Sensory Marketing, Emotional Responses, and Purchase Intention in Georgian Retail: A Multisensory S-O-R Approach

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ABSTRACT

This paper investigates how five sensory stimuli (visual, auditory, tactile, olfactory, and gustatory) are related to consumers' emotional responses, and how strongly these responses predict purchase intention, in the context of the retail sector in Georgia. Addressing a critical theoretical gap regarding the omitted-modality bias in prior sensory research, this study simultaneously assesses all five sensory dimensions within the Stimulus–Organism–Response (S-O-R) framework to disentangle shared atmospheric impressions from unique sensory contributions. Drawing on the S-O-R model, we analyzed data from 723 retail consumers living in Georgia (predominantly residing in Tbilisi, 92.8%). Given the cross-sectional survey design, the findings reflect associative and predictive relationships rather than direct causal effects. Each stimulus, taken separately, showed a moderate-to-strong association with emotional responses ($r = 0.44–0.60$). A composite sensory index explained 45.5% of the variance in emotional responses ($\beta = 0.67$, $p < 0.001$). When all five stimuli were entered simultaneously into a multiple regression, they jointly explained 46.3% of the variance, and each of them retained a significant positive unique predictive effect. In both analyses, olfactory stimuli showed the largest effect ($\beta = 0.234$) and tactile stimuli the smallest ($\beta = 0.076$). Visual stimuli ranked second in the separate analyses but dropped to fourth in the joint analysis, which indicates that their association is largely shared with other atmospheric channels, whereas auditory cues rose in relative importance. Emotional responses were a strong predictor of purchase intention ($\beta = 0.736$, $R^2 = 0.541$). Statistical diagnostics confirmed the absence of problematic multicollinearity (VIF 1.47–2.27), verified construct and discriminant validity, and established that common method variance did not unduly bias the results (Harman's single-factor variance = 38.4%). Managerial implications are discussed with explicit reference to sensory implementation costs, empirical sales literature, and in-store pilot testing.

Keywords: Sensory marketing; emotional responses; purchase intention; S-O-R model; retail, Georgia.

INTRODUCTION

The modern retail sector operates in a rapidly changing and highly competitive environment in which winning and retaining consumers' attention is becoming ever more difficult for companies. Today's consumers are no longer satisfied with the functional attributes of goods alone; they look for products and experiences that will be memorable for them (Belwal et al., 2025; Guimarães & Rodrigues, 2026). Sensory marketing shapes consumers' perceptions, emotional responses, and behavioral reactions by engaging all five senses—sight, hearing, touch, smell, and taste (Krishna, 2012). Color, lighting, background music, the opportunity to touch a product, the ambient scent, and the opportunity to taste—all of these factors influence what shoppers feel in the store, often without conscious deliberation (Goel et al., 2024).

A substantial share of the existing research links sensory stimuli to consumer responses. The sensory environment primarily alters consumers' affective experiences, which in turn shape their behavioral intentions (Chen & Lin, 2018; Jang & Lee, 2019; Abdolmohamad Sagha et al., 2022). This theoretical logic is fully grounded in the Stimulus–Organism–Response (S-O-R) model (Mehrabian & Russell, 1974), which is widely used in retail research (Pereira et al., 2023; Saricam, 2023; Cao et al., 2024; Erensoy et al., 2024).

Despite the growing popularity of sensory marketing, a critical theoretical and empirical gap persists in the environmental psychology and retail atmospherics literature. The vast majority of prior studies have investigated sensory cues either in isolation—focusing exclusively on a single sensory modality such as background music tempo (Milliman, 1986), ambient scent (Roschk & Hosseinpour, 2020), or tactile explorat-

ion (Peck & Shu, 2009)—or examined isolated bimodal combinations (e.g., sound-scent congruence in laboratory settings). While single-cue studies isolate localized cognitive and physiological mechanisms, they suffer from an inherent "omitted-modality bias" when extended to actual brick-and-mortar retail environments. In an authentic retail store, consumers do not perceive atmospheric stimuli in isolated silos; rather, they are immersed in a continuous, multisensory atmospheric envelope where visual merchandising, background acoustics, ambient fragrance, physical product interaction, and gustatory sampling operate concurrently.

Consequently, examining sensory modalities solely in isolation or relying exclusively on bivariate zero-order correlations can generate a distorted hierarchy of atmospheric influence. Specifically, dominant visual elements often absorb the shared ambient variance of co-occurring sensory cues. When researchers fail to evaluate all five sensory channels simultaneously, it remains impossible to determine whether a given sensory modality exerts an authentic unique influence on consumer emotions or merely reflects shared atmospheric variance. Furthermore, it leaves unresolved a fundamental question in environmental psychology: does the internal "Organism" (emotional response) react primarily to a holistic, Gestalt atmospheric impression, or does each sensory channel supply an independent, additive predictive increment? Addressing this theoretical tension through simultaneous 5-dimensional evaluation represents the central theoretical contribution of this study.

