descriptive results suggest a potential, but not strong advantage of neuromarketing advertising techniques in influencing consumer feelings and purchasing behaviour in the health and wellness food market.

Additionally, emotional engagement was higher on average in the neuromarketing group ($M_{\text{neuromarketing}}$ = 6.00, *SD* = 1.45) than in the traditional group ($M_{\text{traditional}}$ = 5.29, *SD* = 1.64), indicating that the neuromarketing advertisement possibly had a stronger emotional impact

on participants. This could mean that one possible way in which neuromarketing affects consumer purchasing behaviour is through emotions.

Goal alignment had an opposite result, as the mean value was higher in the traditional marketing condition ($M_{traditional}$ = 6.54, *SD* = 1.98; $M_{neuromarketing}$ = 5.98, *SD* = 1.93). This suggests that participants who viewed the traditional advertisement perceived the yoghurt product as slightly more aligned with their personal (health) goals than those who were exposed to the neuromarketing advertisement, which in turn could influence consumer purchasing behaviour. The traditional marketing advertisement may have more effectively demonstrated the product's functional advantages and alignment with consumers' goals, while the neuromarketing advertisement may have been more successful in generating emotional engagement. It is also possible that the emotional aspects of the neuromarketing campaign, although engaging, have made the health-related message of the advertisement less clear to some participants and therefore less aligned with their goals.

Finally, descriptive statistics for the potential moderator variables were also examined. Health knowledge was slightly higher among participants in the neuromarketing condition ($M_{neuromarketing}$ = 7.75, *SD* = 0.88) compared to the traditional condition ($M_{traditional}$ = 7.66, *SD* = 1.24), while both lifestyle and health consciousness mean values were somewhat higher in the traditional condition as can be seen in Table 4. Although these differences are small, they imply that the characteristics of the two participant groups are slightly different. This could have affected how participants react to the two advertisements. Section 5.5 examines whether these differences have a significant moderating effect on purchase intention, product attitude, and perceived product value.

5.3 CAMPAIGN EFFECTIVENESS

To examine the effectiveness of the neuromarketing advertisement compared to the traditional advertisement, independent samples t-tests were performed as well as a multivariate test and univariate tests, followed by simple linear and multiple regression analysis. These will be discussed next. Finally, the implications of the results are addressed briefly.

5.3.1 INDEPENDENT SAMPLES T-TEST

Independent samples t-tests were performed to examine whether the identified averages of purchase intention, product attitude, and perceived product value were significantly different between participants exposed to the neuromarketing advertisement vs. the traditional advertisement.

Results show that there was no statistically significant difference in purchase intention between participants that saw the neuromarketing campaign ($M_{neuromarketing}$ = 6.00, *SD* = 1.93) vs. the traditional campaign ($M_{traditional}$ = 5.84, *SD* = 2.02), $t(155) = 0.51$, $p = .611$,

d = 0.08. Similarly, product attitude did not differ significantly between the neuromarketing campaign ($M_{neuromarketing}$ = 6.25, SD = 1.96) and the traditional campaign ($M_{traditional}$ = 5.98, SD = 2.05), $t(155) = 0.84$, p = .402, d = 0.13. For perceived product value also no significant difference was found between the neuromarketing campaign ($M_{neuromarketing}$ = 6.02, SD = 1.43) and the traditional campaign ($M_{traditional}$ = 5.77, SD = 1.53), $t(155) = 1.08$, p = .283, d = 0.17. Appendix F provides an overview of the complete analysis.

Thus, although the neuromarketing campaign produced higher average values for purchase intention, product attitude, and perceived product value compared to the traditional campaign, the differences were not statistically significant ($p > .05$). Effect size estimates suggest small positive effects of the neuromarketing campaign across the three variables. These findings suggest a potential positive influence of neuromarketing techniques, but in the context of this study they were not strong enough to prove an effect.

5.3.2 Multivariate test

To examine the overall effect of campaign type (neuromarketing vs. traditional) on purchase intention, product attitude, and perceived product value, multivariate analysis of variance (MANOVA) was conducted. This was done because the study involves multiple dependent variables that are expected to be also collectively influenced by campaign type. However, the multivariate test indicated that the overall effect of campaign type was not statistically significant, Wilks' Λ = .989, $F(3, 153) = 0.59$, p = .624. The full results can be found in Appendix G.

5.3.3 Regression analysis

While the independent samples t-tests and MANOVA gave insights into mean differences between campaign type and the dependent variables, these methods do not identify the predictive relationships between variables. Therefore, simple and multiple linear regression analyses were performed.

5.3.3.1 Simple linear regression

A series of simple linear regressions were conducted to examine the effect of campaign type (neuromarketing vs. traditional) on the outcome variables purchase intention, product attitude, perceived product value. The results indicated that campaign type did not significantly predict the outcome variables, with all corresponding p-values greater than .05. This suggests that the type of campaign did not directly influence participants' feelings and behaviour related to the product. Results are summarised in Table 5.

Table 5.
Simple linear regression summary

	b	SE	*t*	*p*	R^2
purchase intention	-0.16	0.32	-0.51	.611	.002
product attitude	-0.27	0.32	-0.07	.402	.005
perceived product value	-0.26	0.24	-0.09	.283	.007

5.3.3.2 MULTIPLE REGRESSION

A multiple regression was performed to predict purchase intention based on campaign type, emotional engagement, goal alignment, health knowledge, health consciousness, lifestyle, age, and gender. The model was statistically significant, $F(8, 148) = 22.81$, $p < .001$, explaining 53% of the variance (adjusted $R^2 = .528$). Significant predictors included emotional engagement and goal alignment.

Another multiple regression was performed to predict product attitude based on campaign type, emotional engagement, goal alignment, health knowledge, health consciousness, lifestyle, age, and gender. The model was statistically significant, $F(8, 138) = 5.52$, $p < .001$, explaining 19% of the variance (adjusted $R^2 = .188$). Similarly, the significant predictors were emotional engagement and goal alignment.

Lastly, a multiple regression was done to predict perceived product value based on campaign type, emotional engagement, goal alignment, health knowledge, health consciousness, lifestyle, age, and gender. The model was statistically significant, $F(8, 148) = 48.38$, $p < .001$, explaining 71% of the variance (adjusted $R^2 = .708$). Again, significant predictors were emotional engagement and goal alignment.

The full overview of results can be found in Appendix H.

