“The role of consumers’ visual attention stimuli in advertising: traditional and neuromarketing research perspectives”

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ARTICLE INFO	Jūratė Banytė, Ieva Pūkienė and Greta Dargytė (2025). The role of consumers’ visual attention stimuli in advertising: traditional and neuromarketing research perspectives. *Innovative Marketing* , *21*(1), 296-313. doi:10.21511/im.21(1).2025.24
DOI	http://dx.doi.org/10.21511/im.21(1).2025.24
RELEASED ON	Wednesday, 19 March 2025
RECEIVED ON	Thursday, 20 June 2024
ACCEPTED ON	Monday, 03 March 2025

JOURNAL	"Innovative Marketing "
ISSN PRINT	1814-2427
ISSN ONLINE	1816-6326
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
61	7	4

BUSINESS PERSPECTIVES

LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine

www.businessperspectives.org

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THE ROLE OF CONSUMERS' VISUAL ATTENTION STIMULI IN ADVERTISING: TRADITIONAL AND NEUROMARKETING RESEARCH PERSPECTIVES

Abstract

This research aims to reveal the role of consumers' visual attention stimuli in advertising from traditional and neuromarketing research perspectives. This study examines six stimuli of consumers' visual attention, which are divided into three groups – complexity of advertising, reflection of reality in advertising, and attributes of advertising content. A conceptual model was developed, encompassing the relationships of the identified stimuli with consumers' visual attention (via gaze fixation duration and frequency) and with consumers' attitudes toward advertising. The model was empirically tested using survey questionnaires and an eye-tracking system to analyze a specific food advertising case. A survey involving 403 respondents in Lithuania found that a statistically significant relationship exists between all visual attention stimuli and attitudes toward advertising, except for advertising authenticity (p-value>0.05). However, the results of the linear regression confirm only instrumental attributes in advertising content (R2=0.294) and higher design complexity (R2=0.230) positively influence on consumer attitudes toward advertising. In the neuromarketing study with 26 participants, a significant relationship was revealed between both dependent variables (the duration and frequency of participants gaze) and visual attention stimuli in food advertising. ANOVA analysis results show longer gaze fixation duration for simple, clear designs, manipulative advertising, symbolic content attributes; more frequent gaze fixation for advertising reflecting high functional and design complexity, authenticity, and instrumental content attributes. However, no relationship was found between gaze variables and consumer attitudes, except for authentic advertising, where higher greater gaze frequency was linked to a more positive attitude.

Keywords visual attention, stimuli, advertising, consumer attitude, neuromarketing, eye-tracking system

JEL Classification M37, M31, M30

Received on: 20th of June, 2024
Accepted on: 3rd of March, 2025
Published on: 19th of March, 2025

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Conflict of interest statement:
Author(s) reported no conflict of interest

INTRODUCTION

A highly competitive goods and services market, along with an overcrowded communication space, encourages the search for advertising methods that are effective from the consumer's perspective and efficient for the company. Global advertising spending is expected to increase by 6.8 percent in 2025 to $1.1 trillion (GroupM, 2024). However, large amounts of money spent on advertising do not necessarily guarantee its success. For information to influence consumer behavior, it first needs to be noticed, making consumer visual attention the key element initiating the decision-making process (Khachatryan et al., 2018). Due to its characteristic of being easily memorable and intensely stimulating consumer attention, visual advertising content plays an especially important role. Its usage has become a leading trend since 2018, with 69 percent of marketers consider visual elements essential in their strategies (Marketing Digi Book, 2020).

http://dx.doi.org/10.21511/im.21(1).2025.24

The need for effective advertising for consumers and businesses drives continuous scientific research. Consumer behavior researchers often focus on visual content, which has many advantages, as well as on consumer visual attention, which is important for processing this content (Huddleston et al., 2015; Zhou et al., 2021). Yet, visual advertising content is also purposefully selected (Moore & Zirnsak, 2017), as consumers typically pay attention to information related to the task at hand (Florack et al., 2020). In this case, not only consumer visual attention but also the attitude toward advertising and the reasons for its formation become important. As the volume of messages reaching consumers grows, it is crucial to investigate consumer visual attention stimuli and their connections with consumers' attitudes toward advertising. However, traditional research in this area has limitations, underscoring the need for findings from neuromarketing research. Recent studies on consumer visual attention stimuli are mostly based only on traditional (Kusumasondjaja et al., 2019) and less frequently solely on neuromarketing (Boscolo et al., 2021) research with the primary focus on consumers' self-reported attitudes, while less attention is given to exploring subconscious perceptions. This highlights the urgent need to integrate both approaches in research and practice, which can yield more significant, accurate, and complementary results in enhancing advertising effectiveness, improving consumer engagement, and developing a deeper understanding of decision-making processes.

1. LITERATURE REVIEW

Based on the literature analyzing the consumers' visual attention and its impact on consumer behavior, it can be stated that areas particularly frequently studied include the influence of visual attention on consumer intention to buy (Shukla et al., 2023; Suci et al, 2021; Donato & Adıgüzel, 2022), preference formation among choices (Peschel et al., 2019; Zuschke, 2020; Yu et al., 2021), or willingness to pay more (Suci et al, 2021). Evaluating the visual stimuli that can provoke desired consumer behavior as studied, researchers notably focus on the retail environment (Soomro et al., 2017; Kim & Lee, 2021), product packaging (Shukla et al., 2023; Yu et al., 2021), labels (Gómez-Carmona et al., 2021; Peschel et al., 2019), and similar. However, given the modern, abundant, and diverse communication space, it is necessary to seek effective advertising methods and ways of expression as the primary channel for conveying information about goods.

Consumer attention can be not only automatic, generating spontaneous behavioral tendencies, but also interacting with cognitive processes such as perception, memory, or behavioral planning (Zimmermann et al., 2015). Furthermore, attitude, by its fundamental nature, integrates cognition and emotions into an evaluative act through which the conceptualization of individual objects occurs in consciousness (Crano & Prislin, 2008). Combining these theoretical perspectives, it is important to distinguish two groups of stimuli emphasized by researchers that can influence consumer attitudes toward advertising (Deng & Sloutsky, 2016). The first group includes analytical stimuli that form during the cognitive process and depend on the task (Gençer & Yıldırım, 2021), while the second group encompasses fast and unprocessed external stimuli (Huddleston et al., 2015). This suggests that consumer attitudes toward advertising may be influenced not only by consumer visual attention stimuli examined in studies such as ad size, color, or text style, but also by its ability to resonate with consumer needs, values, and other formative elements of attitude. However, the research on the impact of these attention stimuli associated with advertising, known as analytical and formed through the cognitive process, remains particularly scarce. This research aims to respond to the results of relevant studies conducted so far, concluding that it is meaningful to include in the main group of independent variables such consumer visual attention stimuli depicted in advertising as: complexity of advertising, reflection of reality in advertising, and attributes of advertising content.

