

Article

Consumers' Visual Attention and Eco-Labeled Product Preference: An Examination of Logo and Text Effectiveness

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Abstract

Eco-labels communicate environmental information to consumers, yet evidence regarding their effectiveness remains mixed. Drawing on the Stimulus–Organism–Response (S–O–R) framework, this study examines relationships among empathy, environmental behavior, willingness to pay for eco-labeled products, product preferences, and visual attention to environmental cues. Data were collected from 121 participants in Istanbul, Türkiye, using questionnaires and eye-tracking measurements. Participants evaluated six beverage categories presented in neutral, eco-label logo, and environmental-message conditions while fixation and saccade metrics were recorded. Empathy was positively associated with environmental behavior ($r = 0.585$, $p < 0.001$) and willingness to pay for eco-labeled products ($r = 0.699$, $p < 0.001$), but not with product preferences. Differences in product preferences according to environmental behavior emerged only in the green smoothie and coffee categories, where participants with higher environmental behavior scores were more likely to prefer environmental-message products. Eye-tracking analyses indicated that the relationship between environmental behavior and visual attention varied across product categories and areas of interest. Heatmap analyses showed that eco-label logos and environmental messages redirected visual attention toward sustainability-related information. The findings indicate that consumer responses to eco-labels depend on individual characteristics and product context. The results provide practical implications for firms and policymakers seeking to improve eco-label design and environmental communication strategies.

Keywords: consumer neuroscience; consumer behavior; environmental economics; environmental behavior; eye-tracking; eco-labels; empathy



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1. Introduction

As global environmental challenges such as climate change, resource depletion, and biodiversity loss become increasingly urgent, the role of consumer behavior in promoting sustainability has gained critical importance [1,2]. Although growing environmental awareness has encouraged more sustainable consumption intentions, a consistent gap between intention and behavior persists [3,4]. Bridging this gap necessitates a deeper understanding of the psychological and cognitive mechanisms underlying consumer decisions. Although eco-labels are widely promoted as tools for encouraging sustainable consumption, previous findings regarding their effectiveness remain inconclusive. While some studies report positive effects of eco-labels on consumer attitudes, willingness to pay, and product choice [5,6],

others suggest that eco-label information may have only a limited influence on purchasing decisions, particularly in food-related contexts [7]. These mixed findings indicate that consumer responses to eco-labels are likely to depend on contextual and individual-level factors. Consistent with the broader observation that the effectiveness of interventions may vary across different settings and decision environments [8], eco-label effectiveness cannot be assumed to be uniform across consumers or product categories.

Among the individual factors that may shape responses to eco-label information, empathy and environmental behavior are particularly relevant. Empathy—defined as the ability to connect emotionally and cognitively with others, including the natural environment—has been identified as an important antecedent of pro-environmental action [9–11]. Likewise, eco-labels provide consumers with environmental information at the point of product evaluation and may influence product-related evaluations and decisions [6,12]. Consumers with stronger environmental orientations may therefore attach greater relevance to environmental product attributes; however, the mechanisms through which these orientations shape consumer responses to eco-label information have received limited empirical attention.

Furthermore, understanding consumer responses to eco-labels requires not only investigating explicit self-reported attitudes but also examining implicit cognitive processes, such as visual attention patterns. Recent advances in consumer neuroscience, particularly eye-tracking technologies, offer valuable insights into how consumers process environmental cues embedded in product labels [13,14]. Nevertheless, visual attention to an eco-label should not automatically be interpreted as a preference for the product or as willingness to pay a premium for it. Most eco-label studies have examined stated attitudes, purchase intentions, or willingness to pay in response to environmental product information [6,7]. In parallel, eye-tracking research has explored how consumers attend to logo- and text-based environmental cues during product evaluation [13,14]. Research on empathy and environmental behavior has also emphasized the role of individual orientations in environmentally relevant actions and evaluations [9–11]. Despite these contributions, the relationships among empathy, environmental behavior, willingness to pay, product preferences, and visual attention to eco-label information constitute an underexplored area in the existing literature. Building on these lines of research, the present study examines empathy and environmental behavior together with willingness to pay, product preferences, and visual attention to logo- and message-based environmental cues.

Against this background, the present study is guided by the following research questions: (RQ1) Is empathy associated with environmental behavior and willingness to pay for eco-labeled products? (RQ2) Do consumers with stronger environmental orientations differ in their explicit product preferences for neutral, eco-label logo, and environmental-message product versions? (RQ3) Does the allocation of visual attention to eco-label cues vary according to individual empathy and environmental behavior levels? (RQ4) How does the type of eco-label stimulus (logo versus environmental message) shape visual attention patterns across different product categories? By addressing these questions, the study seeks to contribute to the growing body of literature on sustainable consumer behavior by linking individual-level psychological factors with both explicit product evaluations and implicit attentional processes.

To address these issues, this study draws on the Stimulus–Organism–Response (S–O–R) framework to examine how eco-label stimuli are processed through individual characteristics such as empathy and environmental behavior, and how these processes are reflected in visual attention, willingness to pay, and product preferences [15–17]. To the best of the authors' knowledge, research integrating empathy, environmental behavior, willingness to pay, explicit product preferences, and eye-tracking-based visual attention within a single eco-labeling framework remains limited in the context of Türkiye. Prior research has either

focused on self-reported attitudes and purchasing intentions without capturing visual attention [6,7] or examined visual attention to eco-labels without integrating individual psychological characteristics such as empathy [13,14]. By combining survey-based and eye-tracking measures within the S-O-R framework, the present study provides a more comprehensive examination of how consumers respond to eco-label information. In doing so, it contributes to the eco-labeling literature by integrating empathy, environmental behavior, visual attention, and consumer evaluations within a single analytical framework and by providing experimental evidence from the Türkiye context.

2. Theoretical Framework

2.1. Eco-Labeling

The environmental impacts of consumption behaviors have become increasingly visible, particularly as the climate crisis and ecological degradation begin to affect daily life more directly [2,18]. This has heightened environmental concern among individuals and strengthened the desire to make more sustainable choices. However, despite positive attitudes toward environmentally friendly products, the rate at which these attitudes translate into actual behavior remains relatively low [3,4]. This gap between intention and action poses a significant challenge for both marketers and policymakers aiming to promote sustainable consumption [19]. In this context, eco-labels have emerged as an effective tool that informs consumers about the environmental performance of products and encourages sustainable behaviors [12]. Typically featured on product packaging, eco-labels convey environmental messages through symbolic indicators (e.g., logos), textual explanations, or a combination of both [20]. The design, legibility, and visual salience of these labels play a critical role in shaping consumer perceptions and purchase decisions [21]. The effectiveness of these labels is largely determined by individual factors such as environmental literacy and concern [22]. Eco-labels may function not only as informational tools but also as cues associated with environmental responsibility and related value orientations [5]. As of 2025, there are an estimated 450 active eco-labeling schemes in over 199 countries and 25 industry sectors [23]. This diversity reflects the variation in market structures and consumer expectations. For many consumers, the information presented on a product's label is often the first—and sometimes only—source for determining its environmental impact [24,25]. Eco-labels thus play an informative role across a wide array of product categories, ranging from food and textiles to energy and tourism [6]. To be effective, eco-labels must fulfill several key criteria: they should be visible and understandable, maintain a balance between symbol and text, demonstrate category-level consistency, and align with the environmental values of the target consumer base [26,27]. Nevertheless, some studies—particularly in the food domain—suggest that eco-labels may have limited influence on purchasing decisions [7]. This suggests that the effectiveness of eco-label cues cannot be assumed to be universal across all contexts. Consistent with broader evidence that the effects of interventions may vary across different contexts [8], consumer responses may vary depending on product characteristics, individual differences, and situational factors, highlighting the context-dependent nature of eco-label effectiveness. These observations suggest that the effectiveness of eco-labels depends not only on the environmental information they provide but also on how that information is presented and processed by consumers. Eco-labels therefore constitute more than simple informational devices; they function as communication cues that may influence consumer evaluations through visual, cognitive, and affective processes [28,29]. Understanding these processes is particularly important when examining how consumers attend to and interpret environmental information during product evaluation.