5.3.4 DISCUSSION

The independent sample t-tests and simple linear regressions directly testing the effect of campaign type on purchase intention, product attitude, or perceived value thus did not find evidence that campaign type by itself influences these outcomes. The MANOVA also shows that, when considering all dependent variables together, the campaign type does not differ significantly. The results suggest that, in this sample, the type of advertising campaign (neuromarketing vs. traditional) did not significantly influence the measured consumer responses. Therefore, hypotheses H1, H2, and H3 are rejected. The multiple regression was significant, however, which means that when considering several variables together these explain a significant amount of variance in purchase intention, product attitude, and perceived product value.

Several factors may be responsible for the lack of significance, including the limited sample size. Participants might not have had (long) enough interaction with the advertisement to be influenced. Another possibility is that they could have low interest in health and wellness food products such as yoghurt, or their responsiveness to different ad types was decreased by an already high or low intention to purchase yoghurt, regardless of the advertisement. The neuromarketing and traditional advertisement may not have been different enough from each other enough to create different reactions. Also, neuromarketing techniques might influence behaviour only slightly, not strongly. Lastly, self-reported measures (e.g., the Likert scales used in the questionnaire) might not capture the subtle psychological or neural responses that neuromarketing aims to influence. This will be discussed more in depth in Section 6.

5.4 MEDIATION ANALYSIS

5.4.1 MEDIATION LOGIC

Before testing for mediation, we examined whether campaign type significantly predicts the potential mediators, and whether the potential mediators significantly influence the outcome variables.

5.4.1.1 EMOTIONAL ENGAGEMENT

First, univariate analysis of variance (ANOVA) was done. The results revealed a statistically significant difference between the two campaign types on emotional engagement, $F(1, 155) = 8.23$, $p = .005$, $\eta^2 p = .05$. As the average emotional engagement was higher for the neuromarketing campaign ($M_{\text{neuromarketing}} = 6.00$, $SD = 1.45$, $M_{\text{traditional}} = 5.29$, $SD = 1.64$) we can conclude that participants who saw the neuromarketing-based advertisement reported feeling significantly more emotionally engaged than those who saw the traditional advertisement.

Also, simple linear regression was performed to examine the effect of campaign type (neuromarketing vs. traditional) on emotional engagement. The results indicated that campaign type significantly predicted emotional engagement ($b = -0.71$, $p = .005$) and explained 4.4% of the variance (adjusted $R^2 = .044$). Emotional engagement, in turn, also significantly predicted purchase intention ($b = 0.797$, $p < .001$), product attitude ($b = 0.53$, $p < .001$), and perceived product value ($b = 0.698$, $p < .001$).

These findings support the possibility that emotional engagement mediates the relationship between campaign type and the outcome variables. Mediation analysis using PROCESS macro Model 4 from Hayes (2018) to formally test these indirect effects will be discussed in Subsection 5.4.2.

5.4.1.2 GOAL ALIGNMENT

For goal alignment, the ANOVA analysis revealed a non-significant effect, $F(1, 155) = 3.21$, $p = .075$, $\eta^2 p = .02$, though the result approached significance. Simple linear regression also indicated that campaign type did not significantly predict goal alignment ($b = 0.56$, $p = .075$). Goal alignment did, however, significantly predict purchase intention ($b = 0.66$, $p < .001$), product attitude (b = 0.42, $p < .001$), and perceived product value ($b = 0.57$, $p < .001$).

As goal alignment was not significantly affected by the type of campaign, it may not meet the necessary condition for mediation in this study. Given the theoretical relevance of goal alignment, this will be examined further in Subsection 5.4.3 with a mediation analysis using the PROCESS macro Model 4 (Hayes, 2018).

5.4.2 MEDIATING ROLE OF EMOTIONAL ENGAGEMENT

Mediation analysis was conducted in SPSS using PROCESS Model 4 with 5,000 bootstrapped samples and a 95% confidence interval (Hayes, 2018) to examine whether emotional engagement (M) mediates the relationship between campaign type (X; neuromarketing vs. traditional) and purchase intention, product attitude, and perceived product value (Y). Mediation analysis summary is presented in Table 6.

Table 6.

Mediation analysis summary for emotional engagement

Relationship	Total effect	Direct effect	Indirect effect	Confidence Interval		t-statistic	Conclusion
				Lower Bound	Upper Bound		
Campaign type → Emotional engagement → Purchase intention	-0.16 ($p = .611$)	0.43 ($p = .086$)	-0.59	-1.05	-0.19	-2.65	Full mediation
Campaign type → Emotional engagement → Product attitude	-0.27 ($p = .402$)	0.11 ($p = .718$)	-0.38	-0.71	-0.10	-2.47	Full mediation
Campaign Type → Emotional engagement → Perceived product value	-0.36 ($p = .283$)	0.25 ($p = .120$)	-0.51	-0.92	-0.16	-2.67	Full mediation

The results indicated that campaign type had a significant effect on emotional engagement ($b = -0.71$, $p = .005$) and explained 5% of the variance ($R^2 = .05$). Thus, neuromarketing campaigns (coded 1) generate higher emotional engagement in participants compared to traditional campaigns (coded 2). Emotional engagement, in turn, significantly predicted

purchase intention (*b* = 0.83, *p* < .001), product attitude (*b* = 0.53, *p* < .001), and perceived product value (*b* = 0.72, *p* < .001).

The indirect effect of campaign type on purchase intention through emotional engagement was significant (*b* = −0.59, 95% CI [−1.05, −0.19]), indicating a significant mediation effect. Neuromarketing increases emotional engagement, and this increased engagement in turn leads to higher purchase intention, whereas traditional marketing reduces emotional engagement, which in turn reduces purchase intention. These results support H4a.
The direct effect of campaign type on purchase intention was not significant (*b* = 0.43, *p* = .086) when emotional engagement was included in the model, with a 95% confidence interval crossing zero [-0.06, 0.91]. This indicates full mediation. Moreover, the total effect of campaign type on purchase intention was not statistically significant (*b* = −0.16, *p* = .611). This further demonstrates that, without considering emotional engagement, campaign type alone does not significantly influence purchase intention.

Similar results were found for product attitude and perceived product value.
The indirect effect of campaign type on product attitude through emotional engagement was significant (*b* = −0.38, 95% CI [−0.71, −0.10]), indicating mediation. The negative coefficient again shows that the neuromarketing advertisement increased emotional engagement more than the traditional advertisement, and this higher engagement in turn leads to a more positive product attitude, supporting H4b. The direct effect of campaign type on product attitude, when emotional engagement was incorporated into the model, was not significant (*b* = 0.11, *p* = .718) with a 95% confidence interval crossing zero [-0.48, 0.70], again suggesting full mediation. The total effect of campaign type on product attitude was also not statistically significant (*b* = −0.27, *p* = .402).

