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EYES DON'T LIE! VISUAL PREFERENCES: EYE-TRACKING STUDY ON UNPLANNED FOOD SELECTIONS IN FINE DINING RESTAURANTS

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ABSTRACT

Consumer food choices are often treated as conscious decisions. However, recent evidence using eye-tracking methodology demonstrates that consumers' visual attention processes significantly influence their decision-making. This method is crucial for understanding the factors that affect consumers' gaze behavior. This research employs eye-tracking technology to investigate how consumers make food selections in fine-dining restaurants, focusing on unplanned choices. The study monitors consumers' menu examination processes using an eye-tracking device, identifying focal points such as gaze duration and fixation count. The findings reveal how consumers' eye movements guide their selection decisions. In particular, the visual presentation of the dish and familiarity with it have been shown to be influential in consumer preferences. In an experiment conducted with 25 participants, it was found that the most fixated-upon dish was not necessarily the one ordered, indicating that the intensity of focus and gaze behavior do not directly determine decisions. However, prior experience with the dishes strongly influenced the decision-making process. In this respect, the research critically examines the "attention = choice" assumption in eye-tracking studies. From an industry perspective, it demonstrates that simply captivating visuals are not enough; menu design must be integrated with customer experience management and familiarity strategies.

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INTRODUCTION

Consumers engage in purchasing activities daily for various reasons, primarily driven by the physiological need for food products. During the food purchasing process, they must decide on the criteria for selecting products and the quantity they will purchase. The most frequently cited selection criteria in the literature include sensory attributes (taste, smell, texture, appearance), nutritional value and health concerns, price and economic conditions, social and cultural influences (family, circle of friends, traditional habits), and past experiences. While these factors influence consumers' food choices, consumers generally tend to make decisions about food products within a few seconds (Cameron et al., 2016). However, it is also known that food choices are not always rational or planned. According to Bell et al. (2011), many purchasing transactions occur without prior planning. Consumers engage in unplanned purchasing activities through impulse buying. This means that the consumer acts on the impulse to buy without any prior intention and without considering the long-term effects of the purchasing activity (Nyrhinen et al., 2024). Especially in recent years, easy access to online shopping applications, which have become an integral part of daily life due to new technologies, provides consumers with instant consumption opportunities. However, academic research on how unplanned purchases occur remains inadequate. Therefore, it is essential to conduct a thorough investigation of the factors influencing unplanned purchases (Duong & Liaw, 2021).

The current research investigates how consumers' unplanned food choices are made in an unplanned matter. In this research, impulsive buying behavior is considered as an unplanned choice, defined as the difference between the participant's initial menu preference and their final decision. Customers in food and beverage establishments often select a dish, which represents a "natural choice." However, if changes occur between their initial and final choices during the selection process, this can be considered a deviation from their preferences, and such deviations may indicate that customers are making unplanned choices during the purchasing decision process.

Additionally, numerous studies examining purchasing behavior in food and beverage establishments emphasize the importance of menus for consumers. However, studies highlighting the role of visual attention to menus in the decision-making process are quite limited. Some of these studies have employed eye-tracking analysis, but they generally use physical menus to examine which menu pages consumers focus on and

whether the menu's visual design is appreciated. In contrast, this study aims to examine consumers' impulsive food choices on fine-dining restaurant menus using eye-tracking technology and to reveal the role of visual attention processes in decision-making. This study addresses a current scenario by exploring which choice criteria consumers consider when viewing an online menu, they have never seen before and whether previously experienced dishes increase their likelihood of selection during impulsive purchasing behavior. In this context, the research questions identified for the purpose of this study are as follows:

- On fine-dining restaurant menus, which menu items (food visuals, name, description, and price) do consumers' eye movements focus on the most during impulsive meal choices?
- According to eye-tracking data, do foods that consumers have previously tried attracting more attention during impulsive choices compared to those they have not tried?

THEORETICAL BACKGROUND

According to research conducted on the theory of unplanned purchases (Ninh Do et al., 2020; Kimiagari & Malafe, 2021; Yang et al., 2021; Lee et al., 2021; Karl et al., 2021; Feng et al., 2024; Nyrhinen et al., 2024), consumers make purchases impulsively for enjoyment and excitement, without thinking, planning, or negotiating. When a consumer feels hungry, they may engage in unplanned purchasing activities for any food that appeals to them at that moment. In the purchase decision process, it is assumed that the motivations of the consumer remain homogeneous throughout the shopping experience in the case of unplanned purchases (Suher & Hoyer, 2020). This means that consumers are influenced by numerous internal and external motivations, which drive them toward unplanned purchasing (Chandon et al., 2000).

Consumers may opt for physical grocery stores for food shopping or turn to online shopping sites. In both cases, consumers pay attention to visual characteristics when making food selections (Vermeir & Roose, 2020). Visual cues are considered one of the most important communication tools in modern society (Sample et al., 2020) and are used in marketing to attract consumer attention, communicate about a product or brand, and provide sensory pleasure and stimulation (Bloch, 1995). When consumers lack information about a food or brand during the purchasing decision process, they rely on visual cues to evaluate these products (Spence, 2016).

Understanding visual perception in the marketing context is critically important for marketing managers (Krishna, 2012). Consequently, the complexity of studies addressing consumers' visual perceptions of food products (Puurtinen et al., 2021) has led to an increased interest in this area. Garcia-Burgos et al. (2017) emphasize that attentional tendencies towards food cues play a critical role in food selection; however, it is noted that exactly which characteristic of the food influences visual attention has not been thoroughly investigated.

Research in cognitive neuroscience suggests that when individuals see something edible, their brains focus on imagining consuming that food (Suzuki et al., 2017; Toepel et al., 2009), and enhancing the visual appeal of food is expected to positively affect consumer purchasing decision processes. From this standpoint, it can be said that there is a relationship between consumers' decisions to prefer or purchase a food product and their visual attention. According to Wadhera and Capaldi-Phillips (2014), the senses of sight and smell provide the first impression of a food item before tasting it. Additionally, the color and shape of the food can also be significant factors in the selection process. Vermeir and Roose (2020) argue that visual cues influencing food selection can shape behaviors in preferring a food item. According to researchers, aspects such as the color of the food, the color of the food packaging, label, and logo, the shape of the food, the shape of the packaging, the texture and glossiness of the food, the brightness of the packaging, the positioning of the label and logo on the packaging, the location of the food on the supermarket shelf, and combinations of text and images can all influence behavioral outcomes (Gölemezli, 2022).

Food selection is a behavior examined to explain how and why a person decides what to consume (Köster & Mojet, 2018). It is considerably challenging to evaluate and concretize the food selection process merely by asking consumers. This is because consumers harbor very complex feelings and attitudes during the food selection process (Papies, 2017). In recent years, there has been an increasing interest in neuromarketing studies that examine consumer behavior using various neuroscientific techniques (Kuoppa et al., 2016; Stasi et al., 2018). Through these studies, consumer facial expressions and gaze deviations can be analyzed to determine which products their attention is focused on (Raghubir, 2012). Eye trackers are notably used to identify visual cue variable detections, such as attention. Eye-tracking devices that examine eye movements are preferred to obtain comprehensive information on visual attention related to food. These eye-tracking methods allow for the study of factors influencing gaze behavior

and decision-making processes (Vu et al., 2016). In eye-tracking studies, the directions and durations of consumer gaze are calculated (Schmidt et al., 2016; Doolan et al., 2014). Jantathai et al. (2013) assert that the number and duration of fixations are associated with the selection of a food item. In other words, fixation measurements focus on the time spent selecting a food product and the number of gaze visits directed toward these food items (Puurtinen et al., 2021).