2.2. Environmental Behavior and Consumer Preferences

The escalating global environmental challenges have necessitated a fundamental reassessment of individuals' environmentally related decisions and behaviors. Environmental behavior is conceptualized as a multidimensional construct encompassing not only observable actions—such as waste separation, energy conservation, and sustainable product preferences—but also the underlying values, beliefs, and social norms that drive these actions [30–32].

A strong psychological bond with nature has been identified as a critical determinant in fostering sustainable lifestyles. Empirical studies demonstrate that emotional and cognitive connections to nature significantly enhance both environmental attitudes and the willingness to engage in pro-environmental behaviors [33–36].

However, environmental behavior is shaped not solely by intrinsic motivations but also by individual and contextual factors, including environmental knowledge, social norms, and ecological literacy [2,37]. Although environmental knowledge is generally associated with more sustainable behavior, knowledge alone does not always translate into action [38,39]. Other factors, such as experiential engagement with nature, empathic tendencies, and broader social contexts, may also play an important role in encouraging pro-environmental behavior [40,41].

Sustainable consumption behaviors are shaped not only by environmental knowledge but also by individuals' moral values, environmental concern, and emotional dispositions [42]. Among these factors, empathy has received increasing attention as a potential driver of environmentally responsible behavior, as it may encourage individuals to consider the broader consequences of their consumption decisions [43,44]. Taken together, the literature suggests that environmental behavior and empathy may play an important role in shaping consumer evaluations and preferences for environmentally oriented products.

2.3. The Relationship Between Empathy and Environmental Behavior

Empathy is a multidimensional psychological construct that refers to an individual's capacity to understand and share the emotions and thoughts of others. It is commonly divided into two primary components: emotional empathy, which involves directly experiencing the feelings of others, and cognitive empathy, which refers to the ability to understand another's perspective or mental state [45,46]. Bloom [45] further elaborates on empathy through four dimensions: understanding thoughts, emotional resonance, intuitive feeling, and developing compassion. While empathy plays a pivotal role in interpersonal relationships, it is equally critical in shaping the human-environment connection. In particular, heightened sensitivity to environmental stimuli has been shown to correlate with empathetic dispositions [10,47].

Rather than functioning solely as a cognitive mechanism in decision-making, empathy serves as an internal motivator in adopting environmental responsibilities [45]. The empathy-sustainability hypothesis posits that the ability to take another's perspective and form emotional bonds fosters more responsible and environmentally sensitive behaviors [48]. This perspective shifts the human-nature relationship from a self-centered orientation to one based on mutual interaction and reciprocity. Empathy thus becomes a critical factor in shaping individual responses to environmental crises such as climate change, particularly in the processes of recognizing and developing concern for ecological needs [9,49].

Individuals who exhibit empathetic concern for communities affected by environmental degradation have been found to engage more readily in sustainability-oriented thinking and behavior [11,50]. In this regard, empathy extends beyond interpersonal dynamics

and serves as a moral bridge between humans and the natural environment. This emotional closeness to nature not only enhances awareness of environmental issues but also acts as a psychological mechanism that facilitates the translation of that awareness into pro-environmental action [10,48].

2.4. Stimulus-Organism-Response (S-O-R) Model

The Stimulus-Organism-Response (S-O-R) model offers a theoretical framework positing that individuals' reactions to environmental stimuli are shaped by cognitive and emotional processes [16,17]. Evolving from Thorndike's earlier Stimulus-Response (S-R) approach, the S-O-R model suggests that external environmental factors (S) are processed through individuals' internal evaluative mechanisms (O), ultimately resulting in behavioral outcomes (R) [16,51].

The model has been widely employed in explaining sustainable consumer behavior, illustrating how stimuli such as green messages, eco-labels, and price information are internally evaluated through psychological attributes like environmental behavior and empathy, subsequently influencing consumer responses [15,52,53].

Stimuli are cognitively and emotionally processed at the organism level, incorporating individuals' prior experiences, attitudes, values, and emotional states [54,55]. Through this internal processing, individuals produce behavioral outcomes, such as approach or avoidance behaviors [56]. Sustainability-focused visual stimuli, including eco-labels and environmental messages, can thus impact levels of attention, willingness to pay, and product preferences within this framework [57–59].

A recent systematic review by Hochreiter et al. [15] further supports the extensive use of the S-O-R model in explaining consumer responses in sustainability contexts. In this study, the S-O-R model serves as a theoretical foundation for examining how eco-labels and green messages, through individual characteristics such as empathy and environmental behavior, shape sustainable consumer behavior [60].

Guo et al. [61] demonstrated that visual design characteristics influence both visual attention and subsequent consumer evaluations. Their findings highlight the importance of stimulus features in shaping consumer decision-making processes and support the examination of eco-label characteristics as visual stimuli that may affect consumers' attention and product evaluations. Shi et al. [62] further showed that environmentally oriented value structures may influence how consumers allocate visual attention during product evaluation. Individuals with stronger green consumption values were more likely to focus on environmental product attributes, suggesting that sustainability-related beliefs can shape the processing of visual information during decision-making.

Recent consumer neuroscience research has further demonstrated the applicability of the Stimulus–Organism–Response framework in sustainability-related decision contexts. Using eye-tracking measures, Mohd Isa et al. [63] showed that sustainability-related attributes can influence subconscious attentional processes that subsequently contribute to consumer evaluations and behavioral responses. These findings support the suitability of the S-O-R framework for examining how eco-label cues are translated into consumer responses through internal cognitive processes. Within this framework, eco-labels, environmental messages, and price-related information constitute the stimulus component, while individual characteristics such as empathy and environmental behavior represent organism-level processes that shape the interpretation of sustainability-related information [16,55]. These internal evaluations are subsequently reflected in consumer responses, including visual attention patterns, willingness to pay, and product preferences [15,63]. Accordingly, the S-O-R framework provides an appropriate theoretical structure for integrating the cognitive, emotional, and behavioral variables examined in the present study.

2.5. Development of Hypotheses

The Stimulus–Organism–Response (S-O-R) model [16] offers a robust theoretical framework for explaining how sustainability-themed stimuli influence consumer behavior through individual psychological mechanisms. In this study, eco-labels and green messages presented on product packaging serve as the stimuli, while individual factors such as empathy and environmental behavior function as cognitive and emotional evaluations at the organism level. The resulting responses are observed in consumer behaviors, specifically product choice and willingness to pay [15,17].

Empathy is a multidimensional construct encompassing emotional resonance and cognitive perspective-taking [45,46]. Previous research has demonstrated that higher levels of empathy contribute to greater sensitivity to environmental issues and promote pro-environmental behaviors [10,11]. Particularly, the capacity to establish emotional connections is identified as an intrinsic motivational driver for sustainable actions. Similarly, environmental behavior has been identified as an important predictor of environmentally responsible consumption [2,36]. Consumers who engage more frequently in pro-environmental behaviors are generally more likely to support environmentally oriented products and sustainability-related product attributes [5,7].

Beyond self-reported attitudes, recent studies emphasize the contribution of implicit processes—especially visual attention patterns—in understanding consumer behavior [13,14]. Eye-tracking techniques enable researchers to objectively capture attention patterns that individuals may not consciously report, thus offering deeper insights into the effects of sustainability-oriented stimuli. Given that empathy may influence how consumers evaluate the environmental consequences of consumption choices, it may also contribute to preferences for products that communicate environmental benefits [10,11].

Based on this theoretical background, the following hypotheses were formulated:

- H1.** *Individuals with higher levels of empathy exhibit higher levels of environmental behavior.*
- H2.** *Individuals with higher levels of empathy are more willing to pay for eco-labeled products.*
- H3.** *Individuals with higher environmental behavior scores prefer products with eco-friendly messages more than neutral-content products.*
- H4.** *Eye-tracking data (fixation and saccade counts) reveal longer and more focused visual attention toward eco-friendly messages among individuals with high environmental behavior.*
- H5.** *Empathy levels significantly influence product preferences.*

To the best of the authors' knowledge, this study represents one of the first experimental designs in Türkiye to integrate both eye-tracking and survey data for the simultaneous investigation of explicit and implicit dimensions of sustainable consumer behavior, thereby offering an original methodological and empirical contribution to the eco-labeling literature.

3. Materials and Methods

3.1. Participants

The study sample consisted of voluntary participants aged 18 years and older residing in Istanbul, Türkiye. Individuals residing outside Istanbul or under the age of 18 were excluded from the study.