According to Al-Dmour et al. (2013), the effectiveness of advertising depends on its visual order. Other authors suggest that advertising should clearly convey essential information, which can positively influence consumers' visual attention and facilitate easier perception of the observed object (Favier et al., 2017). Pieters et al. (2010) provided a more detailed explanation of the complexity

of visual advertising, distinguishing two categories: functional and design complexity. Functional complexity of advertising includes the density and arrangement of visual elements, while design complexity relates to the representation of advertising objects. According to researchers, these categories of advertising complexity can have significant but different impacts on consumer attitudes toward advertising. It is noted that functional complexity is negatively associated with consumer visual attention and attitudes toward advertising, whereas design complexity affects these variables positively. Therefore, in the conceptual model being developed, the categories of advertising complexity – functional and design complexity – are identified as distinct groups of consumer visual attention stimuli.

Another important aspect of advertising noted in previous research on consumer attitude analysis is the feature or attention stimulus of advertising authenticity. According to Lazard et al. (2020), the findings of the study suggest that consumers rely on images shown to them even when they are aware that they are manipulative (not entirely truthful) in situations requiring quick decisions. However, it is important to assess the capabilities and knowledge of the modern consumer (Cornelis & Peter, 2017); thus, intentionally misleading, not entirely informative – manipulative – advertising, according to Munusamy et al. (2007), can also have a negative impact on consumer attitudes toward advertising. Based on these insights, the consumer visual attention stimuli related to reflection of reality in advertising in the conceptual model are categorized into two groups – advertising authenticity (unmodified advertising) and it's opposite – advertising manipulativeness.

In summarizing findings from previous scientific studies (Eze & Lee, 2012; Kocaömer et al., 2021; Herrando & Martín-De Hoyos, 2021; Devkota et al., 2021), it can be observed that researchers often examine factors that may influence consumer attitudes toward advertising, such as informativeness of advertisements, economic benefits, social integration/image, materialism, hedonism/pleasure, and others. This research relies on the insight that these aspects can be analyzed based on the functions they fulfill in shaping consumer attitudes. Based on LeBoeuf and Simmons (2010), it is concluded that the main difference in consumer attitudes lies in their alignment with instrumental (utilitarian) – directed towards tangible rewards – or symbolic – expressive of identity and values – attitude functions. The orientation towards these functions is formulated as an independent variable group, referred to as attributes of advertising content, which visually reflect instrumental or symbolic consumer attitude functions in advertising. In the former case, advertisements typically highlight the perceived benefits of a product or service (Lin et al, 2020). Instrumental advertising attributes related to utility and functionality positively correlate with consumer attitudes (Moon et al., 2017). Such advertising messages aim to persuade consumers by appealing to their logical convictions and thereby activating utilitarian-oriented consumer attitude functions (Kim et al., 2020). Meanwhile, the symbolic function is closely related to active consumer self-expression (Yang, 2019). It represents a symbolic encouragement for consumers to purchase a product or service due to the emotions it evokes, influencing consumer attitudes toward advertising (Kim et al., 2020). Symbolic advertising attributes related to values and self-expression also positively correlate with consumer attitudes (LeBoeuf & Simmons, 2010).

To comprehensively explore the relationships between consumers' visual attention, its stimuli, and attitudes toward advertising, it is essential to consider the findings of researchers who have studied consumers' visual attention within the field of neuromarketing. According to their studies, certain characteristics of advertising can influence the duration and frequency of consumer gaze. In this context, it is important to highlight the observation by Higgins et al. (2014) that efforts to prolong overall gaze time on advertising should focus on reducing visual clutter and optimizing the arrangement of details. This indicates a positive relationship between advertising clarity and, conversely, a negative association with high functional complexity affecting consumer attention. The expression of design complexity also remains relevant in terms of attention – longer viewing times and frequencies are observed with advertising characterized by original, creative, artistic elements rather than conventional ones. There is considerable discussion among researchers regarding specially embellished advertising versus

http://dx.doi.org/10.21511/im.21(1).2025.24

those depicting reality. According to Becker et al. (2019), portraying reality in advertising may be more beneficial for strong brands in capturing consumer attention. However, many authors emphasize the significance of visual attractiveness as a critical aspect of advertising (Boerman et al., 2011). According to researchers, it attracts more consumer attention and has the capability to establish or strengthen the connection between a brand and the consumer (Kujur & Singh, 2020). To explain the relationship between gaze duration and frequency with the depiction of instrumental or symbolic attitude functions in advertising, it is meaningful to highlight the study by Zhou and Xue (2021). According to their conclusions, consumer-oriented images that emphasize emotional engagement and product attributes promote a higher level of consumer visual attention.

It is important to emphasize that the variables of consumer visual attention – gaze duration and gaze frequency – can be significantly related not only to the discussed stimuli but also to consumers' attitudes toward advertising. According to the scientific literature, visual attention, such as the spatial distribution of eye fixations, influences information processing and preference formation (Florack et al., 2020), and potentially consumer attitudes toward advertising as well. Mele et al. (2014) revealed a reciprocal relationship. They found that participants' gaze lingered longer in those visual areas that did not match their attitudes. These conclusions were supported by other studies, indicating that the complexity of visual and cognitive processing modulates gaze duration – attention processing or cognitive load increases when attributes do not align with presumed biases. Meanwhile, based on Onisor and Ionita (2020) study, arousing irritating emotions negatively affects consumer attitudes, resulting in shorter visual attention to advertising. There is a significant relationship between engaged consumer visual attention and consumer preferences when choosing a product, thus correlating with a more positive attitude toward one of them, as evidenced by the analysis of gaze frequency (Behe et al., 2015). Therefore, despite this measure often being associated with areas of impact such as brand recognition, this research maintains that including the study of gaze frequency can significantly expand its scope. Revealing the expression of gaze duration and frequency as the most crucial variables of consumer visual attention suggests the need for integrating traditional and neuromarketing research methods. Traditional survey-based marketing research provides the opportunity to reach a large number of respondents and allows for generalizing research findings. However, considering that consumer visual attention influences not only information processing but also the evaluation of stimuli, which can affect the formation of certain preferences (Florack et al., 2020), there arises a need for using neuromarketing research equipment – gaze tracking system. Presumably, such a system would not only uncover the associations between stimuli related to advertising with the consumer visual attention (gaze concentration and frequency) but also enhance conclusions about the associations of consumer visual attention with consumer attitudes toward advertising.