Lastly, the indirect effect of campaign type on perceived product value through emotional engagement was significant (*b* = −0.51, 95% CI [−0.92, −0.16]), indicating a mediation effect and supporting H4c. Again, the direct effect of campaign type on perceived product value, when emotional engagement was included in the model, was not significant (*b* = 0.25, *p* = .120) with a 95% confidence interval crossing zero [-0,07, 0.57], indicating full mediation. The total effect of campaign type on product attitude was not statistically significant (*b* = −0.27, *p* = .402).

Overall, these findings suggest that emotional engagement fully mediates the relationship between campaign type and purchase intention, product attitude, and perceived product value, as the direct effect of campaign type on the dependent variables was not significant after including emotional engagement, while the indirect effect through emotional engagement was significant. The non-significant total effects provide further evidence for this full mediation relationship.

This indicates that neuromarketing campaigns generate higher emotional engagement and can have a more positive effect on consumers' feelings and purchasing behaviour in the health

and wellness food market. Traditional marketing campaigns, in contrast, may have less of an effect on emotional engagement, which results in lower purchase intention, product attitude, and perceived product value. Marketers in the health and wellness food market can thus benefit from designing campaigns that include emotionally engaging aspects, as this can indirectly drive better consumer purchasing results.

5.4.3 MEDIATING ROLE OF GOAL ALIGNMENT

Another mediation analysis was conducted, also using PROCESS Model 4 with 5,000 bootstrapped samples and a 95% confidence interval (Hayes, 2018), to examine whether goal alignment (M) mediated the relationship between campaign type (X; neuromarketing vs. traditional) and purchase intention, product attitude, and perceived product value (Y). Mediation analysis summary is presented in Table 7.

Table 7.
Mediation analysis summary for goal alignment

Relationship	Total effect	Direct effect	Indirect effect	Confidence Interval		t-statistic	Conclusion
				Lower Bound	Upper Bound		
Campaign type → Goal alignment → Purchase intention	-0.16 (*p* = .611)	-0.54 (p = .023)	0.38	-0.04	0.76	1.86	No mediation
Campaign type → Goal alignment → Product attitude	-0.27 (*p* = .402)	-0.51 (*p* = .082)	0.24	-0.03	0.55	1.71	No mediation
Campaign type → Goal alignment → Perceived product value	-0.36 (*p* = .283)	-0.59 (*p* = .000)	0.33	-0.02	0.69	1.81	No mediation

Goal alignment has a significant effect on purchase intention (*b* = 0.68, *p* < .001), product attitude (*b* = 0.44, *p* < .001), and perceived product value (*b* = 0.595, *p* < .001). However, the results indicated that campaign type did not have a significant effect on goal alignment (*b* = 0.56, *p* = .075). Confirming previous expectations, across all three models the indirect effects via goal alignment were not also statistically significant, as the 95% confidence intervals include zero. This indicates that goal alignment does not mediate the relationship between campaign type and purchase intention, product attitude or perceived product value in this context, rejecting hypotheses H5a, H5b, and H5c. Simply aligning a product with consumers' health or lifestyle goals may thus not be sufficient to drive purchasing behaviour in the health and wellness food market.

5.5 MODERATION ANALYSIS

The moderation analysis using Hayes' PROCESS Model 1 (2018) revealed almost no statistically significant interactions between campaign type and the demographic segments tested as possible moderators (health knowledge, health consciousness, lifestyle, age, gender) on purchase intention, product attitude, or perceived product value. Therefore, the hypotheses H6a-e are rejected. Moderation analysis summary is presented in Table 8.

Table 8.
Moderation analysis summary

		b	SE	*t*	*p*	95% CI
purchase intention	health knowledge	0.28	0.30	0.92	.357	[-0.32, 0.88]
	health consciousness	0.13	0.21	0.62	.536	[-0.29, 0.55]
	lifestyle	0.07	0.21	0.33	.739	[-0.34, 0.47]
	age	-0.06	0.03	-1.89	.061	[-0.12, 0.003]
	gender	0.43	0.68	0.64	.522	[-0.90, 1.77]
product attitude	health knowledge	0.19	0.31	0.596	.552	[-0.43, 0.81]
	health consciousness	0.27	0.22	1.23	.219	[-0.16, 0.70]
	lifestyle	0.21	0.21	0.998	.320	[-0.21, 0.64]
	age	-0.096	0.03	-3.24	.001	[0.15, -0.04]
	gender	0.23	0.69	0.33	.743	[-1.13, 1.58]
perceived product value	health knowledge	0.12	0.23	0.51	.613	[-0.34, 0.57]
	health consciousness	0.18	0.16	1.13	.259	[-0.14, 0.50]
	lifestyle	0.18	0.16	1.13	.261	[-0.13, 0.48]
	age	-0.04	0.02	-1.75	.081	[-0.08, 0.005]
	gender	0.34	0.51	0.66	.508	[-0.67, 1.34]

One significant interaction was identified, between campaign type and age on product attitude, $b = –0.10$, $SE = 0.03$, $t(153) = –3.24$, $p = .001$, 95% CI [–0.15, –0.04]. This indicates that age significantly moderated the effect of campaign type on product attitude. Younger participants responded more positively in terms of product attitude to the neuromarketing campaign than the older participants did.

The remaining findings suggest that, in this sample, the effects of the marketing campaign type on purchase intention, product attitude, and perceived product value were not significantly influenced by health knowledge, health consciousness, lifestyle, age, or gender. One possible explanation is that moderation effects are often quite small in behavioural and consumer research, so larger sample sizes are typically needed to detect them (Giner-Sorolla et al., 2024). A sample of 157 participants may not have been large enough to detect small moderation effects. It is also possible that the two campaigns were not different enough from each other to cause people in different groups to respond in clearly different ways. Moreover, the product used in this study might not have made people feel very strongly or think much about it. It is possible that the healthy yoghurt did not create enough emotional reaction for differences between people (like health knowledge or lifestyle) to show.

6. Conclusions and Future Research

In today's world, where the obesity problem continues to grow (Hegewald, 2025), promoting healthy food content and healthier lifestyles is crucial. A consumer's decision-making process is strongly influenced by emotional and subconscious factors (Bhardwaj et al., 2023), especially in the context of food products where consumers tend to make decisions based on emotions (Pancer et al., 2021). As neuromarketing uses emotionally engaging content, subliminal messaging, and storytelling, it presents an opportunity for creating effective marketing campaigns (Bhardwaj et al., 2023) in the health and wellness food market.