A total of 121 participants who completed the questionnaire agreed to participate in the experimental phase of the study. Information on environmental behavior, empathy, and willingness to pay for eco-labeled products was collected through the survey instrument.

Participants were subsequently invited to a controlled laboratory environment for the eye-tracking experiment. Recruitment was limited to Istanbul because the experimental design required in-person attendance under standardized laboratory conditions. Participation was voluntary, and all participants were informed about the study procedures prior to data collection. The study was conducted in accordance with the relevant ethical principles, and participant confidentiality was maintained throughout the research process.

3.2. Data Collection Tools

In this study, three different scales were employed to assess participants' environmental behaviors, empathy levels, and willingness to pay for eco-friendly products.

First, the Environmental Behavior Scale developed by Goldman, Yavetz, and Pe'er [64] was used to comprehensively measure individuals' sustainability-oriented behaviors. This scale consists of 20 items rated on a five-point Likert scale (1 = Never, 5 = Always) and comprises six subdimensions. Total scores range between 20 and 100, and one item is reverse-scored. In the Turkish adaptation study, Cronbach's alpha coefficients for the subdimensions were reported at or above the 0.60 threshold [37] indicating acceptable reliability for the multidimensional structure of the scale.

Second, the Affective and Cognitive Empathy Scale developed by Vachon and Lynam [65] was utilized to evaluate empathy across three core dimensions: cognitive empathy, emotional contagion, and emotional dissonance. This scale includes 36 items, rated on a five-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree), with 22 items reverse-coded. Cronbach's alpha coefficients were reported as 0.90 for cognitive empathy, 0.87 for emotional contagion, and 0.87 for emotional dissonance [66].

Third, the Willingness to Pay for Eco-Labeled Products Scale, adapted from the works cited in Balaban [67], was employed. This unidimensional scale consists of 28 items rated on a five-point Likert scale. The total score ranges between 28 and 140, with a Cronbach's alpha reliability coefficient reported as 0.83 [67].

Additionally, a Demographic Information Form was administered to collect participants' data regarding age, gender, education level, occupation, marital status, monthly income, and their purchasing preferences for eco-labeled products.

Eye-tracking measurements were conducted in a controlled laboratory environment using a GP3 eye-tracking device. The device offers a 60 Hz sampling rate, 5- and 9-point calibration options, a visual angle range of -0.5° to 1° , a tracking area of 25×11 cm, and a ± 15 cm depth tolerance. Infrared cameras tracked participants' pupil movements, and data collection was automatically triggered once the participant's distance from the screen was stabilized within 90 cm [68]. Visual attention metrics were analyzed using iMotions software, Version 9.3.22, based on fixation count and saccade count data. Fixation count indicated the frequency of attention allocated to specific areas of interest, whereas saccade count reflected visual exploration across stimuli. These measures are widely used to examine attentional allocation and information acquisition during consumer decision-making processes [69].

3.3. Experimental Design and Procedure

This study employed an experimental design to examine the effects of environmental behavior and empathy levels on willingness to pay for eco-labeled products, product preferences, and visual attention to eco-label information. A mixed-method data collection model consisting of two phases was implemented.

In the first phase, an online survey was conducted. The questionnaire, created via Google Forms, included a Demographic Information Form, the Environmental Behavior Scale [64], the Affective and Cognitive Measure of Empathy [65] and the Willingness to Pay

for Eco-Labeled Products Scale [67]. The 121 participants who consented to continue with the experimental phase were invited to attend an on-site laboratory session.

At the beginning of the session, participants were welcomed and given a brief overview of the procedure in a designated area before being taken to the measurement room, which was acoustically and visually insulated and kept at 20–23 °C [70]. Participants were seated in a chair with back support in front of a 15-inch monitor connected to the iMotions system, while eye movements were recorded using the GP3 eye-tracking system integrated with the iMotions platform. To ensure accurate facial and eye tracking, participants were positioned approximately 90 cm from the camera. During the experiment, participants were instructed to minimize movement and refrain from speaking. Three-second black screens were inserted between visual stimuli, and six-second transition screens were used between product categories.

Participants were exposed to six different products from the soft drink category (coke, iced tea, fruit juice, coffee, green beverage, and ayran [a traditional Turkish cold beverage made from yogurt and water]). For each product, three types of visual stimuli were prepared: (A) neutral content, (B) featuring an eco-label logo, and (C) including an environmentally friendly message. All visual materials were based on real product packages from store shelves; however, brand names were removed to prevent brand bias while preserving all other original package elements. In order to isolate the effect of sustainability cues on consumer preferences and visual attention, all visual stimuli were standardized in terms of product category, volume (mL), and price information placement. Sample product stimuli from the fruit juice category are presented in Figure 1, including (A) the neutral condition, (B) the eco-label logo condition, and (C) the environmental-message condition.



Figure 1. Sample product stimuli presented to participants in the experimental study (Fruit Juice category): (A) neutral product; (B) product with an eco-label logo; and (C) product with an environmental message.

Price information for neutral products was determined based on the June 2023 market average. For the eco-label and environmental-message conditions, prices were increased by 20% relative to the corresponding neutral product versions.

Because consumer familiarity with eco-labels may vary, three eco-labels representing different sectors were included in the experiment. These were the TerraCycle, Demeter, and Sustainable Agricultural Network (SAN) Bird Friendly Coffee logos. Example images of these labels are presented in Figure 2. The resolution, color, and size settings of all images were standardized in bitmap format. At the end of each product category presentation, participants were asked to select their preferred product through a brief on-screen survey. Participants indicated their choice by clicking on one of the product images displayed on the screen using a mouse.

During the analysis of participants' eye movements, different Areas of Interest (AOIs) were defined for fixation and saccade measurements [71]. For products with neutral content, three AOIs were specified: two areas containing product information and one area

displaying the price. For products containing eco-label logos or environmental messages, three separate AOIs were defined: product information, price, and the section containing either the logo or the environmental message text.



Figure 2. Eco-labels used in the experiment.

All data collected in this study were analyzed using IBM SPSS Statistics for Windows Version 25.0. Descriptive statistics were reported as frequencies and percentages for categorical variables and as means $\pm$ standard deviations and medians (minimum–maximum) for continuous variables. The normality of data distribution was assessed using the Kolmogorov–Smirnov test. Independent samples t-tests were used for comparisons between two independent groups, whereas one-way ANOVA and Bonferroni post hoc tests were employed for comparisons involving multiple groups. Pearson’s chi-square test was used for categorical variables, and Pearson correlation analysis was conducted to examine relationships between continuous variables. Statistical significance was set at $p < 0.05$.

4. Results and Hypothesis Testing

4.1. Results

Table 1 presents the sociodemographic characteristics of the participants. The mean age was 26.61 (± 7.79). Of the participants, 53.7% were female and 46.3% were male. Regarding educational attainment, the majority held a bachelor’s degree (71.7%) or a postgraduate degree (23.0%). In terms of occupation, students (53.7%) and private sector employees (34.7%) constituted the dominant groups. Marital status analysis revealed that 79.3% of the participants were single, while 20.7% were married. With respect to income level, a substantial majority (79.3%) reported belonging to the middle-income group. Additionally, 79.3% of the participants indicated a preference for purchasing eco-labeled products.

Table 1. Distribution of Sociodemographic Characteristics.

Variable	N	%
Age, Mean $\pm$ SD	26.61 $\pm$ 7.79	
Gender		
Female	65	53.7
Male	56	46.3
Education Level		
High school	6	5.3
Bachelor’s degree	87	71.7
Postgraduate degree	28	23.0
Occupation		
Student	65	53.7
Private sector	42	34.7
Self-employed	4	3.3
Public sector	10	8.3

Table 1. *Cont.*

Variable	N	%
Marital Status		
Single	95	79.3
Married	26	20.7
Income Level		
Very poor	4	3.4
Moderate	21	17.2
Good	96	79.3
Preference for Purchasing Eco-Labeled Products		
Yes	96	79.3
No	11	9.1
Never considered	14	11.6

Table 2 compares willingness to pay for eco-labeled products and environmental behavior scores between participants with low and high empathy levels.

Table 2. Comparison of Scale Scores by Empathy Levels.

