DOI 10.18.276/978-83-8419-053-1-1

28th European Conference on Artificial Intelligence (ECAI 2025)

INTELLIGENT MANAGEMENT OF CONSUMER BEHAVIOUR: THE ROLE OF PACKAGING IN VIRTUAL REALITY SHOPPING ENVIRONMENTS

Małgorzata Wiścicka-Fernando[a]

[a] *University of Szczecin, Institute of Management, Poland*

ABSTRACT

Purpose: *This article presents results from neuromarketing EEG and VR analyses conducted on consumers' purchasing decisions and their decision-making processes in immersive virtual environments.*

Need for the study: *Given the increasing interest in intelligent management of consumer behaviour (IMCB) within marketing strategies, it is essential to understand how packaging influences consumer emotions. This study bridges the gap between traditional consumer research and neuromarketing techniques, offering insights into subconscious decision-making processes in a virtual shop.*

Methodology: *The study employed electroencephalography (EEG) and virtual reality (VR) tools to explore consumer responses to packaged and unpackaged products in a virtual shopping environment. It concentrated on measuring brain waves linked to emotional arousal and cognitive engagement. The VR device simulated a realistic grocery store. The key research question is: How does packaging influence consumer emotion and decision-making in a virtual shop? Basic statistical methods were also applied, including Pearson's correlation coefficient, to assess the relationship between the average holding time of a product category and emotional response.*

Findings: *The results indicate that packaged products evoke higher arousal levels yet are stored for a shorter duration than unpackaged goods. However, packaging alone does not significantly alter the emotional value of the products. These findings highlight the complex relationship between sensory engagement, cognitive load, and consumer trust in virtual shopping environments.*

Practical Implications: *The data obtained can offer valuable insights for companies and researchers studying consumer preferences. It can also utilise neuroscience and virtual reality to create a safe environment for grocery shoppers.*

Keywords: IMCB**,** emotions, consumer behaviour, virtual reality, EEG, intelligent management

Jel codes: M31, D87, L86

Peer-review under responsibility of the scientific committee of 28th European Conference on Artificial Intelligence (ECAI 2025) and Intelligent Management Workshop.

1. INTRODUCTION

Research on consumer decision-making has been conducted for nearly a century and remains a challenge for scientists. This is due to the dynamically changing consumer environment and the complexity of cognitive processes, which are challenging to examine precisely. Technological limitations have hindered the analysis of thought mechanisms and their impact on purchasing behaviour for years. However, the development of modern technologies, such as artificial intelligence (AI), big data, neuromarketing, and digital tools, has revolutionised how consumer behaviour is studied and predicted (Al-Shaikh et al., 2024; Tyagi et al., 2024; Venkateswaran et al., 2023; Zhang & Tan, 2020).

This technology set is called Intelligent Management of Consumer Behaviour (IMCB). It is particularly applied in marketing, where analysing large data sets allows a better understanding of consumer decisions and preferences. As a result, companies can dynamically adjust their strategies to evolving behavioural patterns, leading to more effective marketing efforts and an increased market share (Bhatia & Tishya, 2024; Jiang, 2023; Zhao, 2024). Predictive analytics has become integral to decision-making regarding consumer behaviour. The ability to use machine learning methods provides companies with highly accurate information, allowing them to tailor marketing activities precisely to the needs of various segments and engage with them effectively (Shukla et al., 2024).

With the increasingly complex choices facing today's consumers, understanding how various factors interact in everyday purchasing decisions is crucial. The wide range of available sales channels means the decision-making process is not linear; instead, it results from dynamic interactions between elements of the physical and digital worlds.

Online and offline purchases differ in terms of how information is processed, consumer habits, levels of trust, and decision-making mechanisms. Understanding these interrelationships allows companies to adapt their actions and consumers to make better, more conscious choices.

Neuroscience devices currently support research in this area. Some of the most popular tools for consumer behaviour research include eye tracking, electroencephalography (EEG), galvanic skin response (GSR), and virtual reality (VR).

Eye-tracking technology is becoming increasingly popular in consumer behaviour research. By measuring where and how long users direct their gaze, this method provides essential information about their interests, preferences, and actions. This tool helps analyse behaviour at different points of sale, capture consumer reactions, test the effectiveness of promotional activities or interactions, and research emotions (Alsharif, Salleh, et al., 2021; Bell et al., 2018; Budzanowska-Drzewiecka & Lubowiecki-Vikuk, 2023; Porowska, 2016; Sagan, 2018).