This study aimed to explore how neuromarketing principles can be used in advertising to increase consumers' positive feelings and purchasing behaviour in the health and wellness food market, and how these approaches compare to traditional marketing campaigns. Several neuromarketing principles were identified that can be used to create advertising campaigns. Following, two advertisements (neuromarketing-based and traditional) were developed for a healthy yoghurt product and tested across various outcome variables. Several mediators and moderators were also included in the model.

The results show that the neuromarketing campaign had higher averages on purchase intention, product attitude, and perceived product value compared to the traditional campaign. However, these differences were not statistically significant. Therefore, in the context of this study, it is not possible to state that the neuromarketing advertisement performs better than the traditional advertisement. However, the higher neuromarketing means point to a possible benefit of neuromarketing strategies over traditional advertising, that research with a larger sample size, different constructs, or more sensitive metrics could further explore.

Moreover, emotional engagement significantly mediated the relationship between campaign type and the measured consumer outcomes, confirming the idea behind neuromarketing: emotional content has the power to influence consumers' feelings and behaviour. Participants that saw the neuromarketing-based advertisement reported significantly higher levels of emotional engagement compared to those in the traditional marketing condition, which in turn leaded to higher values of purchase intention, product attitude, and perceived product value. This supports existing literature and shows the value of creating marketing content that not only informs but also connects with consumers on an emotional level. This study shows that the identified neuromarketing principles could play a role here.

Finally, goal alignment was not a significant mediator in this study, and the demographic segments did not significantly moderate the effect of campaign type on the dependent variables.

The following sections outline the theoretical and practical implications of these findings, as well as key limitations and directions for future research.

6.1 THEORETICAL IMPLICATIONS

This study contributes to literature on neuromarketing by looking at how it can be applied in the health and wellness food market. Not many neuromarketing studies have focused on this health market, while emotions play a big role in how people make choices when it comes to food (Khoshghadam & Rajabi, 2024; Prinyawiwatkul, 2020). By focusing on a healthy product, this paper aims to show how neuromarketing can be used to increase the effectiveness of healthy food marketing content.

This study offers theoretical contributions to the literature on neuromarketing techniques and strategies. To the best of our knowledge, we extend the current literature by providing a structured comparison of different neuromarketing techniques and by extracting neuromarketing principles from previous studies and experiments that have successfully influenced consumers' purchasing behaviour before. These insights were brought together in a comparative table that helps connect academic research with real-world marketing, giving both marketers and researchers a tool for designing future campaigns. In doing so, the study helps improve the understanding of what actually makes a neuromarketing strategy work.

Moreover, while several past studies have shown that neuromarketing strategies can provide a deeper understanding and positively influence consumer behaviour (Bhardwaj et al., 2023; De Jesus et al., 2022; Plassmann et al., 2012; Yao & Wang, 2024), this research takes things a step further by directly comparing neuromarketing strategies with traditional marketing methods. By comparing a neuromarketing-based campaign for a healthy product with a traditional one, the study aims to provide new insights into how effective neuromarketing really is, and whether neuromarketing can outperform traditional strategies in influencing consumers' feelings and purchasing behaviour.

Previous studies show that neuromarketing works (e.g. Ariely & Berns, 2010; Behl et al., 2023; Bhardwaj et al., 2023; Lim, 2018; Singh et al., 2023). This study takes the next step by identifying why and how it can work, by including mediators emotional engagement and goal alignment. Consistent with earlier theoretical frameworks (Chan et al., 2024; Rust & Huang, 2021; Schwarz, 1989), emotional engagement was found to be a significant mediator between campaign type and the consumer outcomes in this study, supporting the idea that neuromarketing can be effective through emotional stimulation. This aligns with Plassmann et al. (2015), who argued that emotional arousal is an important way in which neuromarketing influences consumer behaviour. Our results support this idea, showing that when a campaign connects with people emotionally, it has a strong influence on how they see the product and whether they are likely to buy it.
Goal alignment, interestingly, was not a significant mediator in this study. This goes against what Chartrand et al. (2008) suggested, that aligning messages to match consumers' goals makes them more persuasive. In this study, it seems that emotional impact mattered more than goal alignment, at least when it comes to marketing health and wellness food products.

Future research could further explore how goal alignment has an impact on consumer outcomes and in what contexts.

Another theoretical contribution of this study is that it takes different types of consumers into account. By including health knowledge, health consciousness, lifestyle, age and gender into the model, this research acknowledges that not all consumers respond the same way. This paper suggests that responses can vary across different groups, which could help bring customer segmentation theories into the neuromarketing conversation, advancing the work of Bhardwaj et al. (2023) and Stanton et al. (2017).

Finally, this study contributes to the discussion about how neuromarketing can be used ethically by synthesizing limitations and ethical considerations.

6.2 PRACTICAL IMPLICATIONS

The study also has several practical implications, for marketers, brand managers, and policymakers working within the health and wellness food sector.

As consumer interest in health-conscious products continues to grow (Pancer et al., 2021), so does the need for effective marketing strategies in this sector. With food content everywhere online, it is crucial to understand what drives engagement for healthy foods. This knowledge can help advertisers match their content to consumers' interests and increase their impact, and assist health advocates in encouraging healthier food choices (Pancer et al., 2022). This study identifies key principles that can help achieve these goals.

Additionally, neuromarketing can seem overwhelming and difficult to use, especially to marketing researchers who are new to the field and even to those already established (Lee et al., 2007). However, this need not be the case, as this paper aims to show. This study demonstrates that neuromarketing principles can be applied in advertising campaigns without directly using high-tech, expensive tools such as EEG, fMRI, or eye tracking. In line with Singh et al. (2023), in this way it can help marketers and businesses better understand how neuromarketing can be used in practice. By creating an advertisement around proven neuromarketing insights and testing it using simple behavioural and attitude-based measures, this research shows that even marketers with lower budgets could benefit from neuromarketing by applying its proven principles. This makes the field more accessible, especially for small and medium-sized businesses in the health and wellness sector.

Another key takeaway from this study is the important role of emotional engagement in how consumers respond to marketing. While the neuromarketing-based campaign did not lead to statistically significant increases in purchase intention, product attitude, or perceived product value compared to the traditional campaign, it did result in higher average scores across all three measures. Emotional engagement had a significant mediating role here, suggesting that when a campaign connects with people emotionally, it is more likely to influence how they

perceive a product and whether they consider buying it. For marketers, this means that adding emotionally engaging elements, such as storytelling and pleasure, can make their health advertisements more effective. Instead of relying only on facts and information, brand managers can create campaigns that leverage emotions and values consumers care about.