Scales	Empathy Scale		<i>p</i> -Value
	Low N = 41	High N = 80	
Willingness to Pay for Eco-Labeled Products Scale	2.98 ± 0.96	3.66 ± 0.44	<0.001
Environmental Behavior Scale	47.56 ± 12.85	58.18 ± 9.97	<0.001

Independent samples *t*-test, *p* < 0.05.

As presented in Table 2, independent samples *t*-test analyses based on empathy levels revealed that individuals with higher empathy scores had significantly higher mean scores on both the Willingness to Pay for Eco-Labeled Products Scale (*p* < 0.001) and the Environmental Behavior Scale (*p* < 0.001). The correlations among empathy, willingness to pay for eco-labeled products, and environmental behavior are presented in Table 3.

Table 3. Correlations Between Scales.

		Empathy Scale	Willingness to Pay for Eco-Labeled Products Scale	Environmental Behavior Scale
Empathy Scale	<i>r</i>	1		
	<i>p</i>			
Willingness to Pay for Eco-Labeled Products Scale	<i>r</i>	0.699 **	1	
	<i>p</i>	<0.001		
Environmental Behavior Scale	<i>r</i>	0.585 **	0.626 **	1
	<i>p</i>	<0.001	<0.001	

Pearson correlation test. ** *p* < 0.01.

As shown in Table 3, Pearson correlation analysis indicated significant positive correlations between the Empathy Scale and the Willingness to Pay for Eco-Labeled Products Scale (*r* = 0.699, *p* < 0.001), as well as between the Empathy Scale and the Environmental Behavior Scale (*r* = 0.585, *p* < 0.001). Additionally, a significant positive correlation was identified between the Willingness to Pay for Eco-Labeled Products Scale and the Environmental Behavior Scale (*r* = 0.626, *p* < 0.001). These findings suggest that as individuals' empathy levels increase, both their environmental behavior and their willingness to pay

for sustainable products also increase. Table 4 presents the correlations between the study scales and fixation count measurements.

Table 4. Correlations Between Scales and Fixation Count Measurements for Products.

		Empathy Scale	Willingness to Pay for Eco-Labeled Products Scale	Environmental Behavior Scale
Ayrar_A_content_fixation_count	r	−0.082	−0.067	−0.214 *
	p	0.370	0.463	0.019
Ayrar_A_text_fixation_count	r	0.184 *	0.056	0.096
	p	0.043	0.538	0.293
Ayrar_A_price_fixation_count	r	0.068	0.083	−0.010
	p	0.458	0.363	0.917
Ayrar_B_content_fixation_count	r	−0.032	0.061	0.101
	p	0.728	0.505	0.272
Ayrar_B_logo_fixation_count	r	−0.040	−0.034	−0.076
	p	0.664	0.715	0.410
Ayrar_B_price_fixation_count	r	−0.005	−0.022	−0.070
	p	0.955	0.814	0.444
Ayrar_C_logo_fixation_count	r	−0.110	−0.174	−0.223 *
	p	0.230	0.056	0.014
Ayrar_C_text_fixation_count	r	−0.016	0.037	0.002
	p	0.865	0.689	0.987
Ayrar_C_price_fixation_count	r	0.023	0.001	0.016
	p	0.805	0.994	0.863
Coffee_A_content_fixation_count	r	−0.023	−0.049	0.076
	p	0.806	0.590	0.405
Coffee_A_price_fixation_count	r	0.090	0.120	−0.031
	p	0.326	0.189	0.736
Coffee_A_logo_fixation_count	r	−0.027	−0.092	−0.143
	p	0.767	0.316	0.118
Coffee_B_logo_fixation_count	r	−0.013	−0.004	−0.165
	p	0.888	0.964	0.071
Coffee_B_text_fixation_count	r	−0.030	0.122	0.090
	p	0.748	0.184	0.325
Coffee_B_price_fixation_count	r	−0.027	0.046	0.067
	p	0.769	0.618	0.463
Coffee_C_content_fixation_count	r	−0.020	−0.048	0.001
	p	0.829	0.605	0.995
Coffee_C_text_fixation_count	r	−0.087	−0.045	0.044
	p	0.345	0.623	0.628
Coffee_C_price_fixation_count	r	−0.047	0.035	−0.045
	p	0.608	0.702	0.626
Coke_A_text_fixation_count	r	−0.088	−0.037	−0.064
	p	0.339	0.691	0.484
Coke_A_content_fixation_count	r	−0.076	0.049	−0.058
	p	0.409	0.590	0.531
Coke_A_price_fixation_count	r	−0.035	−0.046	−0.026
	p	0.701	0.620	0.774
Coke_B_logo_fixation_count	r	−0.076	−0.030	−0.136
	p	0.410	0.742	0.136
Coke_B_text_fixation_count	r	−0.009	0.032	−0.010
	p	0.925	0.730	0.912
Coke_B_price_fixation_count	r	−0.003	0.046	0.013
	p	0.973	0.619	0.891
Coke_C_logo_fixation_count	r	0.025	0.098	−0.062
	p	0.785	0.286	0.501
Coke_C_content_fixation_count	r	−0.048	0.065	0.090
	p	0.598	0.481	0.327
Coke_C_price_fixation_count	r	0.067	−0.044	0.016
	p	0.468	0.630	0.860

Table 4. Cont.

		Empathy Scale	Willingness to Pay for Eco-Labeled Products Scale	Environmental Behavior Scale
Fruit juice_A_text_fixation_count	r	−0.083	0.044	−0.025
	p	0.366	0.630	0.789
Fruit juice_A_content_fixation_count	r	−0.012	0.058	−0.050
	p	0.894	0.525	0.590
Fruit juice_A_price_fixation_count	r	−0.042	−0.050	−0.048
	p	0.651	0.583	0.599
Fruit juice_B_logo_fixation_count	r	−0.002	0.005	−0.084
	p	0.982	0.955	0.359
Fruit juice_B_content_fixation_count	r	−0.159	−0.055	−0.158
	p	0.082	0.547	0.084
Fruit juice_B_price_fixation_count	r	0.018	−0.051	−0.002
	p	0.841	0.582	0.984
Fruit juice_C_logo_fixation_count	r	0.023	−0.020	0.049
	p	0.803	0.830	0.594
Fruit juice_C_content_fixation_count	r	−0.012	0.073	0.067
	p	0.896	0.429	0.466
Fruit juice_C_price_fixation_count	r	−0.036	−0.060	−0.020
	p	0.694	0.512	0.831
Iced tea_A_content_fixation_count	r	−0.302 **	−0.172	−0.146
	p	0.001	0.060	0.110
Iced tea_A_text_fixation_count	r	−0.0188 *	−0.046	−0.207 *
	p	0.039	0.616	0.023
Iced tea_A_price_fixation_count	r	0.040	−0.045	−0.034
	p	0.660	0.626	0.715
Iced tea_B_logo_fixation_count	r	−0.067	0.031	−0.017
	p	0.468	0.739	0.851
Iced tea_B_content_fixation_count	r	−0.003	−0.005	−0.121
	p	0.972	0.960	0.187
Iced tea_B_price_fixation_count	r	−0.021	−0.029	0.002
	p	0.822	0.749	0.985
Iced tea_C_logo_fixation_count	r	−0.041	−0.104	−0.044
	p	0.654	0.256	0.635
Iced tea_C_text_fixation_count	r	0.044	0.030	0.091
	p	0.634	0.743	0.320
Iced tea_C_price_fixation_count	r	0.085	0.121	0.064
	p	0.351	0.185	0.485
Green smoothie_A_logo_fixation_count	r	0.090	0.039	0.022
	p	0.324	0.670	0.808
Green smoothie_A_text_fixation_count	r	0.078	0.028	−0.067
	p	0.397	0.761	0.468
Green smoothie_A_price_fixation_count	r	0.007	0.009	−0.002
	p	0.943	0.918	0.986
Green smoothie_B_logo_fixation_count	r	−0.119	−0.083	−0.134
	p	0.194	0.366	0.142
Green smoothie_B_text_fixation_count	r	−0.084	−0.142	−0.102
	p	0.359	0.121	0.266
Green smoothie_B_price_fixation_count	r	0.027	−0.035	0.015
	p	0.768	0.705	0.873
Green smoothie_C_logo_fixation_count	r	0.031	0.056	−0.006
	p	0.740	0.544	0.945
Green smoothie_C_text_fixation_count	r	−0.073	−0.045	−0.184 *
	p	0.425	0.627	0.043
Green smoothie_C_price_fixation_count	r	0.092	0.052	0.121
	p	0.314	0.572	0.187

Pearson correlation test. * $p < 0.05$; ** $p < 0.01$.