A second commonly used technique in the study of consumer behaviour is electroencephalography (EEG) imaging. As a neuroimaging method, it provides the opportunity to obtain direct information on how the brain responds to various marketing stimuli. The analysis of brain waves enables researchers to gain insights into consumer preferences and behavioural predictions, capturing responses to stimuli or assessing emotional states (Alsharif et al., 2022; Bazzani et al., 2020; Ramsøy et al., 2018; McInnes et al., 2023).

The galvanic skin measurement (GSR) device is convenient because of its size and mobility. This device is beneficial for assessing emotional responses to stimuli, including marketing stimuli. As a result, it offers better opportunities for evaluating consumer decisions in real time. This device has already found its way into commercial products, such as those dedicated to sportspeople, increasing its popularity and providing a large amount of data (Alsharif, Salleh, et al., 2021; Hernandez et al., 2015).

A tool that is also gaining popularity with the development of the Intelligent Management of Consumer Behaviour is virtual reality (VR). This device is particularly favoured by younger generations as it is used for gaming. It has specific features that offer activities in a virtual world that are created in a very realistic manner. It creates immersive and controlled environments to study consumer behaviour and reactions to marketing stimuli. Due to VR's qualities, such as creating a realistic environment and engaging consumers, it is being combined with other neuroimaging devices. Among the most common combinations are EEG fmri devices and eye tracking. An eye-tracking device is often already integrated into VR, making it very easy to study consumer behaviour. Research using combined devices provides even more insight into consumer behaviour, their reactions, and their interactions with products and their packaging (Chen & Zhong, 2024; Kakaria et al., 2023; Kristofferson et al., 2022; Lavoie & King, 2020; Taufik et al., 2021).

Combining neuroimaging devices for research opens up significant opportunities for a deeper understanding of consumer responses and optimising activities in consumer behaviour and beyond.

2. LITERATURE REVIEW

2.1. Packaging and consumer decision-making

The decision-making process regarding packaging is multifaceted, influenced by the number and variety of stimuli that can lead consumers to choose a product. This process takes several forms, including initial attraction through visual appeal, detailed evaluation of functional attributes, and final purchase decisions based on perceived value and sustainability (Peschel et al., 2019).

The role of packaging in consumer purchasing decisions is pivotal. Packaging's primary functions include protection, security, ease of transportation and use, convenience enhancement, and increased sales. This offers a competitive advantage in the fast-moving product market (Rundh, 2005).

The creation of packaging has become a significant aspect of promotional strategies, effectively conveying the product's benefits to consumers. This function is essential in the FMCG sector, where consumers often make impulsive decisions and assess products primarily by their packaging (Rundh, 2009).

Multiple factors influence the selection of packaged products in grocery shops. A study revealed that consumer preferences for packaged products and their associated attitudes are primarily shaped by factors such as preference, ease of use, and prior experience (Rees, 1992). Furthermore, consumers view packaging as a showcase for the product. As a result, the quality of packaging, indicated by its aesthetic appeal, serves as a signal of the product's quality, thereby influencing consumer decisions (Silayoi & Speece, 2007). Additionally, studies have shown that consumers favour food packaging for its ability to reduce cognitive effort during the selection process, enhancing the overall shopping experience (Carroll et al., 2022).

A significant aspect of the consumer experience involves the emotional responses linked to the decision-making process, which continue into the post-purchase phase. The range of emotions experienced is extensive and influenced by the consumer's personality, encompassing both positive and negative feelings.

The Arousal and Valence indices have been identified as potentially useful tools for examining consumer emotions (Moses et al., 2018). These two variables facilitate a deeper understanding of emotions and the analysis of reactions to various stimuli, including products, advertising, and shopping experiences. The Arousal index, in particular, is a valuable metric that assesses the state of arousal, ranging from deep relaxation to high excitement. Conversely, the Valence index refers to the positive or negative nature of the experience. The integration of these two indices forms an active spatial model that is used to analyse emotions (Russell & Barrett, 1999). Applying such a model is particularly beneficial when emotions have an implicit dimension, such as through carefully designed packaging elements that enhance the consumer experience. The analysis can determine which emotions the consumer has experienced and how they can be enhanced; for example, a positive experience can be amplified. Emotions' analysis can be supported using an electroencephalograph (EEG) device.