In recent years, many studies have been conducted regarding visual attention to food selections using eye-tracking methods. For instance, a study by Spielvogel et al. (2018) demonstrated that the type of food influenced children's preferences for healthy and unhealthy foods during eye-tracking. Hummel et al. (2018), in their research aimed at measuring the impact of different eating behavior patterns on visual attention toward various food cues, considered the gender factor and concluded that it plays an important role in the relationship between eating behavior and visual attention to food cues. They also presented strong evidence for the effect of restricted eating behaviors on visual attention. Vu et al. (2018) investigated the effects of culture and familiarity on looking, wanting, and liking regarding a packaged food product (wafer), examining whether gaze behavior differed among two consumer groups (Austria and Vietnam) using an eye-tracking device. The results indicated that familiarity with products plays an important role in shaping consumers' food-related behaviors. Melendrez-Ruiz et al. (2022) investigated the relationship between gaze behavior and food product selection in a virtual supermarket, concluding that product selection had a significantly positive correlation with fixation duration. In research conducted by Mora et al. (2023) aiming to determine meal preferences in restaurant menus using eye-tracking devices, it was noted that the eye-tracking device could be used to predict consumer decisions in restaurants.

In summary, previous studies have primarily focused on the visuals of packaged food products, images of meals in restaurant menus, foods found on supermarket shelves, and mobile applications for placing online food orders. However, the current study focuses on the visuals of dishes featured in fine dining restaurant menus. Fine dining restaurants possess exceptional standards, ambiance, and operating procedures. The target customer base typically consists of individuals with high income levels. Customers often visit these restaurants not only for the services provided but also for elements of prestige, status, and luxury (Chon, 1990). Despite the increasing number of studies in recent years focusing on fine dining restaurants, there is a noticeable lack of research identifying favored dishes

in these restaurant menus using eye-tracking devices. Accordingly, this research examines the menu of a fine dining restaurant located in Istanbul, one of Türkiye's well-known provinces attracting a significant number of tourists and identifies the visuals of the dishes most favored by consumers using eye-tracking devices.

MATERIALS AND METHODS

Sample and Participant Recruitment

The process of determining the participants was based on previous eye-tracking studies. Based on these studies, a total of 30 participants were identified. In terms of industry experience related to eye-tracking studies, it is observed that manufacturer firms generally recommend sample groups of 15–25 individuals. It has been established that experimental research in the field of neuromarketing can yield results with a 1% margin of error using sample groups of at least 30 individuals (Sands, 2009). The current study utilized the Tobii Pro Lab eye-tracking device and analysis software. The data quality rate for eye-tracking experiments provided by the Tobii Pro Lab analysis software interface reaches between 94% and 100% when there are 30 participants (Okuyan, 2024).

Participants for the study were selected using a purposive sampling method based on their compliance with established criteria. Selection criteria included the absence of eye disease, photosensitive epilepsy, and color blindness. This method allows for the identification of participants who are representative of the target population and who can complete the eye-tracking experiments effectively. Participants were also selected from individuals who were capable of using the eye-tracking device correctly, had no visual perception problems, and could follow the instructions provided. All participants were selected from first-year students in the Gastronomy and Culinary Arts Department of Atatürk University's Faculty of Tourism. In this context, five participants were excluded, and data were collected from the remaining 25 participants. Participants were informed about the purpose of the research, how the obtained information would be used, and the content of the research. Additionally, participants were required to complete an informed consent form. Ethical board approval for the research was obtained from Atatürk University’s ethics committee [2].

[2] Ethical approval was obtained from the Social Sciences and Humanities Ethics Committee of Atatürk University. The procedures used in this study adhere to the tenets of the Declaration of Helsinki. Approval number: E.88656144-000-2500068001

A total of 25 participants took part in the study. Of these, 17 were female (68%) and 8 were male (32%). Regarding age distribution, the majority of participants were 18 years old (n = 19, 76%), followed by 19 years old (n = 3, 12%), 21 years old (n = 2, 8%), and 20 years old (n = 1, 4%). These demographic characteristics are summarized in Table 1.

Table 1. *Descriptive Statistics for Participants' Demographic Characteristics*

Variable	Category	N	%
Gender	Female	17	68
	Male	8	32
Age	18 years	19	76
	19 years	3	12
	20 years	1	4
	21 years	2	8

Study Design and Procedures

The research was conducted in the Neurogastronomy Laboratory of Atatürk University's Faculty of Tourism and was designed as an experimental study. The experimental design aimed to investigate participants' impulsive buying behavior and their visual attention (eye movement) responses during this process. Participants' eye movements while viewing food images on a fine-dining restaurant menu were recorded with an eye-tracking device that is compatible with Tobii Pro Lab software. This design minimizes the influence of external variables and allows for the analysis of consumers' visual attention behaviors during impulsive food choices.

All participants were tested in the same environment and on the same computer. To control for variables such as ambient sound and lighting, a dark-colored curtain was used in the restaurant setting, as all analyses were conducted in the same environment. This measure was taken to block daylight or external light, ensuring that the ambient light was provided solely by lamps. To avoid ambient noise, the measurements were conducted during the mid-term break, when the faculty was largely unoccupied.

None of the participants had previously seen the menu images, a condition intended to elicit impulsive buying behavior. Participants were briefed on the use of the eye-tracking device. Eye movements were recorded using the Tobii Pro Glasses 3 device and the Glasses Controller app. Participants viewed food images and then verbally indicated their food

selection. Eye movement data were imported into Tobii Pro Lab software and analyzed using AOI (food image, name, price, description). To conduct analyses with the eye-tracking device, fine-dining restaurants operating in Istanbul and their menus were initially examined. With the research permission obtained, the soup category (Figure 1) from the menu on the Fine Dine Istanbul restaurant's website was used.