As shown in Table 4, significant correlations between the study scales and fixation count measures were observed for a limited number of product stimuli. Empathy was

positively correlated with fixation count for Ayran_A_content and negatively correlated with Iced tea_A_content and Iced tea_A_text. Environmental behavior was negatively associated with fixation counts for Ayran_A_content, Ayran_C_logo, Iced tea_A_text, and Green smoothie_C_text. Overall, most fixation count measures were not significantly associated with empathy, willingness to pay, or environmental behavior. Table 5 presents the correlations between the study scales and saccade count measurements.

Table 5. Correlations Between the Scales and Saccade Count Measurements for Products.

		Empathy Scale	Willingness to Pay for Eco-Labelled Products Scale	Environmental Behavior Scale
Ayran_A_content_saccade_count	r	−0.034	−0.030	−0.207 *
	p	0.711	0.746	0.022
Ayran_A_content_saccade_count	r	0.153	0.018	0.105
	p	0.094	0.846	0.250
Ayran_A_price_saccade_count	r	0.073	0.012	−0.053
	p	0.425	0.896	0.564
Ayran_B_content_saccade_count	r	−0.031	−0.101	0.035
	p	0.738	0.273	0.706
Ayran_B_logo_saccade_count	r	0.055	0.008	−0.018
	p	0.551	0.927	0.843
Ayran_B_price_saccade_count	r	−0.059	−0.159	−0.161
	p	0.517	0.081	0.077
Ayran_C_logo_saccade_count	r	−0.107	−0.204 *	−0.295 **
	p	0.242	0.025	0.001
Ayran_C_text_saccade_count	r	−0.085	−0.046	−0.055
	p	0.356	0.617	0.552
Ayran_C_price_saccade_count	r	0.059	−0.016	−0.016
	p	0.521	0.859	0.862
Coffee_A_content_saccade_count	r	−0.009	−0.107	0.015
	p	0.923	0.241	0.868
Coffee_A_price_saccade_count	r	0.096	0.072	0.000
	p	0.293	0.431	0.997
Coffee_A_logo_saccade_count	r	−0.072	−0.206 *	−0.240 **
	p	0.433	0.023	0.008
Coffee_B_logo_saccade_count	r	0.027	−0.066	−0.165
	p	0.772	0.471	0.070
Coffee_B_text_saccade_count	r	0.089	0.058	0.128
	p	0.332	0.531	0.162
Coffee_B_price_saccade_count	r	−0.010	−0.017	0.042
	p	0.916	0.851	0.646
Coffee_C_text_saccade_count	r	−0.030	−0.073	0.040
	p	0.747	0.426	0.667
Coffee_C_text_saccade_count	r	−0.149	−0.141	−0.034
	p	0.102	0.124	0.711
Coffee_C_price_saccade_count	r	0.014	−0.021	−0.085
	p	0.878	0.820	0.352
Coke_A_text_saccade_count	r	−0.120	−0.119	−0.170
	p	0.189	0.192	0.062
Coke_A_content_saccade_count	r	0.013	0.046	0.038
	p	0.888	0.616	0.676
Coke_A_price_saccade_count	r	−0.011	−0.073	−0.083
	p	0.902	0.426	0.368
Coke_B_logo_saccade_count	r	−0.043	−0.069	−0.044
	p	0.641	0.449	0.630
Coke_B_text_saccade_count	r	−0.019	−0.018	−0.046
	p	0.840	0.849	0.618
Coke_B_price_saccade_count	r	−0.103	−0.065	−0.102
	p	0.260	0.477	0.266
Coke_C_logo_saccade_count	r	0.082	0.049	0.024
	p	0.370	0.594	0.797

Table 5. Cont.

		Empathy Scale	Willingness to Pay for Eco-Labeled Products Scale	Environmental Behavior Scale
Coke_C_content_saccade_count	r	−0.030	0.102	0.062
	p	0.747	0.268	0.502
Coke_C_price_saccade_count	r	0.053	−0.079	−0.018
	p	0.561	0.387	0.848
Fruit juice_A_text_saccade_count	r	0.083	0.085	0.077
	p	0.366	0.354	0.401
Fruit juice_A_content_saccade_count	r	0.060	0.057	0.047
	p	0.515	0.533	0.606
Fruit juice_A_price_saccade_count	r	0.002	−0.029	−0.112
	p	0.979	0.750	0.222
Fruit juice_B_logo_saccade_count	r	0.013	−0.018	−0.026
	p	0.886	0.843	0.779
Fruit juice_B_content_saccade_count	r	−0.164	−0.130	−0.142
	p	0.072	0.156	0.120
Fruit juice_B_price_saccade_count	r	0.015	−0.017	−0.018
	p	0.867	0.849	0.848
Fruit juice_C_logo_saccade_count	r	−0.030	−0.117	−0.068
	p	0.746	0.200	0.460
Fruit juice_C_content_saccade_count	r	−0.047	0.042	0.123
	p	0.605	0.645	0.180
Fruit juice_C_price_saccade_count	r	0.031	−0.011	0.039
	p	0.734	0.901	0.672
Iced tea_A_content_saccade_count	r	−0.117	−0.054	−0.102
	p	0.200	0.556	0.265
Iced tea_A_text_saccade_count	r	−0.136	−0.070	−0.219 *
	p	0.136	0.445	0.016
Iced tea_A_price_saccade_count	r	0.089	0.037	0.052
	p	0.332	0.683	0.569
Iced tea_B_logo_saccade_count	r	0.026	0.001	0.059
	p	0.776	0.994	0.517
Iced tea_B_content_saccade_count	r	−0.020	0.026	−0.190 *
	p	0.831	0.773	0.037
Iced tea_B_price_saccade_count	r	0.000	−0.050	−0.030
	p	0.997	0.588	0.743
Iced tea_C_logo_saccade_count	r	0.039	−0.082	−0.011
	p	0.672	0.369	0.904
Iced tea_C_text_saccade_count	r	0.008	0.032	0.030
	p	0.930	0.725	0.746
Iced tea_C_price_saccade_count	r	0.045	−0.010	−0.023
	p	0.624	0.915	0.798
Green smoothie_A_logo_saccade_count	r	−0.022	−0.052	−0.063
	p	0.815	0.571	0.491
Green smoothie_A_text_saccade_count	r	0.146	0.060	−0.050
	p	0.111	0.515	0.585
Green smoothie_A_price_saccade_count	r	−0.075	−0.090	−0.096
	p	0.411	0.329	0.293
Green smoothie_B_logo_saccade_count	r	−0.107	−0.121	−0.138
	p	0.241	0.184	0.131
Green smoothie_B_text_saccade_count	r	0.047	−0.041	0.097
	p	0.612	0.658	0.292
Green smoothie_B_price_saccade_count	r	0.055	−0.003	0.003
	p	0.549	0.975	0.973
Green smoothie_C_logo_saccade_count	r	0.114	0.044	0.069
	p	0.213	0.632	0.455
Green smoothie_C_text_saccade_count	r	0.045	0.012	−0.102
	p	0.628	0.893	0.266
Green smoothie_C_price_saccade_count	r	0.121	0.019	0.132
	p	0.187	0.839	0.148

Pearson correlation test. * $p < 0.05$; ** $p < 0.01$.

As shown in Table 5, correlations between the study scales and saccade count measures were generally weak and limited to a small number of product stimuli. No significant associations were identified between empathy and saccade count measures. Willingness to pay for eco-labeled products was negatively correlated with saccade counts for Ayran_C_logo and Coffee_A_logo. Environmental behavior was negatively correlated with saccade counts for Ayran_A_content, Ayran_C_logo, Coffee_A_logo, Iced tea_A_text, and Iced tea_B_content. Overall, most saccade count measures were not significantly associated with empathy, willingness to pay, or environmental behavior.

Heatmaps of visual attention across the six product categories and three experimental conditions are presented in Figure 3.