It is also important to note that during the 2019-2021 period, a significant decline in consumers' sense of security occurred, triggered by the pandemic caused by the novel strain of the virus known as SARS-Cov-2. This unprecedented situation led to changes in consumer behaviour, evidenced by increased purchases of packaged food products (Borawski et al., 2021; Shamim et al., 2021). This shift was driven by health and safety concerns, as well as a reluctance to purchase unpackaged food items. This assertion is supported by research findings from 2021, which specifically addressed grocery shoppers' perceptions of packaging. The study's results indicated that consumers view packaging as safeguarding their food and ensuring its safety (Bou-Mitri et al., 2020; Fernando & Misiak-Kwit, 2023). This finding suggests that consumers may attribute protective benefits to packaging, both physically and psychologically.

As mentioned earlier, consumers' choice of packaged products in grocery stores is influenced by various factors, including convenience, perceived quality, cognitive effort, and the role of packaging in conveying product benefits and ensuring freshness. Emotions are consistently a significant factor affecting consumer decisions. The onset of the pandemic and the following political and social turmoil

of the previous four years have intensified feelings of fear and insecurity. Therefore, there is a strong rationale for researching the impact of emotions on feelings of security and the relationship between emotions and consumer security. The results of this research will be crucial in guiding the development of products, including packaging, and in creating a secure shopping environment.

2.2. Modern methods of consumer behaviour research

As mentioned in the introduction, one area of neuroscience is the Intelligent Management of Consumer Behaviour (IMCB), which, thanks to modern technologies, enables a better understanding of the various factors influencing consumer behaviour. Additionally, it gathers data on the impact of stimuli on consumers. Recently, there has been a significant increase in the support for tools provided by Artificial Intelligence (AI). In the context of emotion research, the use of electroencephalography (EEG) combined with other tools is recommended (Alsharif et al., 2024).

A study conducted in a grocery shop within a virtual reality environment presents an innovative approach to understanding consumer behaviour and decision-making processes in a simulated shopping environment. Utilising virtual reality (VR) technology creates a more precise setting regarding the purchase location, facilitating experimental control (Fang et al., 2021). This technological advancement enables the study of consumers and their purchasing behaviour in a realistic environment (Lombart et al., 2019). This approach addresses the limitations of traditional methods, such as the use of static stimuli or online surveys, by providing participants with a more immersive and authentic experience (Ploydanai et al., 2017). The term ‘static stimuli’ refers to fixed or unchanging elements in the study of participants’ reactions, such as eye-tracking surveys, shop configurations, and product placement scenarios. Virtual reality in this context has been shown to reduce hypothetical systematic errors in choice experiments (Filipe et al., 2017), aligning closely with behaviour observed in physical stores (Egbe et al., 2021). This method overcomes the limitations of conventional approaches, including the reliance on static stimuli or online surveys, thus offering participants a more immersive and realistic experience. Static stimuli denote fixed or unchanging elements that researchers present to study participants to observe their reactions. Examples include eye-tracking surveys, shop configurations, and product placement scenarios. The application of virtual reality in this context has demonstrated an ability to mitigate hypothetical systematic errors in choice experiments, replicating behaviour seen in physical stores. Moreover, studies conducted in this way contribute to a growing body of research on consumer behaviour in grocery shops. These investigations examine various factors influencing consumer choices, including shop characteristics, product variety, environmental determinants, knowledge levels, and shifting habits (Gillespie et al., 2022; Grummon et al., 2023; Nikolaus et al., 2016).

The study’s utilisation of neuroscience technology to comprehend consumer behaviour aligns with emerging research on the application of virtual reality across various fields, including neuromarketing, clinical neuroscience, anxiety treatment, and memory assessment. This interdisciplinary approach showcases the versatility of virtual reality technology in providing insights into human behaviour and decision-making across multiple domains.

In the field of consumer behaviour research, which often uses qualitative methodologies, the use of modern measuring devices such as electroencephalography (EEG), eye tracking, pulse meters (for heart rate measurement), and galvanic skin response (GSR) measurement becomes a viable option. These technologies enable the objective documentation of consumer behaviour data and the identification of behavioural patterns. As a result, contemporary consumer research, aided by neuroscience tools, is becoming increasingly sophisticated and precise, leading to a deeper understanding of customers' preferences and motivations in the context of their interactions with products and services.