Lastly, for policymakers this research explains several important ethical challenges and considerations they could keep in mind to ensure that consumer rights and well-being are protected. It highlights the value of creating clear guidelines that promote transparency and responsibility when using neuromarketing, especially as these tools become easier to use and more common.

6.3 LIMITATIONS AND FUTURE RESEARCH OPPORTUNITIES

While this study offers valuable insights into neuromarketing in the health and wellness food market, it is not without limitations that could be overcome in future studies.

Firstly, the neuromarketing-based campaign showed higher average scores on purchase intention, product attitude, and perceived value, but these differences were not statistically significant. One possible reason is the small sample size, which may have made it harder to detect smaller, but meaningful effects. Future studies could improve this by using a larger and more diverse group of participants.

Furthermore, all constructs in this study were measured using self-report Likert scales. While this is common in consumer research (Karantonis et al., 2025), people do not always answer in ways that reflect their real behaviour. They might respond in ways they think are expected to or which are socially acceptable (Teh et al., 2023). Future research could include more direct behavioural measures, like simulated purchases, click-through rates, or even real sales data, to see how attitudes translate into actual decisions. It would also be helpful to look at a wider range of outcome variables, such as how well people remember the ad, how emotionally intense they found it, or whether they felt it was credible or trustworthy. Since this study only looked at short-term responses, future research could explore long-term effects like brand loyalty or the repeated purchase intention. Adding these elements would give a more complete understanding of how neuromarketing strategies impact intentions, and also how people think, feel, and act over time.

Another limitation of this study has to do with how engaged participants were with the advertisements. Out of the 264 responses collected, 99 had to be excluded: 78 because they did not finish the questionnaire, and 21 because they failed the attention check. This high number may indicate that these participants did not engage fully with the advertisement or the questionnaire itself. Even among those who completed it, there is a chance they did not spend enough time watching the advertisement to be really influenced by it. Therefore, the intended effect of the advertisement to change consumer feelings and behaviour might have

not occurred, which could explain the insignificant results. Additionally, some participants may have had pre-existing opinions about yoghurt, which could have reduced their responsiveness to the advertisement. For example, if a participant had no intention of purchasing yoghurt regardless of the advertisement, or is already a regular buyer, the advertisement might not have made a difference. This lack of engagement or interest could explain why this study did not find statistically significant differences between the two campaigns. Future studies could improve this by measuring how interested participants are in the product beforehand or by pre-screening to make sure the product is relevant.

Also, this study focused specifically on a yoghurt product in the health and wellness market. While this context was chosen intentionally to explore health-related consumer decisions, the findings may not generalize to other products as consumer responses may vary (De Paula et al., 2022). Future research could use the same approach to examine other items in the health sector, like protein bars, plant-based foods, or supplements, and even go beyond food to explore products like fitness apps or health services. It could even extend to other industries. It would also be interesting to see how neuromarketing performs in different types of buying situations, such as quick purchases versus more thoughtful ones. Exploring these different contexts could give a more complete understanding of when and for who neuromarketing is most effective.

Moreover, the study explored both emotional engagement and goal alignment as mediators. Only emotional engagement had a significant impact on the relationship between campaign type and the measured consumer outcomes. While goal alignment was conceptually relevant, it did not show a significant mediating effect in this study. A possible explanation for this is that, in a health-related context, many consumers already agree with the message being promoted and thus it does not highly influence their feelings and behaviour. Future research could look into other potential mediators that are central to neuromarketing (Plassman et al., 2015), such as attention capture, recall, perceived trust in the advertisement or product, perceived relevance, or reward anticipation.
Similarly, although this study included health knowledge, health consciousness, and lifestyle as moderators, future work could explore how other factors influence how people respond to health and wellness marketing, such as personality traits, emotional intelligence, personal relevance, dietary restrictions or preferences, education level, or cultural values.

Finally, this study tested the campaigns without using neuromarketing tools directly. This makes the research more practical and accessible, showing that neuromarketing principles can be applied without extensive costs. On the other hand, it means that real-time emotional or brain-based responses to the advertisements could not be captured. Future studies could take a mixed approach, combining self-report surveys with neuromarketing tools to get a complete view of how consumers engage with marketing content.

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APPENDIX

APPENDIX A: ONLINE QUESTIONNAIRE

Dear participant,

This survey invites you to reflect on your perceptions of advertising campaigns and their influence on your preferences and choices, particularly in the context of healthy products.

There are no right or wrong answers in this survey and there are no risks involved in its completion. Your responses are very important, completely anonymous, voluntary, and will be used only for academic purposes. Please answer the following questions to the best of your ability and provide honest, accurate and thoughtful responses.

The survey takes no longer than 10 minutes to complete.

Thank you for your participation!

Informed Consent Form

I declare that I am 18 or over 18 and agree to participate in this research. I declare that I was informed that my participation in this study is voluntary and that I can leave this survey at any time without penalty, and all data is confidential. I understand that I will evaluate responses and that this study does not offer serious risks.

- I agree to participate
- I do not agree to participate

Conditions

Participants are randomly assigned to view either the neuromarketing-based advertisement or the traditional advertisement.

You will now be presented with an advertising campaign for a new healthy **yoghurt** product. Please take a moment to view the ad and consider how it resonates with you.

Figure A1. *Traditional advertisement*

Figure A2. *Neuromarketing-based advertisement*

Dependent variables

Purchase intention (Adapted from Simão et al., 2022)

Using a nine-point scale ranging from 1 (strongly disagree) to 9 (strongly agree), please indicate to what extent you agree with the following statements.

	1. Strongly disagree	2	3	4	5. Neutral	6	7	8	9. Strongly agree
I would consider purchasing the advertised product	○	○	○	○	○	○	○	○	○
I intend to try the advertised product	○	○	○	○	○	○	○	○	○
I am likely to buy the advertised product	○	○	○	○	○	○	○	○	○

Product attitude (Adapted from Batra & Stayman, 1990)

Please rate your attitude towards the advertised product.

	1	2	3	4	5	6	7	8	9	
unpleasant	○	○	○	○	○	○	○	○	○	pleasant
bad	○	○	○	○	○	○	○	○	○	good
negative	○	○	○	○	○	○	○	○	○	positive
unfavorable	○	○	○	○	○	○	○	○	○	favorable
dislike	○	○	○	○	○	○	○	○	○	like
useless	○	○	○	○	○	○	○	○	○	useful
low quality	○	○	○	○	○	○	○	○	○	high quality
not beneficial	○	○	○	○	○	○	○	○	○	beneficial
worthless	○	○	○	○	○	○	○	○	○	valuable
disagreeable	○	○	○	○	○	○	○	○	○	agreeable

Perceived product value (Adapted from Sweeney & Soutar, 2001)

Using a nine-point scale ranging from 1 (strongly disagree) to 9 (strongly agree), please indicate to what extent you agree with the following statements.