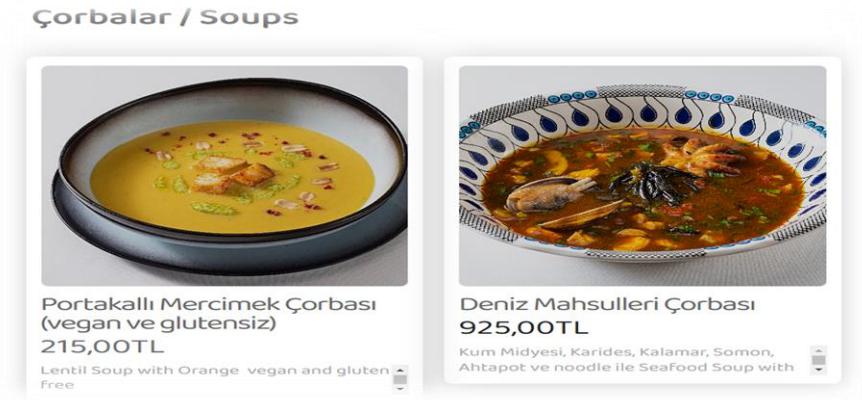


Figure 1. *Soups on the Menu*

Using the eye-tracking analysis method, participants were asked to choose a soup from the existing menu before lunchtime within the framework of unplanned purchasing behavior. To minimize the influence of external variables, all participants were seated at the same computer and in the same environment. Before the session began, a brief explanation regarding the equipment used (eye-tracking device) was provided. The researchers assisted participants in attaching and adjusting the equipment. After the participants put on the eye-tracking device, a specific calibration process was performed via the setup interface prior to the application, and the calibration was verified for each participant. Upon completion of the calibration verification process, each participant was seated approximately 65 cm away from the computer monitor displaying the food image. To ensure that participants exhibited unplanned purchasing behavior, they had not been shown these images previously. Therefore, participants were asked to carefully examine the food images and then verbally state the dishes they decided to eat. During this process, the verbally expressed dishes were recorded in writing, while gaze behaviors were simultaneously recorded. Each participant was given 20 seconds to examine the images and make a selection decision. Since the restaurant's website, the subject of this research, did not accept online orders and it was not possible to add dishes to a cart, the names of the selected dishes were recorded verbally. Data collected from participants via the Tobii Pro Glasses 3 50 Hz model device

and the Glasses Controller application were recorded on the device's memory card and transferred to Tobii Pro Lab (v1.241) software for analysis. These data were used to determine the total fixation durations (DuF) and total fixation counts (NbF) on specific Areas of Interest (AOIs). Additionally, heat maps of eye movements were generated.

For the analysis of eye-tracking data, specifically regarding the viewed areas on the food images shown in the session, the regions where gaze data were recorded were identified as the image of the dish, the price, and the descriptions located below the images. Using the analysis software, specific Areas of Interest (AOIs) were defined for these regions. Figure 2 illustrates that the dish image, name, price, and description sections viewed by users were defined as independent AOIs. Gaze data falling on blank spaces outside these defined areas were excluded from the analysis.

Figure 2. *Examples of Area of Interest (AOI) Placement*

A series of metrics were used to assess participants' eye movements in the study. Total fixation duration (DuF) represents the total time in seconds a participant spent on a specific AOI (food image, name, price, or description). Total fixation count (NbF) represents the number of times a participant looked at the relevant AOI. Time to First Fixation (TFF) measures the time elapsed until the participant's first fixation on a specific AOI and allows for the assessment of attentional priorities. The areas analyzed in the study were examined within specifically designated Areas of Interest (AOIs), encompassing the food image, name, price, and description. Heat maps, which visually represent participants' gaze intensity, indicate which areas received the most attention. These metrics allow for a comprehensive assessment of participants' visual attention and

behavior during the food selection process. Figure 3 summarizes the process that explained in this section.

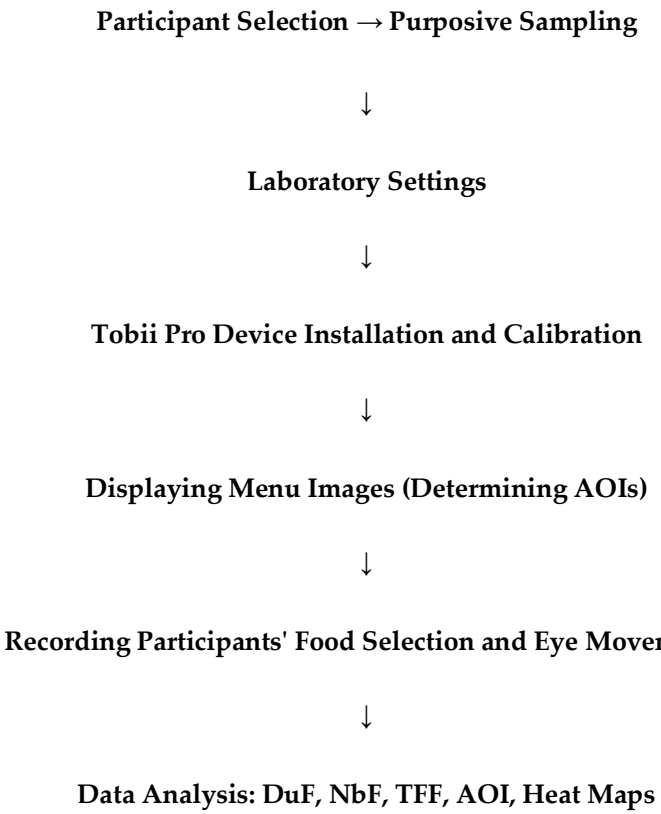


Figure 3. *The Process of the Study*

Given that this study was designed as a data-driven exploratory investigation, no a priori hypotheses were formulated. Instead, the eye-tracking data were analyzed to uncover naturally emerging patterns of visual attention, which can inform future confirmatory research.

Data Analysis

By tracking each record for 25 participants, four AOI placements were made on the soups they examined, and numerical metrics regarding the duration of fixations occurring on the AOI areas in seconds are shown in Table 2 through the analysis software.

According to Table 2, participants focused most on the image of the second soup (71.84 seconds) out of the two soup images presented to them. Participants focused on the image of the first soup, the name of the first soup, the name of the second soup, the price of the second soup, the price of the first soup, the description of the second soup, and the description of the first soup, respectively.

Table 2. *AOI Total Fixation Duration (DuF) Results for Participants*

Participants	Soup 1 Description of the dish	Soup 1 Name of the dish	Soup 1 Price of the dish	Soup 1 Image of the dish	Soup 2 Description of the dish	Soup 2 Name of the dish	Soup 2 Price of the dish	Soup 2 Image of the dish
Participant 1		1.42		2.16				1.58
Participant 2	0.38	0.64	0.12	0.18	1.48	0.14	0.42	0.66
Participant 3		4.39	0.68	2.36	1.42	1.06	1.18	3.35
Participant 4		1.38	0.38	1.99				0.84
Participant 5	0.94	1.96	0.72	1.08	0.28		0.98	0.80
Participant 6	0.22	0.22	0.44	0.24	0.10	0.26	0.70	0.32
Participant 7		0.28		1.20		3.59	0.70	7.03
Participant 8	0.30	1.02	0.26	1.62	0.96	1.48	0.48	5.03
Participant 9	0.78	1.78	0.52	1.82		0.22	0.60	0.60
Participant 10	0.40	4.07	0.74	4.87		0.62		3.37
Participant 11	0.68	0.70		0.84	0.58	2.26	0.20	1.06
Participant 12	0.48		0.08	0.28	1.46	0.42	2.46	3.79
Participant 13	0.94		0.16	0.74	0.16		0.08	1.42
Participant 14		0.58	2.08	3.01		1.78	1.18	4.13
Participant 15		6.47		1.92	0.92	2.24	1.04	0.66
Participant 16		1.04		0.60	0.76		1.20	3.05
Participant 17				1.88				3.27
Participant 18				2.18		1.34	0.52	9.70
Participant 19	0.20	2.95		2.08	0.16	1.28		1.10
Participant 20		1.00		8.94		0.22		3.49
Participant 21	1.84	2.50	1.86	1.84		0.50	0.92	1.06
Participant 22	1.28	0.46			0.20			
Participant 23		6.29	1.02	1.38		1.20	0.34	1.76
Participant 24		2.81	0.34	2.10		1.56		3.77
Participant 25	0.22			0.92	0.66	0.12	0.06	10.00
TOTAL	**8.66**	**41.96**	**9.4**	**46.23**	**9.14**	**20.29**	**13.06**	**71.84**

Table 3 shows the fixation count data of the participants according to the areas of interest. When Table 3 is examined, it is seen that participants looked at the image of the second soup the most. This soup is seafood soup. It contains mussels, shrimp, squid, salmon, and octopus. It is not among the traditional soups of Turkish cuisine and has the characteristic of being a soup that is not consumed much in daily life. Considering that this soup, which is especially served in fine dining restaurants, has not been tasted by the participants before, it is seen as a likely result that this unfamiliar soup is looked at more. After the image of this soup, participants looked at the image of the first soup, the name of the first soup, the name of the second soup, the name and description of the second soup, the description of the first soup, and the price of the first soup, respectively.