The virtual reality grocery shop study represents a novel, interdisciplinary approach to understanding consumer behaviour. Utilising the modern tools of neuroscience, virtual reality technology, and electroencephalography (EEG) to analyse brainwaves, the study not only circumvents the limitations of conventional research methodologies but also significantly contributes to the advancement of knowledge in the fields of consumer behaviour, decision-making processes, and the potential applications of virtual environments (Wiścicka – Fernando et al., 2023).

While emotions significantly influence consumer purchasing decisions, analysing them remains a challenge. They are often assessed based on consumers' declarative statements, which do not always reflect actual reactions. Advances in technology and the increasing application of neuroscience beyond medicine enable a more precise study of consumer behaviour. Examples include measuring

physiological reactions to purchase stimuli, tracking facial expressions to analyse emotions, assessing sentiment based on text, and employing neuroscience techniques to compare the emotional aspects of behavior (Ceccacci et al., 2018; Fici et al., 2024; Kundra et al., 2024; Özmen et al., 2023).

As mentioned, electroencephalography (EEG) has proven to be a valuable tool in neuroscience for assessing the emotional states of research participants. For example, studies conducted by McMahan (McMahan et al., 2015) and Petrantonakis (Petrantonakis & Hadjileontiadis, 2010) utilised the Arousal-Valence Index to quantify emotional experiences. This index defines a two-dimensional emotional space, where one axis represents Arousal and the other represents Valence. Arousal is conceptualised as the degree of emotional intensity, ranging from calm to highly aroused states, while Valence is used to classify emotions along a continuum from positive to negative (Russell & Barrett, 1999). This conceptual framework is visually depicted in Figure 1, where the interaction between Arousal and

Valence allows for a more nuanced understanding of emotional states, making it possible to distinguish between a wide range of emotional experiences and their respective neural correlates. Such measurements offer a deeper insight into the complex nature of emotional processing and how it can be represented through brain activity.

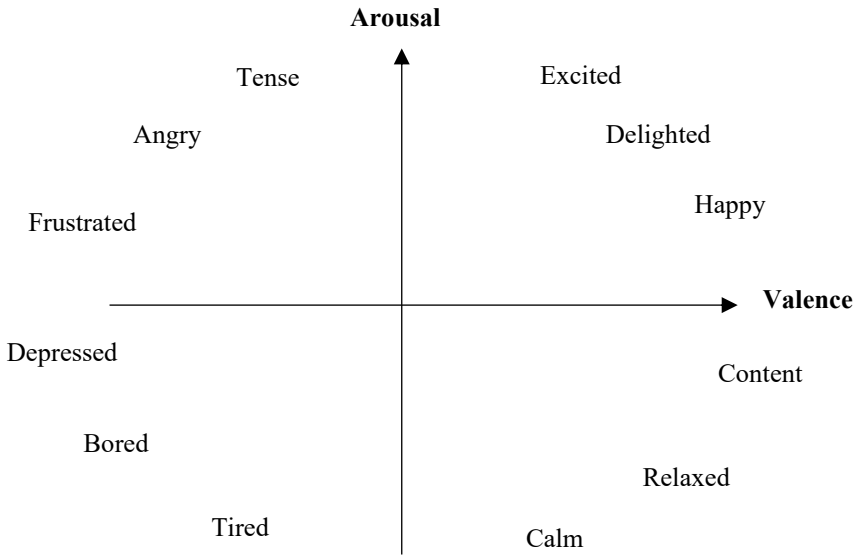

Figure 1. Emotional states and their positions on the Valence/Arousal plane
Source: own elaboration.

Emotions play a vital role in conveying implicit and explicit information, enhancing rapid and optimal decision-making processes (Bechara & Damasio, 2005). Emotions, as a form of influence, can exert a powerful yet fleeting impact on an individual's cognitive and behavioural responses (Frijda, 1994). This underscores the importance of examining the emotional dynamics involved in consumer decision-making, particularly in shopping. Understanding the emotional factors accompanying consumer choices, including those related to sustainable products, is essential for gaining insights into consumer behaviour. Exploring the emotional responses tied to product interest, especially concerning eco-friendly and sustainable products, can reveal key drivers of consumer preferences and inform strategies to enhance consumer engagement with the products.