Summarizing the theoretical assumptions about the relationships between consumers' visual attention, its stimuli, and attitudes toward advertising, the study aims to reveal the role of consumers' visual attention stimuli in advertising from traditional and neuromarketing research perspectives. Therefore, from traditional research perspectives, the following hypotheses are formulated:

H1a: The functional complexity of advertising negatively affects consumer attitude toward advertising.

H1b: The design complexity of advertising positively affects consumer attitude toward advertising.

H2a: Authentic advertising has a positive impact on consumer attitude toward advertising.

H2b: Manipulative advertising has a positive impact on consumer attitude toward advertising.

H3a: Instrumental content attributes of advertising have a positive impact on consumer attitude toward it.

H3b: Symbolic content attributes of advertising have a positive impact on consumer attitude toward it.

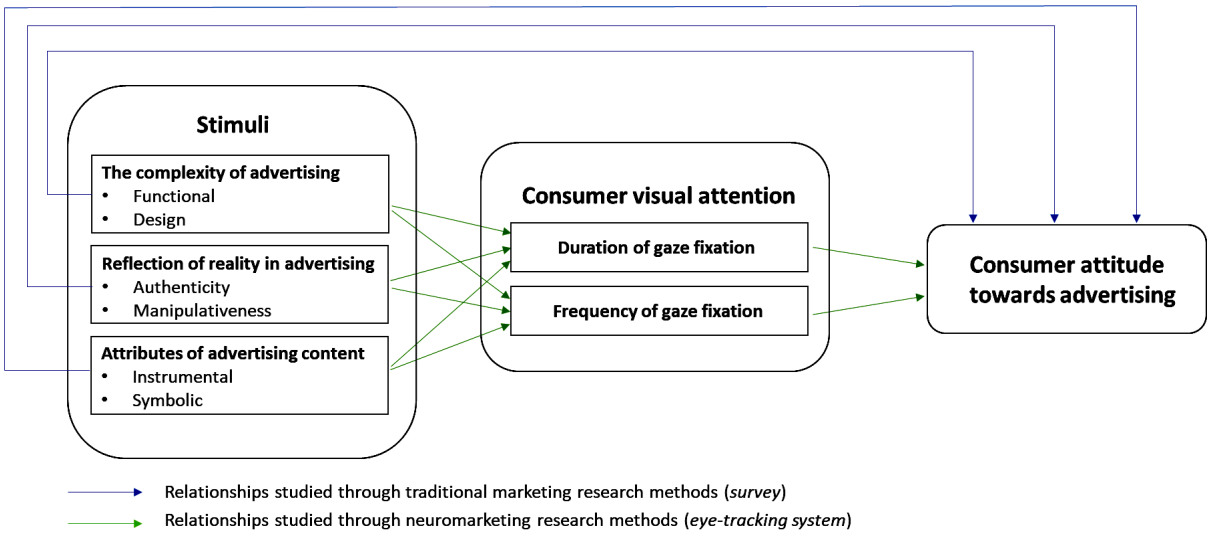

Figure 1. Conceptual model

The first group of hypotheses reflects the impact of visual attention stimuli related to advertising complexity on consumers' attitudes towards advertising. The next two hypotheses are aimed at testing the influence of the reflection of reality in advertising, while the third group of hypotheses seeks to reveal the impact of attributes of advertising content on consumers' attitudes towards advertising. The hypotheses *H1a*, *H1b*, *H2a*, *H2b*, *H3a*, *H3b*, which will be tested through survey methods, while a neuromarketing study will be used to examine other relationships between variables. This is reflected in the conceptual model presented (Figure 1).

Figure 1 illustrates the conceptual model, suggesting that three key groups of visual consumer attention stimuli – complexity of advertising, reflection of reality in advertising, and attributes of advertising content – are essential in advertising, with their role primarily manifested through their effect on consumers' attitudes toward advertising. The key studies that support these relationships are those by Pieters et al. (2010), Lazard et al. (2020), Moon et al. (2017), and Yang (2019). Additionally, identifying the role of visual consumer attention stimuli in advertising requires neuromarketing, particularly eye-tracking research, which measures two key parameters of visual attention: gaze duration and frequency. The most relevant studies supporting these theoretical propositions are those by Higgins et al. (2014), Behe et al. (2015), Florack et al. (2020), and Zhou and Xue (2021).

2. METHODOLOGY

The empirical testing of the model chose food advertising as a case study. This choice is primarily justified by the saturated and competitive food market, where standing out is particularly challenging (Gidlöf et al., 2017). Considering studies in social psychology, neuroscience, and other fields, food advertising often has a subtle yet potentially wide-ranging influence on consumer behavior in the food category (Vukmirovic, 2015). There are numerous factors influencing consumer attitudes toward food advertising, therefore it is meaningful to examine the impact of the stimuli identified in the research. Based on the literature analysis, it is concluded that these stimuli can be related to consumer visual attention and influence consumer attitudes toward advertising. For this reason, all food advertising examined in the research represent distinct stimuli or are contrary for comparison purposes – they do not reflect the significant stimuli in the research context. To ensure consistency and reach a broader audience of respondents, static food advertising has been chosen for analysis.

Considering the aim of this paper, the theoretical outcomes discussed in the literature review, and the finalized conceptual model, the research is structured into two stages. To achieve the first research objective – identifying which visual attention stimuli in static food advertising are most significant to consumers and how they influence atti-

http://dx.doi.org/10.21511/im.21(1).2025.24

tudes towards the advertising – a survey was conducted. An online survey method was employed, utilizing a non-probability convenience sampling approach, which, while limiting sample representativeness, is suitable for empirical testing. The sample size was calculated based on Lithuanian Department of Statistics data (2023), showing ~2.8 million residents aged 18 and older. A sample size calculator (Calculator.io, 2024) set at a 95% confidence level and a 5% margin of error indicated a sample of 385 respondents. Initially, 423 respondents in Lithuania were surveyed, but 20 (4.7%) answered negatively to the screening question: "Do you notice food advertising?" (☐ Yes ☐ No) and were excluded from the study. The data from 403 respondents were used for further analysis. The survey was conducted voluntarily and anonymously, and the questionnaire is considered reliable. The survey link was shared via Facebook, Instagram, and personal contacts database. The questionnaire was developed from scientific studies and included redesigned and modified visual advertising materials based on the literature review and research hypotheses.