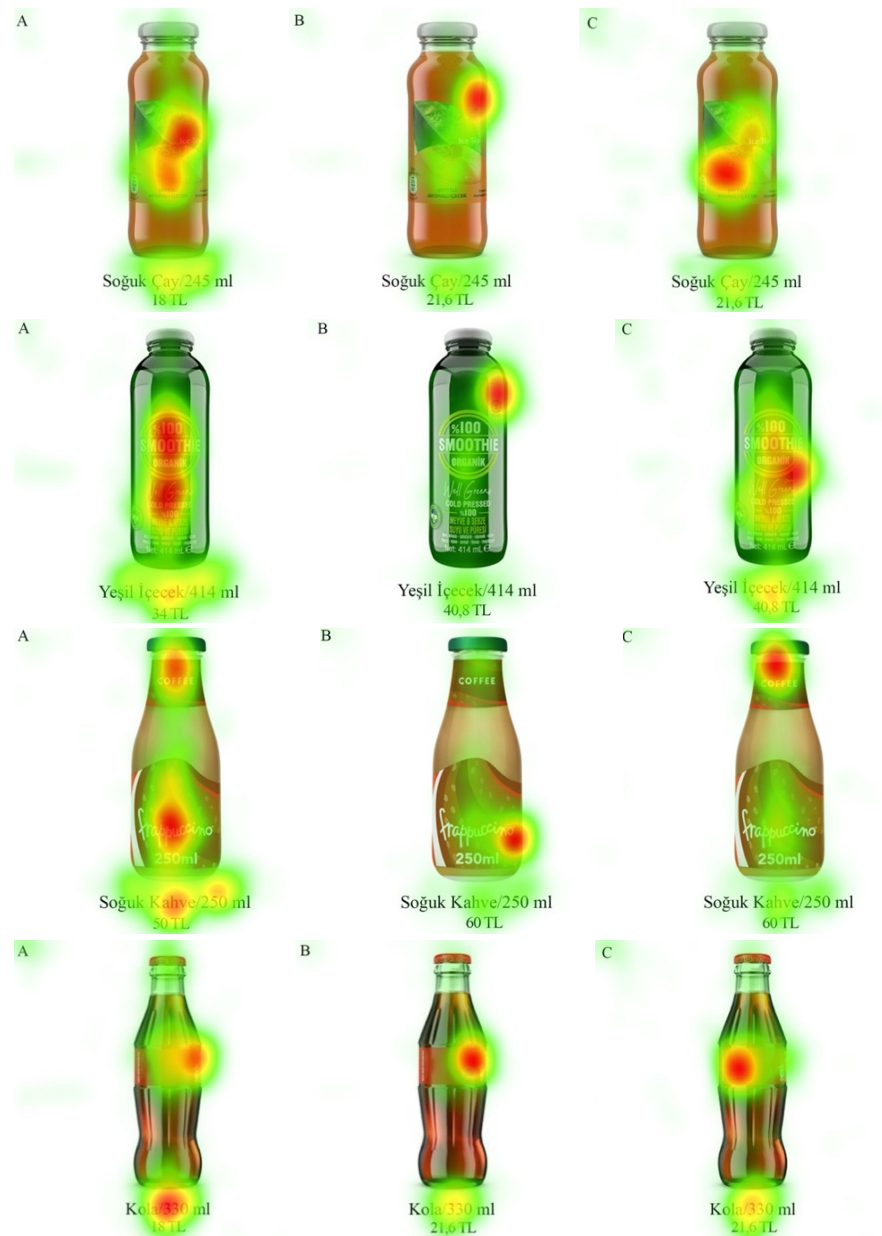


Figure 3. Cont.

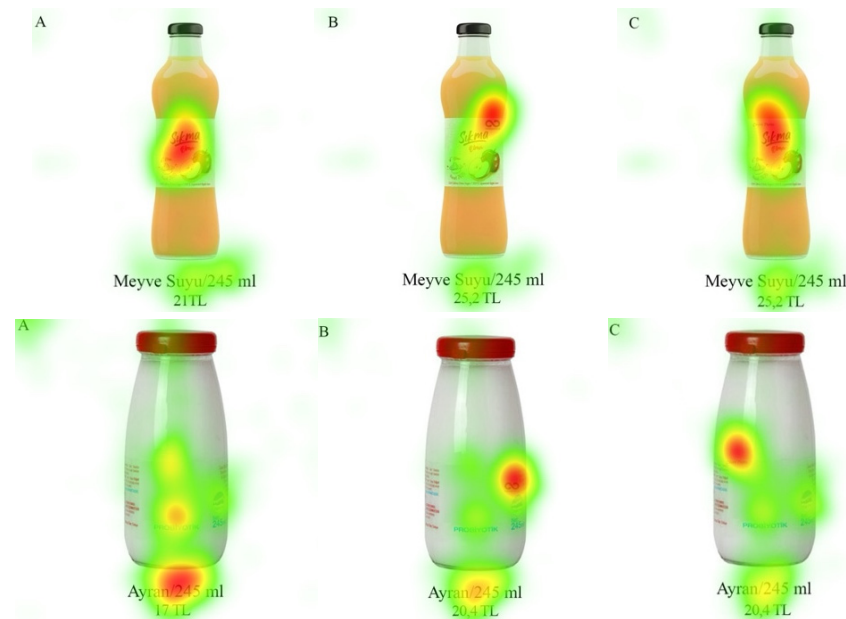


Figure 3. Heatmaps of visual attention across the six product categories based on eye-tracking data: fruit juice, ayran, iced tea, green smoothie, coffee, and coke. For each product category, (A) represents the neutral product condition, (B) represents the product condition featuring an eco-label logo, and (C) represents the product condition featuring an environmental message.

Visual attention to the designated AOIs was evaluated through heatmaps. Figure 3 presents the heatmaps across the six product categories and three experimental conditions; warmer colors indicate areas of greater visual attention. For fruit juice, the neutral version attracted attention to the central label and price, while the logo version shifted attention toward the top area containing the eco-label. The message version showed strong fixation on the textual claim, indicating its salience. In the ayran category, attention in the neutral version focused on the lower label area; the logo version drew attention to the lower-right region, while the message version displayed more dispersed visual attention across the middle section. For iced tea, the neutral product attracted attention to the body and price, while the logo and message conditions redirected gaze to the respective symbolic and textual cues. In the green smoothie category, the logo elicited strong attention toward the top, whereas the message yielded a more balanced distribution. For coffee, logo and message versions were the primary attention targets, while the neutral version emphasized the main product image and price. In the coke category, both logo and message competed with established brand elements, reshaping attention patterns. Overall, attention in neutral products was primarily directed at central visuals and price, whereas eco-label logos and messages consistently redirected attention to sustainability cues. These findings suggest that eco-label logos and environmental messages can redirect visual attention toward environmental information, although the pattern and intensity of attention varied across product categories. Table 6 presents the comparison of empathy, willingness to pay for eco-labeled products, and environmental behavior scores according to product preferences across the six product categories.

Variance analyses conducted for the green smoothie and coffee categories revealed that environmental behavior scores significantly differed based on product preferences ($p = 0.009$ and $p = 0.028$, respectively). According to the Bonferroni post hoc test, the significant differences were specifically observed between neutral-content (A) and eco-friendly message-containing (C) products ($p = 0.012$; $p = 0.025$).

Table 6. Comparison of Scales According to Survey Test Results.