3. METHODOLOGY

3.1. Materials and Methods

Figure 2 presents the methodology used in the study. A total of 34 participants were selected based on their geographical location. The research question formulated was: What is the role of packaging in consumers' purchasing decisions within a specific virtual reality environment?

Figure 2. Research procedure
Source: own elaboration.

The existing Enzone supermarket shop was utilised and adapted for virtual reality (VR) testing using the Unity engine (*Asset Store*, 2017). This adaptation aimed to accurately reflect the shopping environment for fast-moving consumer goods (FMCG), aligning with consumers' experiences in the real world. Before the study began, participants were informed about its nature and voluntarily consented by signing a consent form. The research received ethics committee approval to proceed with the study.

Participants were shown a brief instructional video demonstrating navigation techniques, item selection, and the overall purpose of the simulation: participating in everyday shopping tasks. Afterwards, the subjects had the opportunity to familiarise themselves with virtual navigation before starting the survey. This preliminary test allowed for the adaptation of the study format and protocol (Li et al., 2020).

The participant preparation process for the study involved donning an EEG (electroencephalograph) cap (Enobio 20), attaching electrodes to the scalp, and wearing a virtual reality headset (HTC Vive Pro Eye). The study utilised a cap equipped with 20 electrodes placed at specific locations, including P7, P4, Cz, Pz, P3, P8, O1, O2, T8, F8, C4, F4, Fp2, Fz, C3, Fp1, T7, F7, and Fpz. These electrodes were positioned according to the 10 -20 system, a widely recognised EEG electrode placement standard. Moistening the electrodes was necessary to ensure optimal conductivity. To verify the contact quality between the EEG electrodes and the scalp, impedance values were measured using Neuroelectrics® Instrument Controller (NIC2) software. The sampling frequency was 500 Hz.

Participants were then given 20 minutes to engage in their daily shopping experience in virtual reality (Beniczky & Schomer, 2020). Before entering the VR shop, respondents viewed a black screen for 60 seconds, which was aimed at calming their emotions and brain waves. The introduction of a time limit was driven by participants' well-being and health considerations.

The virtual shop was divided into three lanes: the first contained fruit and vegetables, with dairy and meat at the end; the second contained pasta, sweets, and seafood; and the third contained bread. Figure 3 illustrates the store’s visualisation in virtual reality.

In the first stage, data was collected from an event file that included information on each product picked up, the time the product was held, and the decision to place it in the basket. It should be noted that each product was assigned to two categories: packaged and unpackaged. Simultaneously, the product's duration in the respondents' hands was used to determine their purchase choices. Subsequently, emotional level indices were calculated based on the Arousal and Valence indices in Table 1. These specific indices were selected for analysis as they are helpful in examining the decisions made by consumers in simulations (Moses et al., 2018; Szymkowiak et al., 2021).