The statements describing the stimuli of consumer visual attention (8 items), namely the complexity of advertising – unctional and design – were adapted from Pieters et al. (2010), Al-Dmour et al. (2013), Kusumasondjaja and Tjiptono (2019), Shukla et al. (2023), Lazard and Mackert (2014). Scales designed to measure the reflection of reality in advertising statements (8 items), such as authenticity and manipulativeness, were based on the research of Cornelis and Peter (2017), Eze and Lee (2012), Pomering et al. (2013), Lazard et al. (2020). Statements for the scales of the attributes of advertising content (8 items) – instrumental and symbolic – were adapted from Lin et al. (2020), Murphy and Narkiewicz (2010), Kim et al. (2020), Fransen et al. (2015). To measure the construct of consumer attitude towards advertising (4 items), the research by Raziq et al. (2018) citing Yagci et al. (2009) was used (total 28 items). A 5-point Likert scale (from 1 – "strongly disagree" to 5 – "strongly agree") was used to measure all constructs related to consumer visual attention stimuli and consumer attitudes towards advertising. All measurement scales presented in the questionnaire to assess the research constructs are reliable. The reliability was determined using Cronbach's alpha coefficient. The overall Cronbach's alpha coefficient for the questionnaire is 0.914. The lowest Cronbach's alpha coefficient (0.856) was found in the case of functional advertising complexity. Considering that all coefficients of the scales in the study exceed the required threshold of 0.7 (Pukėnas, 2009), it is concluded that the questionnaire is reliable, and therefore, the data obtained can be used for further statistical analysis.

The final questions of the questionnaire aimed to determine the demographic characteristics of the respondents – age, gender, and education – based on the research material of Milaković and Mihić (2015). 70.2 percent of the individuals in the study were women. The majority of participants represented the 18-40 age group (69.7%) and had higher education (59.1%) (see Table 1).

Table 1. Demographic characteristics of survey participants

Distribution	Respondents	Percent, %
Total	403	100
By gender		
Women	283	70.2
Men	120	29.8
By age		
18-25 years	175	43.4
26-40 years	106	26.3
41-55 years	84	20.8
56 years and older	38	9.4
By education		
Primary	58	14.4
Secondary	69	17.1
Vocational	6	1.5
Higher vocational	32	7.9
Higher education	238	59.1

Linear regression analysis was conducted to test the research hypotheses. It was applied to investigate the impact of consumers' visual attention stimuli reflected in food advertising on consumer attitudes towards advertising.

To achieve the second research objective – determining the relationships between stimuli in static food advertising and visual attention variables, such as gaze duration and frequency, and how these relate to consumer attitudes towards the advertising – a neuromarketing study was conducted. The sample size for the neuromarketing study was based on Bercea's (2013) work, which