Product	N	Empathy Scale	Willingness to Pay for Eco-Labeled Products Scale	Environmental Behavior Scale
Green smoothie		Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD
A	56	150.92 $\pm$ 16.12	3.59 $\pm$ 0.56	58.10 $\pm$ 10.35
B	28	136.42 $\pm$ 38.22	3.26 $\pm$ 0.97	52.50 $\pm$ 14.13
C	37	142.24 $\pm$ 32.33	3.32 $\pm$ 0.74	50.83 $\pm$ 11.67
<i>p</i>		0.066	0.092	0.009
Post Hoc Tests				A–C
Iced tea		Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD
A	45	148.48 $\pm$ 16.08	3.55 $\pm$ 0.59	57.04 $\pm$ 10.85
B	33	140.90 $\pm$ 36.67	3.28 $\pm$ 0.88	55.48 $\pm$ 13.69
C	43	144.25 $\pm$ 30.91	3.40 $\pm$ 0.75	51.32 $\pm$ 11.54
<i>p</i>		0.498	0.243	0.074
Fruit juice		Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD
A	43	148.11 $\pm$ 16.20	3.54 $\pm$ 0.57	56.95 $\pm$ 11.09
B	38	143.47 $\pm$ 35.11	3.38 $\pm$ 0.91	55.84 $\pm$ 13.21
C	40	142.85 $\pm$ 31.35	3.35 $\pm$ 0.72	50.85 $\pm$ 11.37
<i>p</i>		0.652	0.484	0.052
Coke		Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD
A	48	148.43 $\pm$ 15.59	3.57 $\pm$ 0.57	57.00 $\pm$ 10.55
B	35	142.40 $\pm$ 36.46	3.33 $\pm$ 0.91	55.28 $\pm$ 13.90
C	38	142.78 $\pm$ 32.07	3.34 $\pm$ 0.74	50.89 $\pm$ 11.52
<i>p</i>		0.542	0.233	0.060
Coffee		Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD
A	48	148.43 $\pm$ 15.59	3.57 $\pm$ 0.57	57.00 $\pm$ 10.55
B	46	144.34 $\pm$ 33.41	3.34 $\pm$ 0.82	55.13 $\pm$ 12.82
C	27	139.62 $\pm$ 35.42	3.33 $\pm$ 0.82	49.37 $\pm$ 12.20
<i>p</i>		0.428	0.232	0.028
Post Hoc Tests				A–C
Ayran		Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD
A	42	148.07 $\pm$ 16.39	3.53 $\pm$ 0.57	56.88 $\pm$ 11.21
B	37	142.64 $\pm$ 35.07	3.34 $\pm$ 0.88	55.40 $\pm$ 13.18
C	42	143.76 $\pm$ 31.11	3.41 $\pm$ 0.75	51.57 $\pm$ 11.56
<i>p</i>		0.663	0.520	0.116

ANOVA Test; Post Hoc Test: Bonferroni. A = neutral product condition, B = eco-label logo condition, and C = eco-friendly message condition.

In contrast, no statistically significant differences were found between product preferences in terms of empathy and willingness to pay for eco-labeled products ($p > 0.05$). These results indicate that participants preferring eco-friendly message products differed from those preferring neutral products in terms of environmental behavior scores in the green smoothie and coffee categories. Table 7 presents the comparison of product preferences across low and high empathy groups.

As presented in Table 7, no statistically significant differences in product preferences were observed between participants with low and high empathy levels across the green smoothie, iced tea, fruit juice, coke, coffee, and ayran categories (all $p > 0.05$). This finding suggests that empathy alone may not be a decisive factor in explicit product choice and that product preferences may be shaped by multiple psychological, contextual, and product-related factors.

Table 7. Comparison of Product Preferences by Empathy Levels Based on Survey Test Results (n = 121).

Empathy Scale			
Products	Low N = 41	High N = 80	<i>p</i>
Green smoothie, n (%)			
A	15 (36.6)	41 (51.2)	0.283
B	12 (29.3)	16 (20)	
C	14 (34.1)	23 (28.7)	
Iced tea, n (%)			
A	14 (34.1)	31 (38.8)	0.876
B	12 (29.3)	21 (26.3)	
C	15 (36.6)	28 (35)	
Fruit juice, n (%)			
A	14 (34.1)	29 (36.3)	0.836
B	12 (29.3)	26 (32.5)	
C	15 (36.6)	25 (31.3)	
Coke, n (%)			
A	14 (34.1)	34 (42.5)	0.673
B	13 (31.7)	22 (27.5)	
C	14 (34.1)	24 (30)	
Coffee, n (%)			
A	14 (34.1)	34 (42.5)	0.590
B	16 (39)	30 (37.5)	
C	11 (26.8)	16 (20)	
Ayran, n (%)			
A	14 (34.1)	28 (35)	0.950
B	12 (29.3)	25 (31.3)	
C	15 (36.6)	27 (33.8)	

Pearson Chi-Square test, $p < 0.05$.

4.2. Hypothesis Testing

In this study, the five hypotheses developed were tested through both scale-based data and eye-tracking measurements. The findings reveal several aspects that support the conceptual framework of the research.

H1. *Individuals with higher levels of empathy exhibit higher levels of environmental behavior.*

This hypothesis was accepted. The correlation analysis demonstrated a significant and positive relationship between empathy levels and environmental behavior ($r = 0.585$, $p < 0.001$). This result is consistent with previous findings, which suggest that empathic individuals tend to establish stronger emotional bonds with the environment, thereby enhancing environmental behavior [9–11].

H2. *Individuals with higher empathy levels demonstrate a greater willingness to pay for eco-labeled products.*

This hypothesis was accepted. A strong positive correlation was identified between empathy and willingness to pay for eco-labeled products ($r = 0.699$, $p < 0.001$). This finding

suggests that individuals with higher empathy levels are more willing to pay for eco-labeled products [6,72].

H3. *Individuals with higher environmental behavior scores prefer products with eco-friendly messages more than neutral-content products.*

This hypothesis was partially accepted. In the green smoothie and coffee categories, significant differences were found between preferences for eco-friendly message (C) and neutral content (A) products according to environmental behavior scores ($p = 0.012$; $p = 0.025$). However, this difference was not consistent across all product categories. This result aligns with observations regarding the influence of product context on label perception [14,73].

H4. *Eye-tracking data (fixation and saccade counts) reveal longer and more focused visual attention toward eco-friendly messages among individuals with high environmental behavior.*

This hypothesis was not supported. Fixation and saccade analyses indicated that higher environmental behavior was not consistently associated with greater visual attention to eco-label information. Instead, the observed relationships varied across product categories and areas of interest, consistent with previous studies reporting mixed associations between environmental evaluations and visual attention measures [14,74].

H5. *Empathy levels significantly influence product preferences.*

This hypothesis was not supported. Comparisons based on empathy levels revealed no statistically significant differences in product preferences ($p > 0.05$). This finding suggests that empathy alone may not be sufficient to explain explicit product preferences, which are likely shaped by a combination of psychological, contextual, and product-related factors. This interpretation is consistent with the multidimensional nature of consumer preferences and the importance of contextual variables [13,75].

A summary of the hypothesis testing results is presented in Table 8.

Table 8. Summary of Hypothesis Testing Results.

Hypothesis	Description	Result
H1	Empathy → Environmental Behavior	Supported
H2	Empathy → Willingness to Pay for Eco-Labeled Products	Supported
H3	Environmental Behavior → Preference for Eco-Friendly Messages	Partially Supported
H4	Environmental Behavior → Visual Attention to Eco-Label Cues	Not supported
H5	Empathy → Product Preference	Not supported

5. Discussion

This study examined how empathy and environmental behavior relate to willingness to pay, product preferences, and visual attention to eco-label information within the S-O-R framework. While the findings are broadly consistent with previous research, the multi-method design provides a more comprehensive understanding of both explicit and implicit aspects of consumer decision-making.

The positive relationship between empathy and environmental behavior confirms previous theories emphasizing emotional connection as a driver of pro-environmental action [9–11]. Moreover, the association between empathy and consumers' readiness

to pay for eco-labeled products suggests that emotional drivers may influence not only environmental attitudes but also economic purchasing behavior [72].

However, eye-tracking results revealed that higher environmental behavior levels did not uniformly predict greater visual attention to sustainability cues. In certain categories, individuals with higher environmental behavior scores demonstrated lower fixation and saccade metrics. This finding indicates that the relationship between environmental behavior and visual attention may vary across product categories and sustainability cues [14,76]. This divergence between implicit attention and declared behaviors highlights the complexity of consumer cognitive processing, a nuance often overlooked in declarative studies.

Previous studies have associated higher fixation measures with greater allocation of attentional resources during product evaluation [62]. The fixation patterns observed in the present study may therefore reflect differences in the extent to which sustainability-related information attracted consumer attention across product categories.

These findings should also be interpreted with caution. Although visual attention provides valuable information regarding information acquisition and cognitive engagement, gaze allocation does not necessarily translate directly into product preference or purchase behavior, as attentional processes may be shaped by multiple contextual and evaluative mechanisms [30]. This distinction is particularly relevant when interpreting visual attention toward sustainability-related information.

This pattern may also reflect differences in how environmentally oriented consumers process eco-label information. Previous research has shown that environmental behavior and eco-label knowledge influence how consumers interpret and use environmental information during product evaluation [22,27]. Eye-tracking studies likewise suggest that visual attention is associated with information acquisition and decision-making processes [77]. In addition, fixation measures have been linked to the allocation of cognitive resources during product evaluation [62]. Accordingly, lower fixation levels in some product categories may reflect differences in information processing rather than reduced interest in environmental information.