Table 3. *AOI Fixation Count (NbF) Results for Participants*

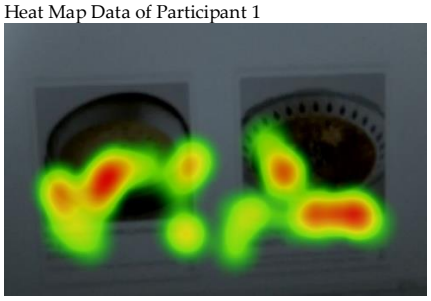
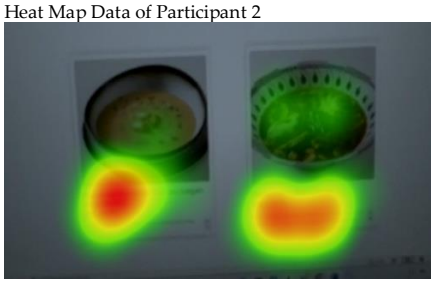
Participants	Soup 1 Description of the dish	Soup 1 Name of the dish	Soup 1 Price of the dish	Soup 1 Image of the dish	Soup 2 Description of the dish	Soup 2 Name of the dish	Soup 2 Price of the dish	Soup 2 Image of the dish
Participant 1		3		12				9
Participant 2	3	5	1	2	9	2	1	5
Participant 3		12	2	7	2	5	1	11
Participant 4		6	2	3				3
Participant 5	2	4	2	6	1		3	2
Participant 6	6	2	5	9	4	3	3	4
Participant 7		1		7		5	2	15
Participant 8	1	2	1	7	4	4	2	17
Participant 9	5	9	2	10		2	2	4
Participant 10	3	11	2	19		3		12
Participant 11	3	2		3	4	8	2	7
Participant 12	2		1	2	4	3	6	13
Participant 13	3		1	3	2		1	4
Participant 14		2	2	9		7	2	14
Participant 15		8		4	1	5	3	3
Participant 16		4		1	1		2	6
Participant 17				5				9
Participant 18				8		4	2	29
Participant 19	1	10		8	1	4		4
Participant 20		4		27		2		16
Participant 21	2	5	4	5		3	3	3
Participant 22	3	1			1			
Participant 23		18	3	6		4	1	8
Participant 24		9	1	6		3		9
Participant 25	1			5	3	1	1	36
TOTAL	**35**	**118**	**29**	**174**	**37**	**68**	**37**	**243**

The answers given to the question "Which of these soups would you order?" asked to the participants are given in Table 4. As seen in Table 4, participants mostly preferred orange lentil soup to order. Only seven participants stated that they could prefer seafood soup. In this case, it is estimated that participants preferred orange lentil soup, which they know, have tasted, and is specific to their culture. Finally, heat maps of participants for soups are given in Table 5.

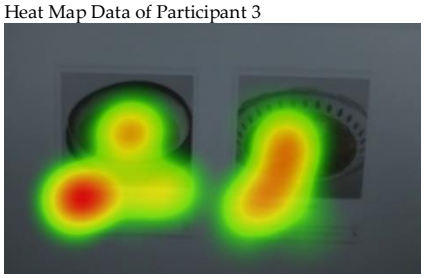
Table 4. *Data on Which Soup Participants Would Order*

Participants	Orange Lentil Soup	Seafood Soup	Participants	Orange Lentil Soup	Seafood Soup
Participant 1			**Participant 14**		
Participant 2			**Participant 15**		
Participant 3			**Participant 16**		
Participant 4			**Participant 17**		
Participant 5			**Participant 18**		
Participant 6			**Participant 19**		
Participant 7			**Participant 20**		
Participant 8			**Participant 21**		
Participant 9			**Participant 22**		
Participant 10			**Participant 23**		
Participant 11			**Participant 24**		
Participant 12			**Participant 25**		
Participant 13					

Table 5. *Heat Maps of Participants*

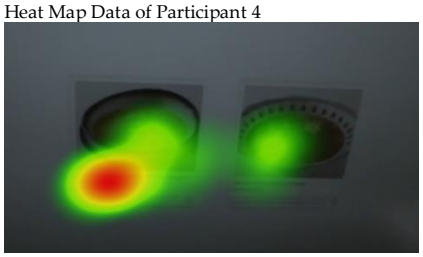
Heat Map Data of Participant 1 	When examining the area of interest (AOI) analysis results of Participant 1 in the soup category presented to them, it was determined that they looked at the image and name of the first soup and only the image of the second soup in total fixation duration. When the fixation count results were examined, the participant focused on the image of the first soup twelve times, the image of the second soup nine times, and the name of the first soup three times. When the time to first fixation (TFF)was examined, it was seen that they initially focused on the image of the first soup in 0.18 seconds, and this focus (first fixation duration) lasted 0.32 seconds. When the heat map of the participant (Figure 3) was examined, it was seen that the most intense focus was on the first soup image. After the participant's eye data were collected, the question "Which of these soups would you order?" was asked, and the participant stated that they would prefer the first soup. In this case, the fact that the participant spent the most time on the image of the first soup and stated that they could prefer this soup in terms of ordering shows that the results obtained are consistent.
Heat Map Data of Participant 2 	When the total fixation duration results in the area of interest analysis results of Participant 2 were examined, it was determined that the participant spent the most time in the description section of the second dish. Then, it was determined that they looked at the image of the second soup, the name of the first soup, the price of the second soup, the description section of the first soup, the image of the first soup, the name of the second soup, and the price of the first soup, respectively. When the fixation count results were examined, the participant focused on the food description section of the second soup nine times. When the time to first fixation was examined, it was seen that the first focus was on the description section of the second soup (in 0.74 seconds), and this focus (first fixation duration) lasted 0.38 seconds. When other fixations are examined, it is seen that this time is less. However, although the participant looked at the price of the second soup at 8.17 seconds, they focused on this area for the longest time (0.42 seconds). In this case, it can be said that the participant spent the most time in the description section containing information about the content of the second soup. When the heat map for the participant (Figure 4) is examined, it is seen that they focused on the name and price sections of both soups and also spent time in the description section of the second soup. When asked which soup they would order, the participant stated that they preferred the first soup. Therefore, it can be said that the participant preferred the orange lentil soup, which is known in Turkish cuisine and is likely to be preferred by everyone, but probably examined the second soup to satisfy their curiosity and learn what the other soup consists of.