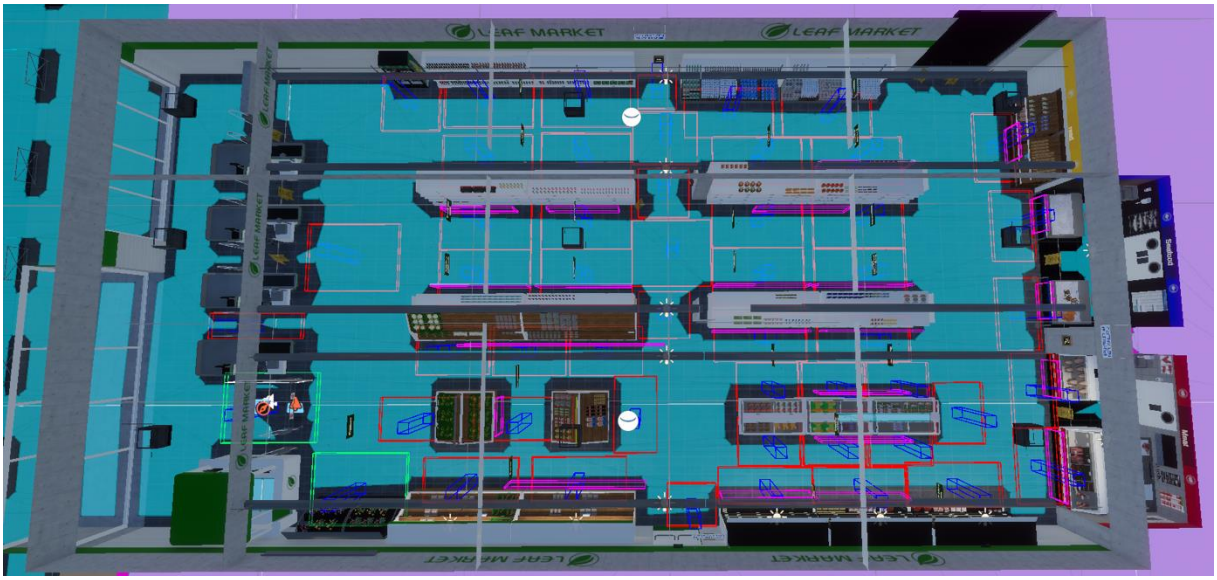

Figure 3. Virtual store plan
Source: own elaboration.

Table 1. Description of formulas used in the study

Index name	Formula	Calculation method
Arousal	$\frac{F3_{Beta}+F4_{Beta}}{F3_{Alpha}+F4_{Alpha}}$	Recording the values of electrodes F3 and F4
Valence	$\frac{F4_{Alpha}}{F4_{Beta}} - \frac{F3_{Alpha}}{F3_{Beta}}$	Recording the values of electrodes F3 and F4

Source: own elaboration.

In the ensuing analyses, Pearson's correlation coefficient was used to ascertain the relationship between the average holding time of a product category and emotion. Analysing this correlation can provide valuable insights for companies. For instance, an extended holding time for a product may indicate its convenience or usability, which could affect users' physical safety.

4. RESULTS

The data were analysed using MATLAB R2019a. The analysis of the electroencephalogram (EEG) signal began with bandpass filtering to eliminate power grid interference, specifically frequencies exceeding 50 Hz. Additionally, the signal was denoised and filtered using the Fieldtrip library. The subsequent analysis of the spectral EEG signal utilised a Morse wavelet, which calculated the average peak frequency of the half-second window (Wachowiak et al., 2018). However, the signal was divided into the corresponding bands – alpha2 (7-13 Hz) and beta3 (13-25 Hz) to calculate alpha and beta frequencies (Tsipouras, 2019).

In the study presented in this paper, indicators were used to determine the emotions experienced by respondents while holding a particular product. In this context, four groups of emotions were identified: satisfaction (positive values of the Arousal and Valence indicators), frustration (positive value of the Arousal indicator and negative value of the Valence indicator), boredom (negative values of the Arousal and Valence indicators), and a feeling of security (negative value of the Arousal indicator and positive value of the Valence indicator).

The recorded time of holding the product and the emotional responses were noted from the moment the product was picked up until it was returned to the basket. Table 2 presents the time, expressed in seconds, that subjects held different products in their hands, categorised into those with and without packaging.

Table 2. Holding time of the product

In the packaging		Without packaging	
Product name	time [s]	Product name	time [s]
Melon	2,59	Lettuce	3,35
Asparagus	3,06	Pineapple	2,44
Carrots	1,51	Leek	8,17
Garlic	4,85	Orange	3,24
Apple	2,76	Courgette	3,84
Salmon fillet	3,75	Strawberries	2,71
Onion	7,04	Tomato	3,73
Cod	4,42	Salmon	5,00
Prawns	6,29	Banana	4,50
Potatoes	2,70	Red pepper	4,04
Meat	3,61		
Average time [s]	3,87	Average time [s]	4,10

Source: own elaboration.

The average time a product is held in hand for packaged items was 3.87 seconds, compared to 4.10 seconds for unpackaged items. Among the unpackaged products, leeks held the longest, at 8.17 seconds, while in the packaged category, shrimp had the longest holding time at 6.29 seconds. Conversely, the products held the shortest were strawberries, which lasted a mere 2.71 seconds without packaging, and carrots, held for only 1.51 seconds when packaged. This variation in holding time suggests that packaging and product type can significantly influence consumer engagement and interest during the shopping process. The final stage of the study was to determine the emotions experienced when holding the product, both with and without packaging (Table 3).