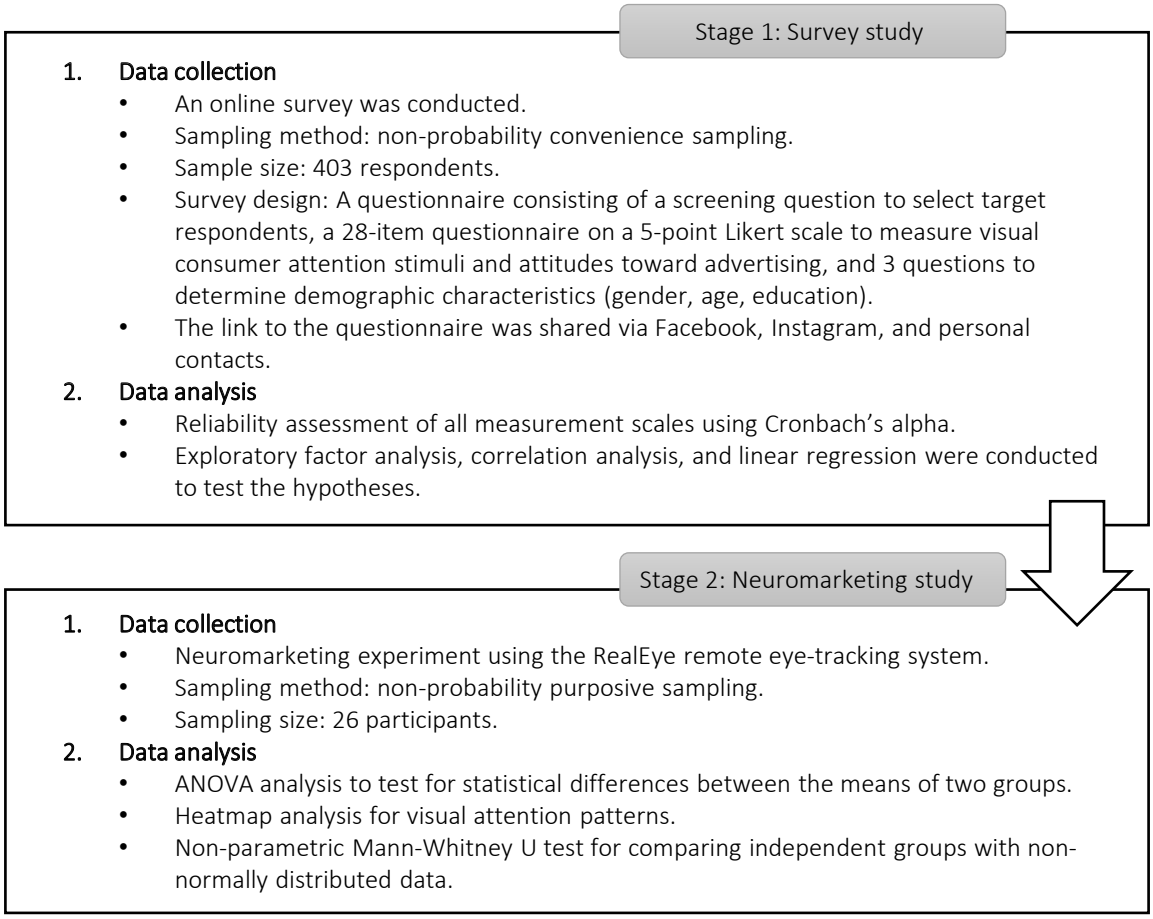

Figure 2. Summarized research logic

highlights that neuromarketing provides insights surpassing traditional marketing methods. It recommends including at least 15-20 participants for studies of this type. Additionally, neuromarketing study participants were selected based on specific criteria, including familiarity with food advertisements, diverse age groups, and balanced gender representation. Consequently, a non-probability purposive sampling method was used. Initially, 28 participants were included in the study, but the final neuromarketing sample consisted of 26, as data from two individuals were unsuitable for analysis. Among them, 14 were women. Nine participants were aged 18-25, nine were 26-40, seven were 40-55, and one was over 56. To fulfill the second empirical research objective, this study was conducted using an experimental method. This approach allowed determining the influence of an independent variable on a dependent variable, making it suitable not only for establishing causal relationships (Białowąs et al., 2021), but also, according to Peterson and Umesh (2018), essential in consumer behavior studies. In the planned experimental study, 5 independent variables were identified: functional advertising complexity, advertising design complexity, advertising authenticity (authentic and it's opposite – manipulative advertising), instrumental and symbolic attributes of advertising content. During the experiment, the food advertising matched the visual examples representing consumer visual attention stimuli in the questionnaire. Dependent variables in the experimental study were two characteristics of consumer visual attention: gaze duration and frequency. It is argued that attention follows where the eyes look (Gwizdka et al., 2019); hence, RealEye remote eye-tracking system was chosen for the study. It enables capturing video, and thus determining eye position, speed, duration of looking at a particular image, number of gaze fixations, i.e., frequency. To explore how independent variables relate to dependent variables – consumer gaze duration and frequency – ANOVA analysis was frequently employed in the experiments. The obtained sta-

http://dx.doi.org/10.21511/im.21(1).2025.24

tistics were compared with responses from neuromarketing study participants reflecting their attitudes toward observed food advertising. Non-parametric Mann-Whitney U test was used to determine associations between consumer visual attention variables – gaze duration and frequency – and consumer attitudes toward the viewed food advertising. The research logic summarizing two stages is reflected in Figure 2.

3. RESULTS

Out of the 423 respondents reached during the study, 20 indicated that they did not notice food advertising. Therefore, data from 403 respondents were used for further analysis. 70.2 percent of the individuals in the study were women. Most participants represented the 18-40 age group (69.7%) and had higher education (59.1%).

Exploratory Factor Analysis of the included variables revealed that the Kaiser-Meyer-Olkin (KMO) measure for all constructs exceeded 0.5, with the highest KMO for instrumental advertising content attributes (0.861) and the lowest for functional advertising complexity (0.780). Bartlett's test was of sphericity p-value was less than 0.000 for all constructs, confirming that the theoretical structure for consumer visual attention stimuli and attitudes towards food advertising remained consistent. Correlation analysis showed significant relationships between consumer visual attention stimuli and attitudes towards advertising, with the strongest correlations between instrumental content attributes (0.474) and design complexity (0.448), except for advertising authenticity (p=0.137). Linear regression was used to test the research hypotheses, and five regression models were created. The information presented in Table 2 shows the authenticity of food advertising was not included in the linear regression analysis. In this case, the regression model was not created because there was no statistically significant correlation with consumer attitude towards advertising. This suggests that the authenticity reflected in food advertising is often not the cause of a specific consumer attitude towards advertising – other aspects influence this attitude. For this reason, *H2a* is not confirmed.

The data presented in Table 2 show that one of the highest values of the coefficient of determination (R^2) is observed for the variable of design complexity of food advertising, which is equal to 0.230. This surpasses the desired threshold of 0.2 and explains the positive influence of advertising design complexity (23% of the change) on consumer attitude towards food advertising, thereby confirming hypothesis H1b. The positive impact of instrumental advertising content attributes on consumer attitude towards food advertising is supported by the ANOVA statistic ($p < 0.05$) and a determination coefficient of 0.294, confirming hypothesis *H3a*. However, the hypotheses testing the influence of functional complexity of food advertising, manipulativeness, and symbolic advertising content attributes on consumer attitude towards advertising – *H1a* (R^2=0.195), *H2b* (R^2=0.159) and *H3b* (R^2=0.136) – were not confirmed due to insufficient determination coefficients. Despite this, the statistical significance of the relationships suggests the value of future research. Such a definitive conclusion cannot be drawn in the case of the authenticity stimulus. In summary, out of the six hypotheses proposed, two were confirmed by the results of the linear regression analysis. The variables of instrumental advertising content attributes and design complexity of advertising have the most positive impact on consumer attitude towards food advertising.

Through an eye-tracking system, neuromarketing study aimed to determine (1) the relationships be-

Table 2. Results of linear regression between consumer visual attention stimuli and consumer attitude towards food advertising

Dependent variable	Independent variable	R^2	F-value	p-value
Consumer attitude towards advertising	Functional complexity of food advertising	0.195	97.079	0.000
	Design complexity of food advertising	0.230	119.813	0.000
	Manipulative food advertising	0.159	75.727	0.000
	Instrumental attributes of food advertising	0.294	167.062	0.000
	Symbolic attributes of food advertising content	0.136	63.184	0.000

tween stimuli reflected in static food advertising and the visual attention variables of consumer – gaze duration and frequency – and (2) how these primary consumer visual attention variables are related to consumers' attitudes towards advertising. To achieve this, an eye-tracking system was used along with food advertising that reflect relevant consumer visual attention stimuli in the examined context, as well as contrasting advertising that do not reflect these stimuli, for comparison purposes.

To reveal the relationships between the study variables, ANOVA analysis was performed first (Table 3). The results of the ANOVA analysis in this experiment indicate that both gaze duration and frequency as dependent variables for specific advertising have p-values lower than the required threshold (0.05), with corresponding F-values of 5.526 and 3.123, respectively. This suggests a statistically significant difference between group means, validating further analysis of this research. The findings are illustrated by heatmaps reflecting participants' gaze zones on food advertising (Figures 3-6). In these maps, regions colored in orange, yellow, and green indicate decreasing levels of gaze fixation, with orange representing the "hottest" zones – those with the highest number of gaze fixations.