Heat Map Data of Participant 3



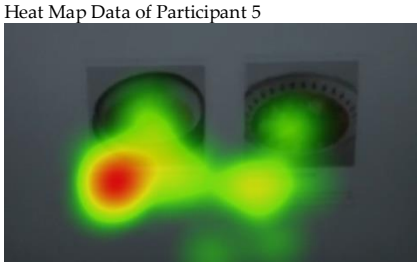
According to the AOI area of interest analysis results for Participant 3's soup images, when the total fixation duration is examined, it is seen that they spent the most time in the name section of the first soup. It is seen that the description section in the first soup was not looked at at all. When the fixation count results are examined, the participant focused on the name of the first soup twelve times, and this focus lasted 0.34 seconds. However, when these data are examined, it was concluded that the participant also focused on the image of the second soup 11 times. When the time to first fixation was examined, it was determined that the first focus was on the image of the second soup at 0.01 seconds, and this focus lasted 0.10 seconds. When the heat map of the participant (Figure 5) is examined, it is also seen that the most intense focus is on the name section of the first soup. In this case, the fact that the participant spent more time on the name of the dish that sounds familiar and gave the answer lentil soup to the question of which soup they would order after the eye-tracking data was taken shows that they made their choice in favor of this soup, and there is consistency between the answer they gave to the question asked and the answer obtained as a result of the eye-tracking data.

Heat Map Data of Participant 4



When the AOI area of interest analysis results of Participant 4 in the soup category are examined, it is seen that they spent the most time in the image of the first soup, while it is understood that they only looked at the description section of the dish in the second soup. The participant focused on the name of the first soup 6 times. The first fixation time was the image of the first soup, and it was determined that this focus was longer than other fixations (1.11 seconds). When the heat map (Figure 6) results of the participant are examined, it is seen that the intensity occurs in the first soup and in the name, price, and description sections of the soup. The answer given to the question of which soup would you order was also the first soup, and in this context, it was concluded that the participant's areas of interest, heat map, and answer were consistent.

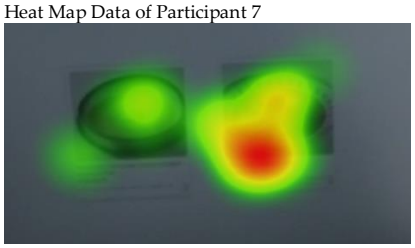
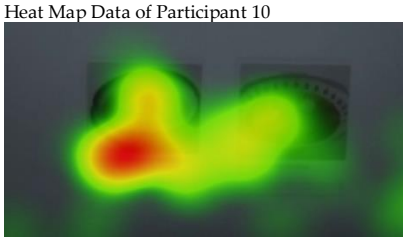
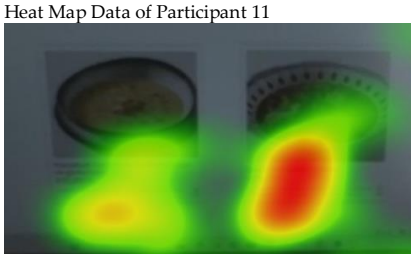
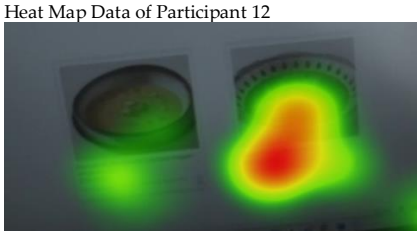
Heat Map Data of Participant 5



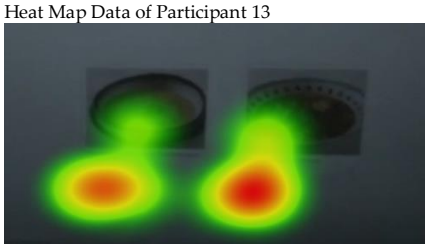
When examining the area of interest (AOI) analysis results of Participant 5 in the soup category presented to them, it was determined that they looked at the name of the first soup the most in total fixation duration. When the fixation count results were examined, the participant focused on the image of the first soup six times. When the time to first fixation was examined, it was seen that they initially focused on the price of the second soup in 1.64 seconds, and this focus (first fixation duration) lasted 0.28 seconds. When the participant's heat map (Figure 7) is examined, it is seen that the intensity is in the name, price, and description section of the first soup, and when all the results of the participant are evaluated, it is concluded that they experienced a cognitive intensity. The participant also stated the first soup in response to the question "Which soup would you order?".

Heat Map Data of Participant 6

In the area of interest analysis results of Participant 6 for soups, it was determined that they looked at the image of the first soup the most in total fixation duration, then the price of the second soup, the price of the first soup, the description of the first soup, the image of the second soup, the description of the second soup, the name of the second soup, and the name of the first soup, respectively. When the fixation count results were examined, the participant focused on the image of the first soup nine times. The first focus was on the price of the first soup at 0.14 seconds, and this focus lasted a total of 0.44 seconds. However, it is also seen that they had a focus of 0.70 seconds on the price of the second soup. When the heat map (Figure 8) of the participant for the soup images is examined, it is determined that they focused more on the first soup and mostly focused on the parts where the name, price, and description of the dish are located. The answer was received that the participant wanted to order the first soup. In this case, the fact that both their preference is for the first soup and that they focused on the first soup as a result of the analysis of the data shows that the participant is consistent in their choice.

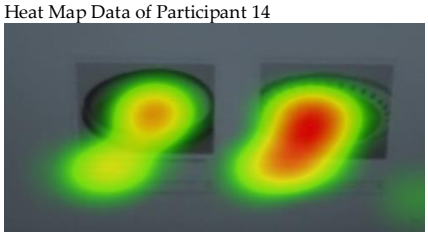
Heat Map Data of Participant 7 	When the eye-tracking data analyses of Participant 7 are examined, it is seen that the most intense focus is on the name of the second soup. Again, they focused on the image of this soup 15 times, their first focus was on the image of the second soup at 0.16 seconds, and this focus lasted 0.22 seconds. When the heat map of the participant (Figure 9) is examined, it is seen that the most intense focus is on the second soup, while this focus occurred in the name, price, and description section of the soup, and partially in the image section of the soup. The fact that they gave the answer seafood soup to the question asked to the participant shows that the results obtained are consistent.
Heat Map Data of Participant 8 	When looking at the eye-tracking data analyses of Participant 8, it is seen that they spent time in the image of the second soup, focused on this image 17 times, first looked at the image of the second soup at 0.74 seconds, and this look lasted 0.32 seconds. In the heat map (Figure 10) for the participant's eye data, it is seen that they experienced an intense focus on the second soup, and they stated that they would order seafood soup as an answer to the question asked. In this case, the participant is decisive in their choice, and the results are consistent with each other.
Heat Map Data of Participant 9 	When the areas of interest in the eye data analyses of Participant 9 are examined, it is seen that they spent more time in the image of the first soup and focused on this area 10 times. Another intense focus occurred 9 times in the name of the first soup. The participant made the first focus on the image of the second soup at 0.14 seconds, and this focus lasted 0.10 seconds. In the participant's heat map (Figure 11), it is seen that the intensity is in the first soup, and they stated that they could order the first soup, which is orange lentil soup, in terms of ordering. Therefore, it is seen that the results obtained are consistent.
Heat Map Data of Participant 10 	When the eye data analyses of Participant 10 are examined, it is determined that the participant spent the most time in the image of the first soup, focused on the image of the first soup 19 times, and again on the name of the same soup 11 times. The participant's first focus was on the image of the first soup at 0.04 seconds, and this focus lasted 0.38 seconds. In the heat map data (Figure 12) for the participant, it is seen that the focus occurred especially in the name and price section of the first soup. The fact that the answer received to the question asked to the participant is the first soup, which is orange lentil soup, shows that the participant is decisive and the results are consistent.
Heat Map Data of Participant 11 	When looking at the analysis results for Participant 11, it was determined that the participant experienced the most focus in the name section of the second soup, again looked at the image of the second soup the most (7 times), made the first focus in the description section of the second soup at 0.36 seconds, and this focus lasted 0.12 seconds. When the heat map (Figure 13) data for the participant are examined, it is seen that the focus occurred in the second soup and in the name, price, and description section of this soup. However, the participant stated that they would order the first soup, orange lentil soup, in response to the ordering question asked to them. In this case, what this participant looked at and said is not seen as consistent. However, the participant may have chosen the first soup with the possibility that they have not tasted the second soup, seafood soup, are curious, or want to remain loyal to tradition.
Heat Map Data of Participant 12 	When examining the area of interest (AOI) analysis results of Participant 12 in the soup category presented to them, it was determined that they looked at the price of the second soup in total fixation duration. They focused on the image of the second soup 13 times, and although they made the first focus on the image of the first soup at 0.06 seconds, it was concluded that they generally spent more time on the second soup. In the heat map (Figure 14), it is seen that the participant focused on the image of the second soup partially and generally on the name, price, and description section. The participant stated that they could order the second soup, seafood soup, and in this case, it was determined that all the results obtained were consistent.