Table 3. Emotions when holding a product in your hand

In the packaging			Without packaging		
Product name	**Stimulation**	**Valencia**	**Product name**	**Stimulation**	**Valencia**
Melon	-0,32798	-0,09773	Lettuce	-0,22659	-0,03798
Asparagus	-0,51801	-0,05289	Pineapple	-0,25376	-0,00304
Carrots	-0,44548	-0,10646	Leek	-0,3081	-0,04458
Garlic	-0,68316	-0,52225	Orange	-0,24402	-0,05279
Apple	-0,39007	-0,06955	Courgette	-0,28833	-0,03462
Salmon fillet	-0,09826	-0,01531	Strawberries	0,381502	-0,23545
Onion	-0,3565	-0,052	Tomato	0,263152	0,15266
Cod	-0,21267	-0,13831	Salmon	1,259015	0,018009
Prawns	-0,43872	0,782404	Banana	0,011121	0,000628
Potatoes	-0,07982	0,029523	Red pepper	0,139198	0,002149
Meat	0,560304	0,008285			

Source: own elaboration.

The results reveal that a significant majority of products (72%) with packaging mainly evoke emotions linked to a sense of security. In contrast, only 50% of unpackaged products elicit similar sentiments. Satisfaction was the second most prevalent emotional response for unpackaged products, observed in 40% of cases. However, this figure was considerably lower for packaged products, at just 9%. These findings suggest that packaging plays a substantial role in shaping consumers' emotional responses, with packaged products predominantly associated with feelings of security. At the same time, unpackaged items tend to evoke more satisfaction-related emotions.

Furthermore, correlation coefficients were calculated between the variables Arousal and Valence and the product held in hand, depending on whether the product was packaged or unpackaged. The results of this study are presented in Table 4.

Table 4. Pearson correlation coefficient between emotions and physically holding a product in the hand

Type of product	Arousal	Valence
In the packaging	0,254739139	-0,0586
Without packaging	0,185814189	0,099528

Source: own elaboration.

The correlation coefficient is a numerical indicator that quantifies the strength and direction of the relationship between the variables under examination. In the case of both packaged and unpackaged products, Arousal demonstrates a stronger correlation with holding the product in hand compared to Valence. Moreover, for packaged products, the correlation between Arousal and holding the product is more pronounced than that for unpackaged products. This indicates that the emotional intensity associated with Arousal significantly influences the consumer's interaction with packaged items.

5. DISCUSSION

The findings from this study offer valuable insights into the role of emotions in consumer decision-making, as well as the impact of packaging on emotional responses. It was noted that emotions play a crucial role in guiding both implicit and explicit decisions, especially in fast-paced, high-stakes situations like shopping. As previous research has indicated, emotions are a significant, though fleeting, influence on consumers (Bechara & Damasio, 2005; Frijda, 1994). In this context, examining the emotional responses connected to product interest is essential, especially when consumers are choosing between sustainable and traditional products. The emotional aspect of consumer decision-making can significantly impact purchasing choices, particularly regarding sustainability, emphasising the necessity for further investigation into how emotions influence consumer preferences for eco-friendly products.

One of the key findings from the data was the role of packaging in influencing emotional responses. Packaged products were found to elicit a stronger sense of security, with 72% of these items evoking emotions related to security, compared to just 50% for unpackaged products. This aligns with the notion that packaging can symbolise reliability and trustworthiness for consumers, providing psychological reassurance that is often absent with unpackaged items. The emotional impact of packaging extends beyond just the security aspect, as it was observed that packaged products predominantly evoke Arousal, indicating heightened emotional intensity, which may affect consumer decision-making processes more strongly than Valence (the positive or negative nature of the emotion). This contrasts with unpackaged products, where satisfaction-related emotions were more common but associated with lower emotional intensity.

The correlation analysis revealed that Arousal demonstrated a stronger correlation with holding a product in hand than Valence, regardless of whether the product was packaged or unpackaged. This suggests that emotional intensity, rather than the positivity or negativity of the emotion, plays a more significant role in the consumer's interaction with the product. Notably, the correlation between Arousal and holding the product was more pronounced for packaged products than for unpackaged items, indicating that packaging enhances consumers' emotional engagement. This insight is crucial for marketers and product designers as it implies that packaging can strategically evoke specific emotional responses, potentially influencing purchasing behavior (Liao et al., 2015).