Regarding product choice, empathy alone did not significantly influence preferences, supporting arguments that consumer behavior is shaped by a multilayered interplay of personal, contextual, and informational factors [13,75]. Particularly, green smoothie and coffee categories showed that environmental messages may enhance preference among highly environmentally engaged consumers, emphasizing the moderating role of product type [14,73]. The variation across product categories suggests that eco-label effectiveness depends on the context in which environmental information is presented. Products such as coffee and green smoothies are often associated with health, lifestyle, and environmental attributes, which may increase sensitivity to eco-label cues. In more familiar product categories, purchasing decisions may be guided more strongly by established preferences and consumption habits, reducing the relative influence of environmental information. This interpretation is consistent with previous research reporting category-specific differences in consumer responses to environmental information [14,61,73] and supports the view that eco-label effectiveness is contingent on situational and individual factors rather than uniform across product categories [8].

By combining self-reported measures with eye-tracking metrics, the study provides additional insight into both explicit and implicit aspects of consumer responses to eco-labels, extending previous research that has primarily relied on declarative measures [5,78]. Further support for the role of visual attention in shaping consumer behavior is provided by the heatmap analyses. Across all six product categories, attention distribution varied systematically depending on the type of sustainability cue. Neutral versions elicited concentrated attention on the body of the product and price, while logo and message

versions redirected attention toward symbolic and textual eco-information, respectively. This pattern was particularly evident in iced tea and green smoothie categories, where logo and message areas became primary focal points. These findings are consistent with prior eye-tracking research demonstrating the attentional salience of eco-label cues [13,74,76]. The differentiated attention allocation highlights the importance of visual design and information placement in communicating sustainability effectively on packaging.

5.1. Theoretical Contributions

The findings provide several theoretical implications for eco-label and consumer behavior research. The results support the applicability of the Stimulus–Organism–Response (S-O-R) framework in explaining consumer responses to eco-labels and environmental messages [15,16,63]. Overall, the findings indicate that empathy and environmental behavior contribute to consumer responses to eco-label cues across both self-reported evaluations and visual attention measures.

An important implication concerns the relationship between environmental behavior and visual attention. Previous research has generally associated stronger environmental orientations with greater attention to eco-label information [14,76]. However, the present findings indicate a more nuanced relationship. Visual attention intensity alone may not fully capture consumers' engagement with environmental information. Accordingly, the findings highlight the importance of combining self-reported and attention-based measures when examining consumer responses to eco-labels.

The findings further indicate that self-reported attitudes and visual attention measures may reflect different dimensions of consumer decision-making. Previous eye-tracking studies have similarly highlighted the value of combining attention-based measures with traditional self-reported indicators when examining consumer responses [13,74]. This observation also aligns with evidence suggesting that visual attention does not necessarily translate directly into behavioral outcomes [30].

The variation observed across product categories also reinforces the context-dependent nature of eco-label effectiveness, which appears to be shaped by both product category and consumer characteristics. Consumer responses to eco-labels appear to depend not only on individual characteristics but also on the product category and the context in which environmental information is presented. This interpretation is consistent with previous studies reporting category-specific differences in consumer responses to environmental information [14,61,73] and supports the broader argument that the effectiveness of interventions may vary across decision environments [8].

5.2. Practical Implications

The findings have practical implications for packaging designers, producers, and policymakers seeking to encourage environmentally responsible consumption through information-based interventions. The results indicate that the effectiveness of eco-labels depends not only on the availability of environmental information but also on how consumers process and interpret eco-label cues. The observed relationships between empathy, environmental behavior, and willingness to pay indicate that environmental communication may be more effective when factual information is complemented by messages that foster emotional engagement with environmental issues [9–11].

The eye-tracking and heatmap findings indicate that the effectiveness of eco-labels depends not only on their presence but also on how eco-label information is visually presented. Previous eye-tracking studies have similarly emphasized the importance of visual attention in the processing of environmental information [74,76]. Accordingly, the visibility,

placement, and format of eco-labels should be adapted to specific product categories rather than implemented through a uniform labeling strategy [13].

The results further indicate that consumers process eco-label information differently depending on their level of environmental engagement. While consumers may differ in how they process eco-label information, less engaged consumers may benefit from clearer and more explanatory environmental messages [22,27].

At the policy level, increasing public awareness and understanding of eco-labels through educational initiatives and awareness campaigns may strengthen the effectiveness of eco-labeling systems and encourage more environmentally responsible purchasing decisions [6,22].

6. Conclusions

This study examined empathy, environmental behavior, willingness to pay for eco-labeled products, product preferences, and visual attention to logo- and message-based environmental cues within the Stimulus–Organism–Response framework. Survey responses and eye-tracking data were integrated to capture both consumers' stated evaluations and their attentional responses during product evaluation. Empathy was positively associated with environmental behavior and willingness to pay for eco-labeled products, yet it did not differentiate product preferences across the six beverage categories. Empathic orientations therefore appear to be more closely related to environmental evaluations and willingness to pay than to product preferences themselves, which seem to reflect a wider set of individual, product-related, and contextual influences.

Visual attention did not show a simple relationship with environmental behavior. Significant fixation and saccade associations emerged only for selected areas of interest and product categories, and several of these associations were negative. Stronger environmental behavior was thus not consistently accompanied by greater attention to environmental cues. The heatmaps nevertheless showed that logo- and message-based stimuli were associated with shifts in attention away from product information and price areas toward environmental information. The magnitude and form of these patterns varied according to the product category and the cue presented.

The green smoothie and coffee conditions offer a useful illustration of this variation. In these categories, environmental behavior scores differed across preferences for neutral and environmental-message versions, whereas comparable differences did not emerge consistently in the remaining categories. Eco-label communication therefore appears to be shaped by contextual variables: the same cue may not carry the same relevance across products or be processed in the same way by all consumers. This has implications for environmentally oriented packaging communication. Rather than assuming that a logo or message will have a similar effect across all products, firms may benefit from considering the visual hierarchy of the package, the product category, and the characteristics of the intended consumer group. Attention to environmental cues should also not be interpreted as equivalent to product preference. A fuller assessment of eco-label communication requires consideration of both what consumers report and how they allocate attention during product evaluation.

7. Limitations and Future Research

7.1. Limitations

This study has several limitations that should be considered when interpreting the findings. The participants were recruited exclusively from Istanbul, and a substantial proportion of the sample consisted of students and private-sector employees. Consequently, the findings may not fully reflect the perceptions and purchasing behaviors of consumers

from different regions, demographic groups, and cultural contexts. In addition, the experiment was conducted under controlled laboratory conditions. Although this approach ensured standardized eye-tracking measurements, consumer responses to eco-labels may differ in real purchasing environments where multiple sources of information compete for attention. Furthermore, the study focused exclusively on beverage products and compared eco-labeled alternatives carrying a 20% price premium with neutral versions. As a result, the effects of environmental information and price could not be examined independently. Finally, visual attention was assessed through fixation and saccade measures. While these indicators provide valuable insight into attentional allocation, they do not capture the full range of cognitive and affective processes that may influence consumer responses to eco-label information.

7.2. Future Research

Future research could build on the present findings by examining larger and more diverse samples drawn from different regions, countries, and cultural contexts. Given that the effects of eco-label cues varied across product categories, further research is needed to better understand the conditions under which environmental information influences consumer evaluations and visual attention. Studies involving additional product categories and real purchasing environments may help explain why eco-label effectiveness appears to differ across contexts. Future studies may also extend the present multimethod approach by combining eye-tracking with other consumer neuroscience techniques, such as electroencephalography (EEG), and by incorporating additional attention measures, including fixation duration, dwell time, revisits, and time to first fixation. Such approaches may provide deeper insight into the cognitive processes underlying consumer responses to eco-label information. Further research could also explore interaction effects among label type, price, product characteristics, empathy, and environmental behavior, thereby contributing to a more comprehensive understanding of the context-dependent nature of eco-label effectiveness. In addition, examining whether visual attention to eco-label information translates into impulsive purchase decisions in real shopping environments could provide further insight into consumer responses under less controlled and more naturalistic conditions.

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