Heat Map Data of Participant 13



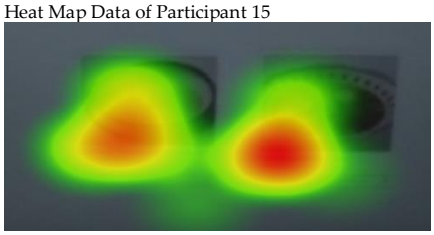
According to the area of interest analysis result of Participant 13, it is seen that they looked at the image of the second soup the most and again focused on the image of the second soup the most (4 times). The participant made their first focus on the image of the first soup at 0.04 seconds, and this focus lasted 0.20 seconds. When the heat map (Figure 15) is examined, it is seen that the areas where the participant experienced more intense focus are the price and description section of the second soup. However, the participant stated that they could order the first soup. In this case, it is estimated that the participant experienced a possible indecision, as seen in the heat map, and used their decision in favor of the soup they knew and tasted before.

Heat Map Data of Participant 14



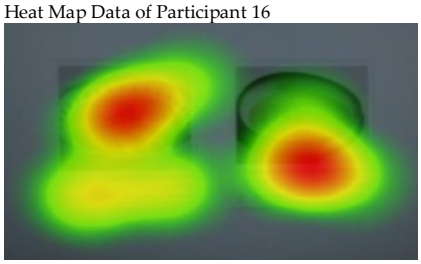
When the area of interest results for Participant 14 are examined, it is determined that the participant spent the most time in the image of the second soup and focused on this image 14 times. Similar findings were found in the heat map (Figure 16) results, and it was concluded that the participant mostly focused on the second soup. The participant stated that they would order the second soup. In this case, it was observed that the participant was decisive and the analysis results obtained were consistent.

Heat Map Data of Participant 15



Participant 15 experienced an intense focus on the name of the first soup, and it was determined that this focus occurred 8 times. In the heat map (Figure 17), it is seen that the regions where intense focuses are located are in the second soup, but the fact that they stated the soup they wanted to order as the first soup, orange lentil soup, revealed the result that the participant was indecisive and preferred the taste they knew.

Heat Map Data of Participant 16

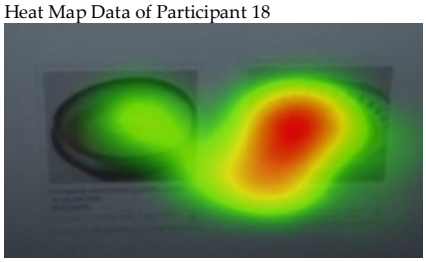


Participant 16 spent more time on the image of the second soup and focused on this image six times. The first focus was on the name of the first soup at 0.18 seconds, but this focus lasted quite short compared to others (0.18 seconds). When the participant's heat map data (Figure 18) were examined, it was determined that the participant focused partially on the image of the first soup and generally on the name, price, and description section, while focusing most intensely on the image of the second soup. The participant stated that they could order seafood soup. In this case, this participant may have clarified their decision by examining the name, price, and description of the first soup, or they may have been influenced by this image and made a decision by looking at the image of the second soup.

Heat Map Data of Participant 17

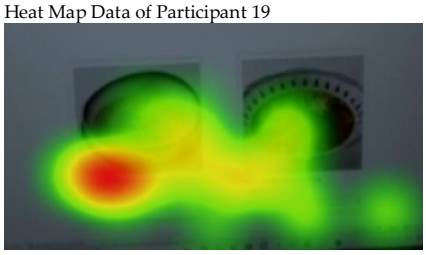
In the area of interest analysis results of Participant 17 for soups, it was determined that they spent more time on the image of the second soup and experienced the most focus on this image (9 times). In the heat map (Figure 19), it is seen that they focused on the image of both soups. The participant stated that they could order orange lentil soup from these soups. In this case, it was concluded that this participant may have been indecisive in their choice and preferred the soup they had experienced before.

Heat Map Data of Participant 18



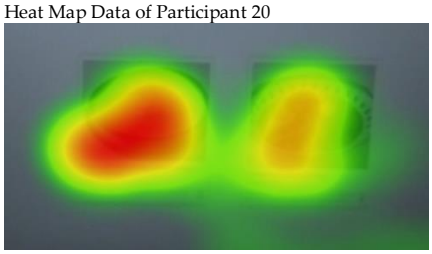
It was determined that Participant 18 spent a lot of time on the image of the second soup and focused on this soup 29 times. The first focus was on this soup at 0.56 seconds and lasted 0.70 seconds. It was determined that the participant also looked at the image of the second soup in the participant's heat map (Figure 20), and they also used their order selection in favor of the second soup, seafood soup. Therefore, it is seen that the participant is decisive and the results are consistent with each other.

Heat Map Data of Participant 19



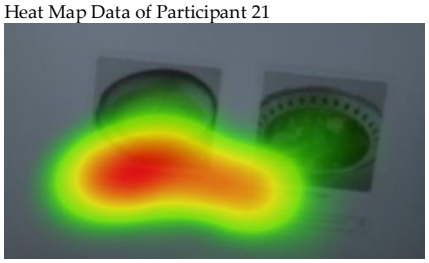
Participant 19 spent more time in the name section of the first soup, focused on this area 10 times, first focused on the image of the first soup at 0.22 seconds, and this focus lasted 0.10 seconds. In the participant's heat map (Figure 21) data, it is also seen that they spent time especially in the name and price section of the first soup. The participant stated that they could order the first soup. In this case, it was determined that this participant also obtained decisive and consistent results in their choices.