Additionally, the differences in product holding times provide further evidence of the emotional impact of packaging. Packaged products like shrimp were held for a longer duration (6.29 seconds) compared to unpackaged items such as leeks (8.17 seconds). This extended engagement with packaged products suggests that packaging can capture consumers' attention more effectively, prolonging their interaction with the product. Conversely, unpackaged products like strawberries were held for a significantly shorter period (2.71 seconds), which may indicate a lack of emotional connection or perceived value compared to their packaged counterparts. This may also be because longer holding

times for packaged products result from a greater focus on the message displayed on the package. It takes a bit longer to decode than an unpackaged product.

6. CONCLUSION

This study aimed to identify the emotions consumers experience when choosing packaged or unpackaged products. The analysis showed that both types of products are linked to emotions; however, packaged products tend to evoke these emotions more often.

The first aspect is the relationship between packaging type and the emotions evoked. It turns out that products with packaging evoke greater arousal than those without. This finding may be crucial for companies planning to introduce new products or modify existing ones, especially in encouraging consumers to interact with the product in-store. Greater arousal may translate into increased interest and willingness to purchase the product.

However, product holding time should also be noted. Despite the greater arousal induced by packaged products, the average holding time is shorter than for unpackaged products. This is likely due to differences in how the product is presented and accessed. Packaging may lead to quicker interaction with the product, thereby reducing hand-holding time. Thus, the question arises as to what actually determines the holding time of packaged products. One explanation is that the factors determining sustainability influence consumer reactions. Therefore, it will be interesting to conduct research on emotions related to the identification of packaging for the sake of sustainability (Kardos et al., 2019; Lombardi et al., 2024).

Another important aspect is the emotional value of the products (Valencia) for the consumers surveyed. The analysis results indicate that packaging does not significantly impact the emotional value of a product. Both packaged and unpackaged products evoke similar levels of emotion, whether positive or negative. These findings did not align with the results obtained by other researchers (Carroll et al., 2022). According to the authors, this may be due to the unfamiliarity of the brands offered in the studied virtual shop. It would be interesting to research the impact of a product that is already familiar to the consumer or a well-known brand. Familiar and recognisable products may evoke a different emotional response time. The placement of products featuring recognisable brands could provide additional value. However, it's important to note that these activities require obtaining a license and the consent of the brand owner, and in the case of grocery stores, the number of brands is quite extensive. This could also lead to increased costs for such research.

Although the EEG tool provides a wealth of real-time data, it still faces challenges in analysis and proper interpretation, as it is a relatively new area of research. The complexity lies in capturing consumers' emotions since the device primarily detects physiological reactions rather than specific emotions. For this purpose, biometric measurements, such as facial expression analysis, would need to be conducted.

The study's authors argue that in today's fiercely competitive market, characterised by many products, it is essential to examine emotions individually and their impact on purchasing decisions, particularly since emotions play a crucial role in influencing choices within the fast-moving consumer goods (FMCG) sector. Furthermore, sudden environmental shifts, such as a pandemic or geopolitical instability in Europe, can affect emotions, including consumers' sense of security, impacting their decisions.

Advanced technology allows for precise monitoring of emotions and the situations in which they occur. Access to such data enables managers to take more effective actions, such as optimising shop layout, enhancing product presentation, and improving customer communication. Additionally, the survey results can indicate which actions should be taken to reduce negative emotions and transform them into positive ones.

Additionally, limited uninterrupted shopping time affects consumers. While shopping in physical stores, they encounter more environmental stimuli and unexpected situations. Furthermore, social aspects, such as meeting a friend in the store, can influence consumer behaviour and decisions.

Another limitation of the research conducted is the scope of the study, which was only a pilot study. In order to obtain a representative research sample, it is necessary to expand the sample further.

The authors believe that additional research into the impact of packaging on consumer emotions is crucial for a better understanding of consumer processes and for designing packaging that can effectively shape positive shopping experiences.

The study's findings could be valuable to marketers, enabling them to create more personalised shopping experiences by better understanding and interpreting consumers' emotions. Additionally, these insights can guide decisions to improve products that evoke negative emotions, although further qualitative research to uncover the underlying problem would be necessary. Moreover, big data analytics can enhance customer experience management at the point of purchase, but this process would require integrating artificial intelligence tools.

Funding: Co-financed by the Minister of Science under the "Regional Excellence Initiative".

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