	1. Strongly disagree	2	3	4	5. Neutral	6	7	8	9. Strongly agree
The product would arouse positive feelings in me	○	○	○	○	○	○	○	○	○
I would like the product	○	○	○	○	○	○	○	○	○
The product would be approved of by others	○	○	○	○	○	○	○	○	○
The product would make me perform well	○	○	○	○	○	○	○	○	○
If I bought or used the product, it would create a favorable perception of me among other people	○	○	○	○	○	○	○	○	○
The product has a positive social image	○	○	○	○	○	○	○	○	○
I would be willing to buy the product at the store	○	○	○	○	○	○	○	○	○
The product is a good choice	○	○	○	○	○	○	○	○	○
I would recommend the product to friends or relatives	○	○	○	○	○	○	○	○	○
I would not expect any problems with the product	○	○	○	○	○	○	○	○	○

Mediators

Emotional engagement (Adapted from Zhang et al., 2014)

Using a nine-point scale ranging from 1 (not at all) to 9 (extremely), please indicate to what extent you agree with the following statement: The advertised product makes me feel ...

	1. Not at all	2	3	4	5. Neutral	6	7	8	9. Extremely
good	○	○	○	○	○	○	○	○	○
happy	○	○	○	○	○	○	○	○	○
relaxed	○	○	○	○	○	○	○	○	○
positive	○	○	○	○	○	○	○	○	○
cheerful	○	○	○	○	○	○	○	○	○
please select 3	○	○	○	○	○	○	○	○	○
content	○	○	○	○	○	○	○	○	○
touched	○	○	○	○	○	○	○	○	○
interested	○	○	○	○	○	○	○	○	○

Goal alignment (Adapted from Gerow et al., 2014)

Using a nine-point scale ranging from 1 (strongly disagree) to 9 (strongly agree), please indicate to what extent you agree with the following statements.

	1. Strongly disagree	2	3	4	5. Neutral	6	7	8	9. Strongly agree
The product supports my health goals	○	○	○	○	○	○	○	○	○
I can adapt the product to my health goals	○	○	○	○	○	○	○	○	○
My health goals and the product match each other	○	○	○	○	○	○	○	○	○
I identify a fit between my health goals and the product	○	○	○	○	○	○	○	○	○
My health goals and the product correspond to each other	○	○	○	○	○	○	○	○	○
My health goals align with the product	○	○	○	○	○	○	○	○	○

Moderators

Health knowledge (Adapted from Mamun et al., 2020)

Using a nine-point scale ranging from 1 (strongly disagree) to 9 (strongly agree), please indicate to what extent you agree with the following statements.

	1. Strongly disagree	2	3	4	5. Neutral	6	7	8	9. Strongly agree
I am familiar with healthy foods	○	○	○	○	○	○	○	○	○
I am knowledgeable about the impact of unhealthy foods	○	○	○	○	○	○	○	○	○
I am interested in finding out more about healthy foods	○	○	○	○	○	○	○	○	○
I am informed that the healthy foods contain fewer harmful chemicals than unhealthy foods	○	○	○	○	○	○	○	○	○
I am informed that the consumption of unhealthy food is harmful for health	○	○	○	○	○	○	○	○	○
Reading of production information and expiration date on a food package is important	○	○	○	○	○	○	○	○	○

Health consciousness (Adapted from Mai & Hoffmann, 2015)

Using a nine-point scale ranging from 1 (strongly disagree) to 9 (strongly agree), please indicate to what extent you agree with the following statements.

	1. Strongly disagree	2	3	4	5. Neutral	6	7	8	9. Strongly agree
I reflect a lot about my health	○	○	○	○	○	○	○	○	○
I am very self-conscious about my health	○	○	○	○	○	○	○	○	○
I'm generally attentive to my feelings about my health	○	○	○	○	○	○	○	○	○

Lifestyle (Adapted from Mamun et al., 2020)

Using a nine-point scale ranging from 1 (strongly disagree) to 9 (strongly agree), please indicate to what extent you agree with the following statements.

	1. Strongly disagree	2	3	4	5. Neutral	6	7	8	9. Strongly agree
I choose food carefully to ensure good health	○	○	○	○	○	○	○	○	○
I consider myself as a health-conscious consumer	○	○	○	○	○	○	○	○	○
I often think about health-related issues	○	○	○	○	○	○	○	○	○
I am prepared to do anything that is good to health	○	○	○	○	○	○	○	○	○
I often focus on my health	○	○	○	○	○	○	○	○	○
I think that I take health into account a lot in my life	○	○	○	○	○	○	○	○	○

Manipulation check

Please select the option that best describes the advertisement you saw.

○ A colorful ad of a smiling male in activewear eating a yoghurt product

○ A neutral ad of a yoghurt product surrounded by nutritional information

Demographics

What is your age? (please insert numbers only)

What is your gender?

- ○ Male
- ○ Female
- ○ Non-binary
- ○ Prefer not to answer

What is your nationality?

- ○ Portuguese
- ○ Other

APPENDIX B: ASPREDICTED STUDY REGISTRATION (#201997)

ASPREDICTED

Wharton CREDIBILITY LAB
UNIVERSITY of PENNSYLVANIA

Neuromarketing vs Traditional Marketing in the Health and Wellness Food Market (#201997)

Author(s)
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Diego Costa Pinto (Universidade NOVA de Lisboa) - dpinto@novaims.unl.pt
Joana Rita Nunes (NOVA IMS - Information Management School) - jrnunes@novaims.unl.pt

Pre-registered on: 11/29/2024 03:38 AM (PT)

1) Have any data been collected for this study already?
No, no data have been collected for this study yet.

2) What's the main question being asked or hypothesis being tested in this study?
How can neuromarketing principles be utilized to enhance consumer purchase behavior in the health and wellness food market?
How do neuromarketing-based campaigns compare to traditional marketing campaigns in the health and wellness food market?

3) Describe the key dependent variable(s) specifying how they will be measured.
Willingness to purchase. 9-point Likert Scale adapted from Dodds et al. (1991). On a scale from 1 (not at all) to 9 (extremely), participants will rate the extent to which they consider / are willing to / are likely to buy the advertised healthy product.
Purchase intention. 9-point Likert Scale adapted from Simão et al. (2022). On a scale from 1 (strongly disagree) to 9 (strongly agree), participants will rate the extent to which they agree with the following items "I would consider purchasing this product", "I intend to try this product", "I am likely to buy this product".
Product attitude. 7-point semantic differential scale adapted from Batra and Stayman (1990). Participants will rate their attitude towards the advertised healthy product, with items such as "pleasant - unpleasant", "positive - negative", and "like - dislike".
Perceived product value. 9-point Likert Scale adapted from Sweeney and Soutar (2001). On a scale from 1 (strongly disagree) to 9 (strongly agree), participants will rate the extent to which they agree with the items such as "The product would, in functional terms, perform well", "I would like this product", "I would not expect any problems with this product".