Heat Map Data of Participant 20



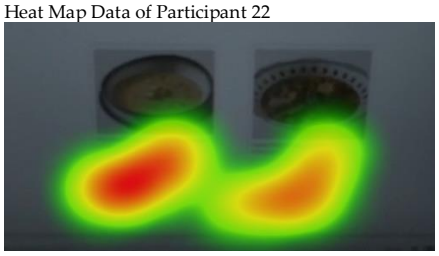
In the area of interest analysis results for Participant 20, it is seen that they experienced an intense focus on the image of the first soup. They focused on this image 27 times, the first focus was on the image of the first soup at 0.26 seconds, and this focus lasted 0.16 seconds. When the participant's heat map (Figure 22) data were examined, it was determined that they looked at the image of the first soup. The participant stated that they could order the first soup. In this case, the results obtained from this participant are consistent.

Heat Map Data of Participant 21



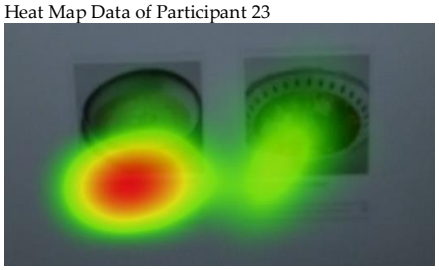
Participant 21 spent time in the name section of the first soup, focused on the image of the first soup five times, and made the first focus on the price of the first soup at 0.52 seconds. As seen in the participant's heat map (Figure 23), focuses occurred partially on the image of the first soup and mostly on the name, price, and description sections. The participant made their choice in favor of orange lentil soup, and consistent results were obtained.

Heat Map Data of Participant 22



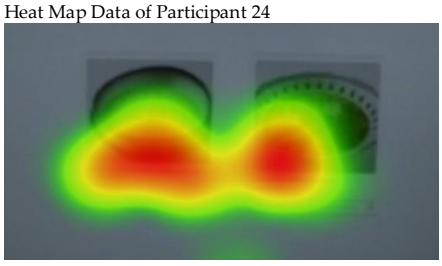
According to the AOI area of interest analysis results of Participant 22 for soup images, it is seen that they spent time in the description section of the first soup and experienced the most focus in this section. The first focus was on the description section of the second soup at 0.42 seconds, and this focus lasted 0.20 seconds. In the participant's heat map (Figure 24), it was determined that the most intense regions were in the name, price, and description section of the first soup, but they also experienced non-intense focuses in the section where this information of the second soup was located. The participant used their order preference in favor of orange lentil soup, and although they were a little indecisive, consistent results were obtained from the participant.

Heat Map Data of Participant 23



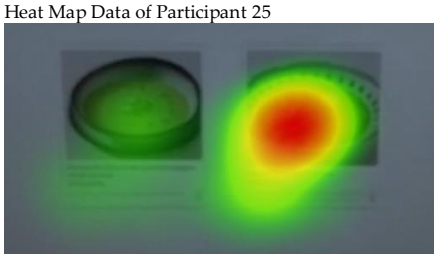
Participant 23 spent more time in the name section of the first soup and focused on this area 18 times. In the participant's heat map (Figure 25), it is seen that there is intensity in the first soup, and it is known that they preferred this soup in their order selection. Therefore, the participant is decisive and the results are quite consistent.

Heat Map Data of Participant 24



In the area of interest analysis results of Participant 24 for soups, it is seen that they spent more time on the image of the second soup and focused on this area nine times. However, the participant also focused on the name of the first soup nine times. The first focus time occurred on the image of the first soup at 0.16 seconds. In the heat map (Figure 26) for the participant, it is seen that the participant focused on both soups, and it is estimated that they experienced a possible indecision. The participant made their choice in favor of orange lentil soup.

Heat Map Data of Participant 25



When the eye-tracking data analyses of Participant 25 are examined, it is seen that the most intense focus occurred on the image of the second soup and this focus was 36 times. In the participant's heat map (Figure 27), it is seen that the intensity is in the second soup, while the fact that they made their choice in favor of this soup reveals the result that the participant is decisive.

CONCLUSION AND DISCUSSION

The most basic expectation of consumers from food and beverage businesses is that the food offered is delicious. However, many studies show that consumers consider many criteria when selecting a restaurant. The quality of the food, the image of the food, the way it is served, the price, hygiene, portion size, and the general atmosphere of the restaurant can affect consumers' decision-making processes. Knowing what information consumers look for or what information they need during purchasing, which is affected by a number of factors while satisfying their needs, helps food and beverage businesses determine their marketing strategies. Past research has generally accepted that consumers are "rational," but current studies reveal that consumers actually need less information than expected in the purchasing decision process (Olson & Jacoby, 1972). Therefore, the current study focused on the image, name, price, and description of the food.

Food images in menus (Bowen & Morris, 1995; Özdemir & Çalışkan, 2015), price information (McCall & Lynn, 2008), and explanations about the content of the food (Fikri & Ramadhan, 2011; Wansink et al., 2001) affect consumers' purchasing behaviors and encourage them to visit the food and beverage business again.

In the current study, data were collected through two soup images. There are two soups on the menu of the food and beverage business that constitutes the sample of the study. These are orange lentil soup and seafood soup. Soups, which are as old as human history, were made by early humans with the bones and meat of the animals they hunted, resulting in dishes with high nutritional value. Lentil soup is a very common soup in Turkish culinary culture and is deeply rooted in the culture. It is high in nutritional value and rich in protein, iron, phosphorus, and B vitamins. The fact that it is both economical and can be easily prepared in large quantities is one of the reasons why Turks often prefer this soup. With the spread of Turkish restaurants internationally, soup also plays a key role in the

promotion of Turkish gastronomy. In a study conducted by Yalçın and Mankan (2024), it was determined that the most liked soup by people residing in Istanbul is lentil soup. The lentil soup on the menu of the food and beverage business included in the research is prepared as orange and gluten-free, going beyond the traditional recipe. Another soup evaluated within the scope of the research is seafood soup. In Türkiye, seafood is easily accessible due to its geographical location, and it is frequently consumed, especially in geographical regions close to the seacoast. When Turkish culinary history is examined, it is seen that this culture was formed in the past, especially through the eating habits of Romans, Byzantines, Armenians, Jews, and Greeks living in Istanbul, and it evolved after the Republican period as a result of the migration of Turks from the Balkans to the region. Ottoman culinary records include information that fish soup was frequently made alongside many fish dishes (Şengör & Ceylan, 2018). However, it is estimated that it is not consumed much today compared to lentil soup, and even its taste is not known or is unfamiliar to many.

The soups in the fine dining restaurant menu operating in Istanbul were examined through an eye-tracking device. Eye-tracking technology facilitates research on consumers' purchasing and decision-making processes (Okuyan, 2024). According to Huddleston et al. (2018), eye fixations interact with specific regions in the brain to process the information collected, and this interaction directs eye movement to stimulus areas that attract consumers' attention. In other words, eye fixations do not occur randomly; they occur in relation to the type of information sought and the current task. Accordingly, the research aimed to determine to what extent consumers focused on the image, name, price, and description of the soups in the pre-purchase information search behavior while making unplanned purchases. While the impact of menu visuals on consumer behavior has been frequently examined in the literature, no studies have tested eye-tracking technology specifically for Turkish cuisine. In this context, this study fills a gap. Furthermore, while previous studies have focused primarily on price and menu descriptions, this study empirically demonstrates the dominant role of visuals in influencing attention.