Based on the analysis results of the functional complexity of food advertising, a higher average gaze duration was found for simple and clear advertising with low functional complexity (average gaze duration towards it is 268.73, compared to 238.45 towards food advertising with high functional complexity). Since the p-value in Table 3 is lower than the required threshold (0.05), this indicates that there is a statistically significant relationship between the gaze duration and the functional complexity of food advertising: gaze duration is longer in the case of simple and clear food advertising. The ANOVA analysis also indicated a statistically significant relationship between gaze fixation frequency and the functional complexity of food advertisements. Notably, a higher mean was observed for advertising with high functional complexity (18.46 vs. 17.08).

Analyzing the heatmap of gaze fixation for functional complexity advertising (Figure 3), it is evident that in simple and clear advertising, the highest gaze concentration is related to the advertised food product. In contrast, in high functional com-

Table 3. Results of ANOVA analysis in the neuromarketing study

Dependent variable	Independent variable	Mean	Standard deviation	F-value	p-value
Duration of gaze fixation	Simple and clear advertising	268.73	187.064	5.526	0.000
	High functional complexity advertising	238.45	133.733		
	Simple design advertising	298.91	220.154		
	High design complexity advertising	260.57	165.432		
	Authentic advertising	268.38	188.223		
	Manipulative advertising	301.16	235.985		
	Advertising not reflecting instrumental content attributes	296.23	232.012		
	Advertising reflecting instrumental content attributes	265.46	179.504		
	Advertising not reflecting symbolic content attributes	288.28	227.803		
	Advertising reflecting symbolic content attributes	308.86	229.156		
Frequency of gaze fixation	Simple and clear advertising	17.08	2.652	3.123	0.001
	High functional complexity advertising	18.46	2.121		
	Simple design advertising	16.12	3.681		
	High design complexity advertising	17.73	2.616		
	Authentic advertising	17.12	2.455		
	Manipulative advertising	15.42	3.074		
	Advertising not reflecting instrumental content attributes	15.58	3.501		
	Advertising reflecting instrumental content attributes	16.88	2.688		
	Advertising not reflecting symbolic content attributes	15.88	2.790		
	Advertising reflecting symbolic content attributes	15.73	3.305		

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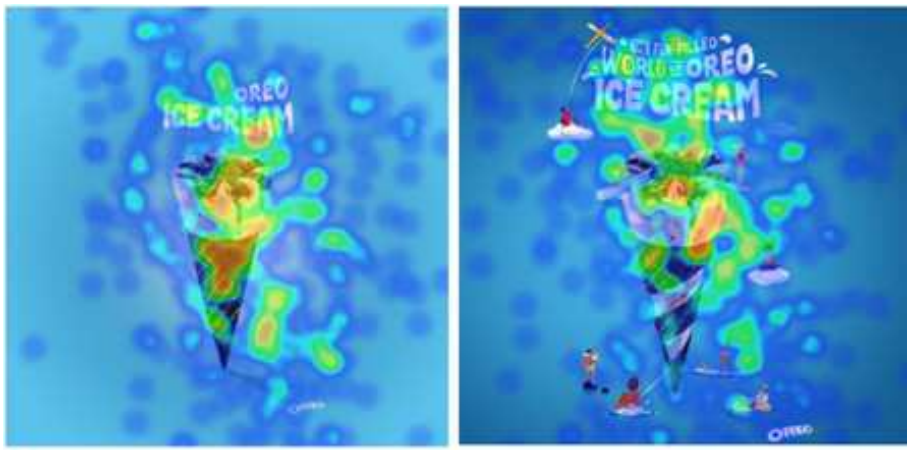
Low functional complexity High functional complexity

Figure 3. Heatmaps in the case of the functional complexity of food advertising

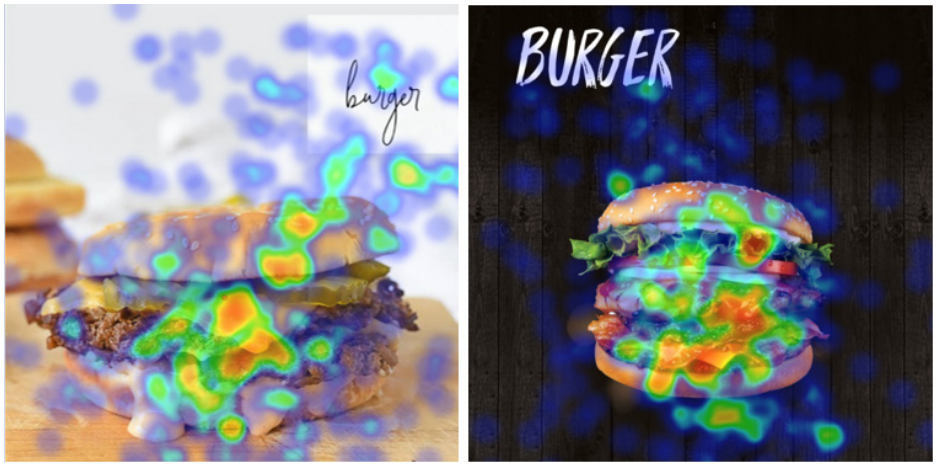
plexity advertising, the gaze is dispersed, with few "hot" zones. This supports the result obtained from ANOVA analysis – the focus characteristic, gaze fixation duration, is clearly visible in simple and clear food advertising, while the scattered gaze of participants in high functional complexity advertising explains the higher average gaze frequency.

Similar to the case of functional complexity of food advertising, a longer average gaze duration was observed for advertising that does not reflect the stimulus – simple design advertising (298.91 compared to 260.57). The ANOVA analysis confirmed that the analysis of food advertising design complexity is meaningful, as the p-value is less than 0.05. Thus, while there is a statistically significant relationship between gaze fixation duration and the complexity of food advertising design, fixation duration is longer in the case of simple design advertising. A higher gaze frequency is attributed to high design complexity advertising (17.73 compared to 16.12). In Table 3, the p-value indicates the statistical significance of the difference between group means, demonstrating a statistically significant relationship between gaze frequency and the design complexity of food advertising, with gaze frequency being higher for food advertising with high design complexity. The heatmap for high design complexity advertising (Figure 4) shows that participants' gaze was more dispersed, encompassing various creative elements of the advertising that were absent in the simple design advertisement. ANOVA analysis confirmed that the scattering of gaze does not hinder a positive evaluation of high design complexity advertising.