4) How many and which conditions will participants be assigned to?
Two conditions: Advertising campaign type: Neuromarketing-based or Traditional.
The study employs a between-subjects study design.

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.
t-test, ANOVA, and MANOVA for main effect.
Mediation analysis using the Process Macro.
Regression analysis for moderation effects.

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.
We will exclude participants who fail the attention check and incomplete survey submissions.

7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.
Sample size will be determined by the G*Power tool.

8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)
Participants must be 18 years or older and participants will need to pass the attention check question to be eligible for the study

APPENDIX C: NOVA IMS ETHICS COMMITTEE APPROVAL

This is to certify that
Project No.: **DDMKT2024-11-177551**
Project Title: **Unlocking the Brain: Neuromarketing's Impact on Consumers' Purchasing Behavior in the Health and Wellness Food Market**
Principal Researcher: **Nikki van Rijswijk**

according to the regulations of the Ethics Committee of NOVA IMS and MagIC Research Center this project was considered to meet the requirements of the NOVA IMS Internal Review Board, being considered **APPROVED** on 11/17/2024.

It is the Principal Researcher's responsibility to ensure that all researchers and stakeholders associated with this project are aware of the conditions of approval and which documents have been approved.

The Principal Researcher is required to notify the Ethics Committee, via amendment or progress report, of
- Any significant change to the project and the reason for that change;
- Any unforeseen events or unexpected developments that merit notification;
- The inability of the Principal Researcher to continue in that role or any other change in research personnel involved in the project.

Lisbon, 11/17/2024

NOVA IMS Ethics Committee
ethicscommittee@novaims.unl.pt

APPENDIX D: EXPLORATORY FACTOR ANALYSIS

Table D1.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin (KMO) value		0.909
Bartlett's Test of Sphericity		
	Approx. Chi-Square	9170.51
	df	1326
	p	< .001

Table D2.

Total variance explained

Factor	Initial Eigenvalues	% of Variance	Cumulative %
1	**19.41**	**37.33**	**37.33**
2	**6.91**	**13.29**	**50.62**
3	**5.15**	**9.91**	**60.52**
4	**2.85**	**5.48**	**66.00**
5	**2.15**	**4.14**	**70.14**
6	**1.51**	**2.90**	**73.04**
7	**1.21**	**2.32**	**75.35**
8	**1.05**	**2.01**	**77.36**
9	.929	1.79	79.15
10	.758	1.46	80.61
11	.704	1.35	81.96
12	.696	1.34	83.30
13	.611	1.18	84.47
14	.567	1.09	85.56
15	.524	1.01	86.57
16	.491	.95	87.52
17	.468	.90	88.42
18	.461	.89	89.30
19	.409	.79	90.09
20	.406	.78	90.87
21	.365	.70	91.57
22	.348	.67	92.24
23	.308	.59	92.84
24	.299	.58	93.41
25	.269	.52	93.93
26	.254	.49	94.42
27	.233	.45	94.86
28	.216	.42	95.28

29	.197	.38	95.66
30	.192	.37	96.03
31	.180	.35	96.37
32	.163	.31	96.69
33	.159	.31	96.99
34	.152	.29	97.29
35	.138	.27	97.55
36	.135	.26	97.81
37	.128	.25	98.06
38	.113	.22	98.28
39	.102	.20	98.47
40	.095	.18	98.66
41	.092	.18	98.83
42	.088	.17	99.00
43	.080	.15	99.16
44	.077	.15	99.30
45	.068	.13	99.43
46	.063	.12	99.56
47	.055	.11	99.66
48	.051	.10	99.76
49	.040	.08	99.84
50	.034	.07	99.90
51	.030	.06	99.96
52	.020	.04	100.00

Figure D1. Scree plot

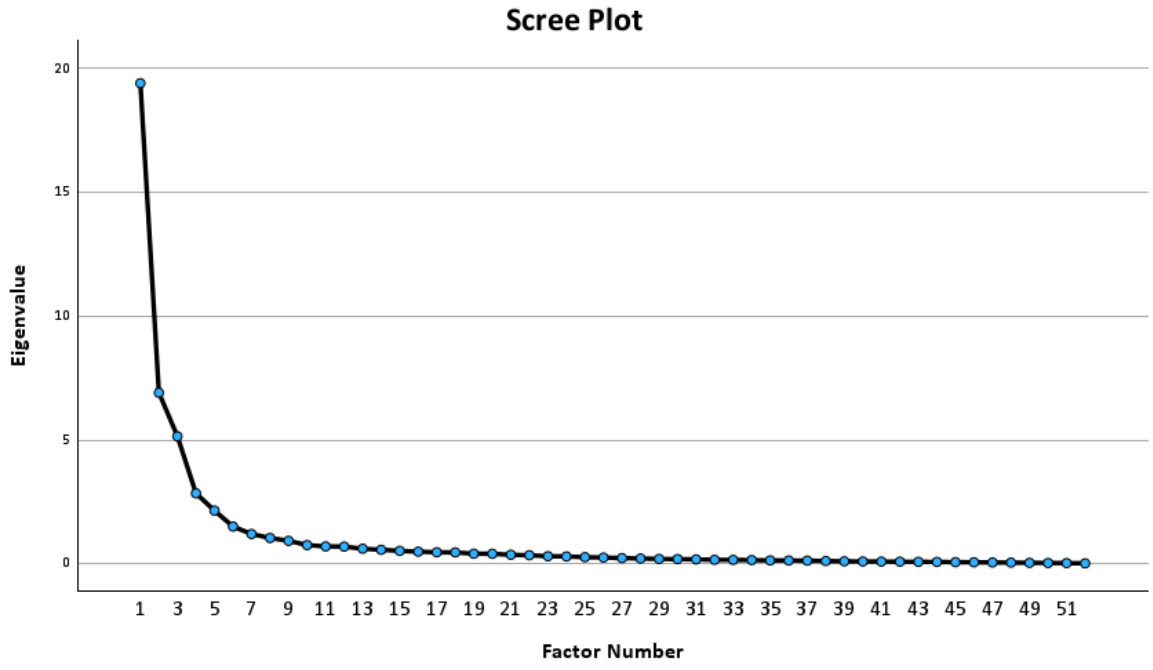

Table D3.