In the research, the areas of interest (AOI) focus durations, counts, and heat maps were determined via the eye-tracking analysis applied to 25 volunteer participants. In addition, the answers obtained from the questions asked to the participants after the eye-tracking device was removed were also evaluated, and the results were compared with each other.

While searching for information when ordering soups in the soup category, participants looked at the image, name, price, and description sections of the first soup, respectively. They focused on the image, name, price, and description sections of the second soup, respectively. Based on these data, it can be said that the priority of the participants in the food selection process is the image of the food. These findings are partially similar to the research conducted by Chocarro et al. (2022). Both studies revealed that consumers primarily gravitate towards visuals. The study emphasized the dominant role of visuals in influencing attention, but also highlighted that visuals attract less attention when they are not crucial for purchasing a particular product. Furthermore, that study was conducted on an e-commerce website. Therefore, it is thought that this difference may be due to the nature of the products. Similarly, a study by Dai et al. (2020) empirically supported the strong role that food visuals play in decision-making processes. However, this study did not collect data with an eye-tracking device and focused on the salience of food visuals. A study by Dong et al. (2023) emphasized the critical role of food images in influencing user attention and experience, and eye-tracking technology determined that visuals in larger food images attract more attention than categories and text areas. However, these studies did not assess consumer purchasing behavior. It is observed that visually emphasizing some features and making them more prominent can increase their consideration in decision-making (Lynch & Ariely, 2000). In general, visual aesthetics is one of the first elements noticed in the process of purchasing a product (Mumcu & Kimzan, 2015). Bhandari et al. (2019) clearly emphasize that perceived aesthetic values affect consumer behaviors in terms of quality and attractiveness. Visual features (Garcia-Segovia et al., 2015), which are evaluated within the scope of the aesthetic features of a food, can guide our perception of food during purchasing behavior (Youssef et al., 2015). Another reason why participants focused more on the images of the dishes within the scope of the research may be that the image takes up more space on the screen and is more eye-catching than other areas.

The fact that consumers look at the names of the dishes secondly may be to learn what that dish is, to turn to the part related to the name if they cannot understand it from the image, and thus to determine whether they have an idea about the dish. Focusing on the price of the dish thirdly may be important in deciding which dish they can order according to their income status. From this point of view, there is a possibility that the participants will make a choice in line with their financial means. This is because economic factors differ from consumer to consumer. While some

consumers interpret the price as an indicator of product quality or prestige, some consumers see the price negatively and try to reduce the price they pay with different shopping strategies (Sternquist et al., 2004: 83). Therefore, the price of soups may have a differing effect on the purchasing behavior of the participants according to their lifestyles, income levels, and perceptions. However, in this study, all participants were students, and their income levels were quite similar. Therefore, further studies could be conducted to examine the differences between income levels.

The description of the dishes was the area that received the least focus. Participants may have made their decisions before looking at that area. Participants who remained indecisive may have looked at the description section at the end and finalized their decision. However, the absence of anyone with different eating habits (celiac patients, vegan/vegetarian, dietary restrictions, etc.) among the participants in the current research did not require them to check the description section for foods to which they might be sensitive. Therefore, there is no difference in the information search behaviors of the participants for both soups. While there are studies in which food descriptions attract less attention than visuals and other indicators, there are also studies in which individuals with food allergies, in particular, focus more on these descriptions than other indicators. For example, in a study conducted by Lee and Wei (2024) with individuals with food allergies using an eye-tracking device, participants were quicker to identify food allergy-related information on menus. This suggests that customers with food allergies pay more attention to the food description. Research by Reale and Flint (2016) emphasized that food information can only significantly influence food choice when presented in color and with health logos. Therefore, it can be argued that customers without any health issues do not pay much attention to the food description.

The fixation count of the participants according to their areas of interest is similar to the total fixation duration. Participants looked at the image, name, description, and price of the first soup, and the image, name, description, and price of the second soup, respectively. The most striking element in these data is that the description of the dish received a higher number of fixations than the price. When examined in general, the image of the second soup was the most viewed and focused on. However, although seafood soup attracted more attention from the participants, only seven of the participants stated that they would order this soup. There may be many reasons why participants did not prefer the soup they focused on and looked at more. Participants may not have tried seafood soup before, so

they may have been curious about this soup and looked at it more. However, at this point, it is useful to increase the number of questions asked to the participants in future research. In particular, questions can be asked about why they chose that dish in relation to the dish they are considering ordering. The current research only focuses on which soup is liked and preferred. Through different future studies, participants can be asked during the information search process what attracts their attention the most on the menu, whether there is a situation of liking/not preferring both products, how they would behave in such a situation, whether they want more alternatives in the soup category on the menu, and whether they need more information on the menu page they are viewing. Comparisons can be made with eye-tracking data in line with these questions. The research is based on an unplanned food selection scenario. Therefore, differences in the behaviors of the participants in a planned purchasing process could be observed. In addition to these, in future research, participants can be divided into several groups, and a budget can be determined for each group by increasing the alternative options in the menus, and they can be asked to make choices so as not to exceed that budget. In this research, only the soup category in the menu was evaluated. In this context, participants can be asked to create a menu, and it can be examined whether the menu they created is made according to menu planning principles. In addition, people with gluten sensitivity, those on diets, and vegetarians can be selected as participants, and the food choices of these groups can be examined. Methods such as EEG, GSR (electrodermal activity), and facial analysis can be integrated into the eye-tracking device in research, and all future studies can provide deep insight into understanding consumer behaviors.

In conclusion, the research findings revealed that consumers primarily focus on visuals when making impulsive food choices, followed by the dish's name and price. The description section received the least attention. This suggests that visual elements play a more dominant role than cognitive elements in impulsive decision-making. Furthermore, the findings showed that consumers were more likely to look at dishes they hadn't tried before (e.g., seafood soup) but mostly chose dishes they were familiar with (e.g., lentil soup) during the decision-making process. In other words, while interest and curiosity were directed toward new dishes, familiarity and habit were more prominent in purchasing behavior. In this context, restaurant managers should prioritize visual elements on menus. The aesthetic presentation of the dish and the quality of the photography are the first things consumers notice, which can increase purchase intention. Because the description section typically receives the least attention,

descriptions should be short, concise, and complement the visuals. Menus can use "recommended dish" labels, short stories, or chef's notes to spark curiosity about new and untried dishes. This can encourage consumers not only to browse but also to order. Familiar dishes should be preserved on the menu for loyal customers, but when new dishes are added, visual appeal should be increased to encourage trial. Future research could compare participants' impulsive and deliberate choice processes to test different behavioral patterns. Consumers' viewing times for familiar and unfamiliar foods in different cultural contexts (e.g., foreign cuisines versus traditional Turkish cuisine) could be reexamined.

As this research aimed to explore visual attention patterns in impulsive food choices, the study followed an exploratory design. Accordingly, hypothesis testing was not employed, as identifying basic gaze patterns was a necessary first step before developing confirmatory hypotheses for future studies. Building on these findings, this study provides preliminary evidence that can guide future research.

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