Low design complexity High design complexity

Figure 4. Heatmaps in the case of the design complexity of food advertising



Authentic Manipulative

Figure 5. Heatmaps in the case of the reflection of reality in food advertising

Regarding the reflection of reality in advertising, analysis of the ANOVA results reveals that the average gaze duration is longer for manipulative food advertising (301.16 versus 268.38). The p-value presented in the neuromarketing study's ANOVA results table meets the required threshold (0.05), indicating a statistically significant difference between group means. Comparing the obtained averages, it is evident that the overall gaze fixation duration is longer for manipulative advertising. Additionally, the analysis revealed a statistically significant relationship between gaze fixation frequency and the authenticity of food advertising. However, the average gaze fixation frequency was higher for authentic advertising (17.12 versus 15.42). Visual heatmaps of the examined advertisements visually confirm the longer gaze duration in manipulative advertising and higher gaze frequency in authentic advertising (Figure 5).

During ANOVA analysis, a statistically significant relationship was found between gaze fixation duration and instrumental content attributes of food advertising. However, a higher average gaze duration was observed in advertising that does not reflect these content attributes (296.23 vs. 265.46). Meanwhile, a higher average gaze fixation frequency was observed in the case of instrumental advertising content attributes (16.88 vs. 15.58). Heatmaps of advertising featuring instrumental content attributes (Figure 6) reveal that the latter disperses gaze more widely compared to adver-

Does not reflect instrumental content attributes Reflects instrumental content attributes

Figure 6. Heatmaps in the case of the instrumental content attributes in food advertising

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tising lacking such attributes. Study participants noticed significant elements such as icons reflecting beneficial grains and nutritional substances on the packaging. The "hottest" spot on the heatmap of advertising without instrumental content attributes is located directly on the food product itself, indicating effective advertising in terms of gaze duration.

ANOVA analysis has shown a statistically significant difference between group means (p-value meets the required 0.05 criterion), with a longer average gaze duration observed in advertising reflecting symbolic content attributes (308.86 versus 288.28). Unlike gaze fixation duration, a higher average gaze fixation frequency was not observed in advertising that reflects instrumental content attributes (15.73 vs. 15.88). From the heatmaps, unlike many of the examples described earlier, it is evident that a longer gaze duration was recorded for advertising reflecting stimuli in the form of symbolic content attributes (Figure 7). It is important to note that in this advertising, study participants not only noticed but also maintained an intense gaze on elements expressing social status. Conversely, the monochrome background and single-object representation in the non-stimulus reflecting advertising captured a slightly higher gaze frequency.

The results showed that simple and clear, manipulative, or advertising reflecting symbolic content attributes elicit longer gaze durations, while higher gaze frequencies are observed in cases of high complexity in food advertising design and advertising reflecting instrumental content attributes. The results demonstrate statistically significant relationships between gaze duration and the functional complexity, authenticity, and symbolic content attributes of food advertising, with longer gaze durations observed in the cases of simple and clear, manipulative, and symbolic food advertising, respectively. Additionally, a significant relationship was found between gaze frequency and the design complexity and instrumental content attributes of food advertising, with higher gaze frequencies observed for advertising with high design complexity and those reflecting instrumental content attributes. These findings are related to stimuli used in food advertising and consumer visual attention in neuromarketing research.

To explore the relationships between consumers' attitudes towards food advertising and their visual attention – gaze duration and frequency – the Mann-Whitney U test was used (Table 4). Due to the limited scope of the study, the test focused on comparing attitudes towards authentic versus manipulative advertising. Authentic advertising had an average attitude score of 2.36, while manipulative advertising scored 4.51. The study examined whether attitudes differed based on gaze fixation duration (long/short) and frequency (high/low). Participants were grouped according to whether their gaze fixation duration or frequency was above or below the overall average. To test if con-

Does not reflect symbolic content attributes

Reflects symbolic content attributes

Figure 7. Heatmaps in the case of the symbolic content attributes in food advertising

Table 4. Participants' attitudes towards authentic and manipulative advertising; the Mann-Whitney U test results of gaze fixation duration and frequency

Case of authentic advertising				
Tested variable	**N**	**Mean rank**	**Sum of ranks**	**p-value**
Consumer attitude towards advertising	Short duration of gaze fixation (17)	15.35	261.00	0.085
	Long duration of gaze fixation (9)	10.00	90.00	
	Low frequency of gaze fixation (17)	9.36	131.00	0.003
	High frequency of gaze fixation (9)	18.33	220.00	
Case of manipulative advertising				
Consumer attitude towards advertising	Short duration of gaze fixation (11)	11.00	121.00	0.131
	Long duration of gaze fixation (15)	15.33	230.00	
	Low frequency of gaze fixation (11)	15.03	225.00	0.207
	High frequency of gaze fixation (15)	11.41	125.00	

sumer attitudes towards food advertising vary depending on gaze duration and gaze frequency, the analysis was subdivided into two parts: (1) longer gaze fixation duration correlates with more positive attitudes towards food advertising, and (2) higher gaze fixation frequency correlates with more positive attitudes towards food advertising.

For authentic advertising, the mean rank for participants with short gaze fixation (15.35) was higher than for those with long gaze fixation (10.00), but this result was not statistically significant ($p > 0.05$ (Table 3). The same conclusion applies to manipulative advertising, with a p-value of 0.131 and mean ranks of 11.00 for short and 15.33 for long gaze fixation. Consumers' attitudes towards food advertising do not vary depending on gaze fixation duration, as longer gaze fixation duration does not correspond to a more positive consumer attitude towards food advertising. For authentic advertising, a significant difference was found between low (mean rank 9.36) and high (mean rank 18.33) gaze fixation frequencies, with a p-value of 0.003. This suggests that higher gaze fixation frequency correlates with a more positive attitude, possibly due to less focus on the unappealing visual details of the product. In contrast, for manipulative advertising, the p-value exceeded 0.05, indicating that gaze fixation frequency does not significantly correlate with consumer attitudes towards this type of food advertising. Based on Mann-Whitney U test results, a significant relationship was found only between gaze fixation frequency and attitudes towards authentic food advertising, with higher fixation frequency correlating with more positive attitudes.