Pattern matrix showing factor loadings for retained factors

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
PI1	.77							
PI2	.84							
PI3	.77							
PA1			.68					
PA2			.84					
PA3			.93					
PA4			.91					
PA5			.91					
PA6			.82					
PA7			.85					
PA8			.80					
PA9			.90					
PA10			.89					
PPV1	.65							
PPV2	.69							
PPV3							.56	
PPV4							.44	
PPV5							.53	
PPV6							.57	
PPV7	.63							
PPV8							.43	
PPV9							.41	
PPV10								.26
EE1				.70				
EE2				.82				
EE3				.61				
EE4				.87				
EE5				.89				
EE6				.64				
EE7				.52				
EE8				.40				
GA1						.79		
GA2						.80		
GA3						.89		
GA4						.87		
GA5						.90		
GA6						.91		
HK1					.66			
HK2					.85			
HK3					.41			
HK4					.55			
HK5					.86			
HK6					.47			
HC1		.81						
HC2		.69						
HC3		.81						
LS1		.88						
LS2		.81						
LS3		.78						
LS4		.65						
LS5		.85						
LS6		.86						

Extraction Method: Principal Axis Factoring
Rotation Method: Oblimin with Kaiser Normalization

APPENDIX E: NORMALITY TESTS

Table E1.

Kolmogorov-Smirnov tests of normality

	D	df	*p*
purchase intention	.127	157	<.001
product attitude	.137	157	<.001
perceived product value	.128	157	<.001
emotional engagement	.125	157	<.001
goal alignment	.122	157	<.001
health knowledge	.123	157	<.001
health consciousness	.168	157	<.001
lifestyle	.111	157	<.001

Table E2.

Skewness and Kurtosis tests of normality

	Mean	SD	Skewness	Kurtosis
purchase intention	5.92	1.97	-0.69	-0.12
product attitude	6.12	2.00	-0.86	-0.12
perceived product value	5.89	1.48	-0.79	1.05
emotional engagement	5.65	1.58	-0.85	0.95
goal alignment	6.26	1.96	-0.91	0.42
health knowledge	7.71	1.07	-1.18	2.45
health consciousness	7.20	1.45	-1.04	1.60
lifestyle	6.66	1.50	-0.84	0.75

APPENDIX F: INDEPENDENT SAMPLES T-TEST

Table F1.

Group statistics for outcome variables

Construct	Condition	n	Mean	SD
purchase intention	Neuromarketing	78	6.00	1.93
	Traditional	79	5.84	2.02
product attitude	Neuromarketing	78	6.25	1.96
	Traditional	79	5.98	2.05
perceived product value	Neuromarketing	78	6.02	1.43
	Traditional	79	5.77	1.53

Table F2.

Independent samples t-test for outcome variables

	t	df	*p*	95% CI of the difference	Cohen's *d*
purchase intention	.51	155	.611	[-0.46, 0.78]	0.081
product attitude	.84	155	.402	[-0.36, 0.90]	0.134
perceived product value	1.08	155	.283	[-0.21, 0.72]	0.172

APPENDIX G: MULTIVARIATE ANALYSIS OF VARIANCE (MANOVA)

Table G1.

Multivariate test of campaign type on outcome variables

Multivariate test	Value	*F*	df1	df2	*p*	Partial η^2
Wilks' Lambda	.989	.59	3	153	.624	.011

Table G2.

Tests of between-subjects effects

Construct	*F*	df	*p*	Partial η^2
purchase intention	.26	1	.611	.002
product attitude	.71	1	.402	.005
perceived product value	1.16	1	.283	.007

APPENDIX H: MULTIPLE REGRESSION

Table H1.
Multiple regression for purchase intention

Model summary

	R	R^2	Adjusted R^2	SE
purchase intention	.743	.552	.528	1.353

ANOVA

	Sum of Squares	df	Mean Square	*F*	*p*
Regression	333.86	8	41.73	22.81	< .001
Residual	270.78	148	1.83		
Total	604.64	156			

Coefficients

Predictor	B	SE B	β	*t*	*p*
(constant)	-0.767	1.070		-0.72	.475
campaign type	-0.146	0.242	-0.037	-0.60	.548
emotional engagement	0.454	0.094	0.365	4.86	< .001
goal alignment	0.434	0.076	0.433	5.73	< .001
health knowledge	0.063	0.126	0.034	0.50	.619
health consciousness	-0.033	0.128	-0.024	-0.26	.798
lifestyle	0.108	0.124	0.082	0.87	.386
age	0.018	0.011	0.099	1.74	.084
gender	0.062	0.233	0.015	0.27	.791

Table H2.
Multiple regression for product attitude

Model summary

	R	R^2	Adjusted R^2	SE
product attitude	.479	.230	.188	1.804

ANOVA

	Sum of Squares	df	Mean Square	*F*	*p*
Regression	143.73	8	17.97	5.52	< .001
Residual	481.60	148	3.25		
Total	625.34	156			

Coefficients

Predictor	B	SE B	β	*t*	*p*
(constant)	2.353	1.427		1.65	.101
campaign type	-0.129	0.323	-.032	-.40	.689
emotional engagement	0.323	0.125	.255	2.59	.011
goal alignment	0.259	0.101	.254	2.56	.011
health knowledge	0.127	0.168	.068	0.76	.451
health consciousness	0.103	0.171	.075	0.60	.549
lifestyle	-0.158	0.166	-.118	-0.95	.342
age	-0.009	0.014	-.047	-0.63	.529
gender	0.068	0.311	.016	0.22	.827

Table H3.

Multiple regression for perceived product value

Model summary

	R	R^2	Adjusted R^2	SE
perceived product value	.851	.723	.708	0.800

ANOVA

	Sum of Squares	df	Mean Square	*F*	*p*
Regression	247.74	8	30.97	48.38	< .001
Residual	94.74	148	0.64		
Total	342.47	156			

Coefficients

Predictor	B	SE B	β	*t*	*p*
(constant)	1.400	0.633		2.21	.028
campaign type	-0.179	0.143	-0.061	-1.25	.212
emotional engagement	0.406	0.055	0.434	7.34	< .001
goal alignment	0.391	0.045	0.518	8.73	< .001
health knowledge	0.060	0.075	0.043	0.81	.422
health consciousness	-0.114	0.076	-0.112	-1.51	.134
lifestyle	0.043	0.073	0.043	0.58	.563
age	0.001	0.006	0.004	0.10	.925
gender	0.047	0.138	0.015	0.34	.737

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