4. DISCUSSION

The performed linear regression analysis revealed that only two stimuli – instrumental food advertising content attributes and the complexity of food advertising design – could be confirmed as having an impact on consumers' attitudes towards advertising. The results support the conclusions of Murphy and Narkiewicz (2010), Moon et al. (2017), and others, suggesting that instrumental – clearly beneficial – advertising content attributes influence consumers' logical beliefs and promote a utilitarian attitude function (Kim et al., 2020), which can positively affect advertising evaluation. Design complexity, typically related to the advertised object, advertising creativity, and visual originality, also influenced consumer attitudes. More complex designs led to more positive evaluations, while participants found simple design advertisements somewhat dull. It can be concluded that high design complexity advertisements elicited more positive responses from participants compared to simpler designs. This supports the insights of Pieters et al. (2010), Lazard and Mackert (2014), and Modig and Rosengren (2014), who argue that creative advertising positively impacts attitudes. Meanwhile, the impact of functional advertising complexity, manipulativeness, and symbolic advertising content attributes on consumers' attitudes towards advertising was not confirmed. Nevertheless, the statistical significance of the relationships suggests the value of future research. Although the literature increasingly emphasizes the benefits of reflecting reality in advertising (Cornelis & Peter, 2017; De Jans et al., 2018), this was not confirmed in the context of the analyzed food advertising. The fur-

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ther objective of the study, apart from examining the advertising stimuli, includes the construct of visual consumer attention. This study, using an eye-tracking system, revealed a statistically significant relationship between attention variables – such as fixation duration and frequency – and the independent variables (advertising stimuli). It also showed differences among group means and confirmed that certain advertising characteristics are significantly associated with consumers' fixation duration and frequency (Higgins et al., 2014; Zhou & Xue, 2021). Authors indicate that advertising reflecting stimuli are often rated more favorably by consumers than those that do not. The evaluation of participants' attitudes towards the functional complexity of food advertising in the neuromarketing study suggests that simple, clear advertising lead to longer gaze fixation durations and generate more positive responses from consumers compared to those with high functional complexity. This finding aligns with Al-Dmour et al. (2013) and Favier et al. (2017). Based on the research results, it is presumed that the more visually pleasing nature of manipulative advertising contributed to longer gaze durations, suggesting an advantage for this type of advertising. Despite the simplicity of symbolic attributes in food advertising, participants may have perceived them as somewhat mundane. However, analysis of the data shows that participants generally agreed that advertisements reflecting stimuli were good and appealing, suggesting that using symbolic content attributes in food advertising remains meaningful. This aligns with research showing that symbolic attributes evoke emotions and positively influence consumer attitudes (Kim et al., 2020; LeBoeuf & Simmons, 2010). Both traditional and neuromarketing research results confirm a more positive consumer attitude towards advertising characterized by instrumental and symbolic content attributes, as well as towards static food advertising reflecting design complexity compared to those that do not. In terms of authenticity in advertising, manipulative advertising received more positive evaluations. This indicates that visual aesthetics, even when perceived as deceptive, remain important and are therefore significant in practice. The same can be observed for creative advertising elements, whose importance was emphasized by Lazard and Mackert (2014), Pieters et al. (2010), Favier et al. (2017), and advertisings expressing benefit or certain symbolic value. Moon et al. (2017) and Kim at al. (2020) similarly noted their positive impact on consumer attitudes. Despite frequent references by neuromarketing researchers (Florack et al., 2020; Onișor & Ionita, 2020) to the persuasive influence of gaze fixations on information processing and preference formation, which can shape more positive or negative attitudes towards advertising, the results indicated that participants' attitudes were more positive when gaze fixation frequency was higher. This suggests that an unappealing visual representation of the main object in authentic advertising might lead to a more favorable evaluation as attention spreads to other details rather than focusing intensively on the main object.

CONCLUSIONS

This research paper aims to reveal the role of consumers' visual attention stimuli in advertising from traditional and neuromarketing research perspectives. The results of traditional survey research indicate that consumers' visual attention stimuli reflected in food advertising significantly correlate with consumer attitude toward advertising. The survey study also provides valuable insights into the influence of conceptually based visual attention stimuli on consumer attitudes towards food advertising. The findings demonstrate that, despite the existence of statistically significant relationships, only one stimulus from the category of advertising complexity (higher design complexity) and one stimulus from the attributes of advertising content (instrumental content attributes) has a positive influence on consumer attitudes towards advertising. This suggests that further research should explore these relationships, expanding the scope of study to include not only static but also digital food advertising, product packaging, and related elements.

The neuromarketing study revealed a statistically significant relationship between participants' gaze fixation durations or frequency and stimuli in food advertising. Longer durations of gaze fixation were observed in cases of simple, clear, manipulative, symbolic content attributes reflect-

ing food advertising, and in cases of advertising that do not reflect instrumental content attributes. More frequent gaze fixation was observed in advertising featuring high functional and design complexity, authenticity, and both instrumental and symbolic content attributes. The results did not show a statistically significant relationship between participants' attitudes toward food advertising depending on their duration of gaze fixation; however, it was found that in the case of authentic advertising, a higher frequency of gaze fixation resulted in a more positive attitude toward static food advertising. In summary, it can be concluded that there is a limited explanation of gaze fixation (duration and frequency) and consumer attitude relationships, suggesting the need for further research.

The results of the neuromarketing study suggest that stimuli reflected in advertising affect consumers' visual attention; however, the impact of these attention variables on attitudes cannot be clearly defined. The survey revealed high appreciation for advertising reflecting instrumental content attributes, while in the neuromarketing study, advertising with high design complexity received the highest ratings. Authentic food advertising received negative reactions in both studies. In summary of the study results, it can be determined that the conceptual model is suitable for further investigations.

The results of the conducted research are also valuable for practitioners seeking to influence consumer attention and attitudes toward advertising. Using symbolic attributes in advertising to enhance clarity and attract attention is effective for maintaining engagement. Employing creative elements or elements that clearly express benefits is suitable for arousing consumer attention, thereby forming consumer attitude toward advertising. It is important to emphasize that longer consumer attention (longer duration of gaze fixation) does not necessarily result in a more positive attitude. However, maintaining consumer attention is crucial for business success. Therefore, further studies examining its relationship with consumer attitude toward advertising are necessary.

AUTHOR CONTRIBUTIONS

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