Moreover, the overwhelming majority of multisensory retail research has been conducted in highly developed Western and East Asian economies, leaving emerging post-transitional markets—such as Georgia—conspicuously under-researched. Emerging markets present distinct retail dynamics characterized by the rapid expansion of modern retail formats alongside traditional trade, making empirical validation in this setting theoretically and practically informative (Todua, Ghvaladze, 2026).

In line with the aim of the present study, the paper poses the following research questions (RQs):

RQ 1: What is the relationship between each individual sensory stimulus and consumers' emotional responses, and what unique effect does each of them retain when all five are taken into account simultaneously?
RQ 2: How strongly do emotional responses predict purchase intention?

LITERATURE REVIEW AND DEVELOPMENT OF RESEARCH HYPOTHESES

2.1. The S-O-R Model

According to the S-O-R model, environmental factors (stimuli) evoke certain internal states in an individual (organism), which in turn give rise to approach or avoidance responses (response) (Mehrabian & Russell, 1974). Pleasure and arousal induced by the store environment were directly linked to approach behavior—namely, the willingness to spend time and money in the store. More generally, emotions are widely recognized as one of the principal drivers of the consumer decision-making process (Bagozzi et al., 1999). In the present study, the stimulus is the store's sensory environment, which comprises visual, auditory, tactile, olfactory, and gustatory components. The organism is the consumer's emotional response, and the response is purchase intention, which the theory of planned behavior regards as the immediate antecedent of actual behavior (Ajzen, 1991).

Importantly, within the context of our cross-sectional research design, these paths represent perceived associational and predictive relationships rather than definitive causal mechanisms.

2.2. Sensory Stimuli and Emotional Responses

The retail environment is multisensory by nature (Spence & Gallace, 2011; Haase et al., 2018); therefore, the different sensory channels rarely operate in isolation, and their perceived quality is interrelated (see Table 2). In the present study, we test this joint relationship at three levels. First, we assess the independent, zero-order relationship between each stimulus and consumers' emotional responses (EMO) by means of separate simple linear regression analyses. Second, in line with the established practice of studying multisensory composites, we create a single sensory index as the mean of the five sensory constructs and relate it to emotional responses (EMO) by means of a simple regression. This is a direct, joint test of whether the sensory stimuli, taken toget-

her, are positively related to consumers' emotional responses. Third, at a more stringent level, we test all five stimuli simultaneously by means of multiple regression analysis, which allows us to determine whether each sensory channel makes a unique contribution to the prediction of EMO when the other four variables are statistically controlled.

H1: *Sensory stimuli, taken together as a composite index, are positively related to consumers' emotional responses.*

Visual stimuli. Color palette, lighting, and product layout are the most conspicuous elements of the store atmosphere. They determine how pleasant and stimulating the store appears to the consumer (Krishna, 2012; Chen & Lin, 2018; Jang & Lee, 2019).

H1a: *Visual stimuli have a positive unique effect on consumers' emotional responses.*

Auditory stimuli. Background music and the acoustic environment have a significant influence on consumers' mood and behavior in the service sector. For example, the literature has shown that the tempo of music also shapes the pace of customers' behavior (Milliman, 1986; Jang & Lee, 2019).

H1b: *Auditory stimuli have a positive unique effect on consumers' emotional responses.*

Tactile stimuli. Touch is a fundamental channel for evaluating products. Even brief physical contact with a product heightens the sense of ownership over it (Peck & Shu, 2009) and influences the evaluation of branded products (Karangi & Lowe, 2021), while the touch experience constitutes an independent component of multisensory design (Spence & Gallace, 2011).

H1c: *Tactile stimuli have a positive unique effect on consumers' emotional responses.*

Olfactory stimuli. Smell is closely linked to emotion and memory (Herz, 2016). A meta-analysis of the literature on ambient scents shows that a pleasant scent improves consumers' responses (Roschk & Hosseinpour, 2020).

H1d: *Olfactory stimuli have a positive unique effect on consumers' emotional responses.*

Gustatory stimuli. In food-related retail contexts, taste experiences—for example, a wide variety of products with different flavors or the opportunity to sample them—strengthen consumer engagement and the final evaluation of the product (Piqueras-Fiszman & Spence, 2015; Martins et al., 2022).

H1e: *Gustatory stimuli have a positive unique effect on consumers' emotional responses.*

2.3. Emotional Responses and Purchase Intention

A positive emotional state experienced in the store is directly related to a stronger desire to make a purchase. Sensory marketing studies in the context of consumer behavior consistently link emotional responses to purchase-related outcomes (Chen & Lin, 2018; Jang & Lee, 2019; Abdolmohamad Sagha et al., 2022). This fully

accords with the widely held theoretical view that emotions drive consumers' decisions (Bagozzi et al., 1999). Because emotional response is the only organism (O) state in the present model, the transition from emotion to intention is common to all five sensory channels and is expressed in a single hypothesis (H2).

H2: *Consumers' emotional responses are positively related to their purchase intention.*

Based on the literature review above, we developed a conceptual model describing how sensory stimuli influence the purchase intentions of retail consumers (see Figure 1).

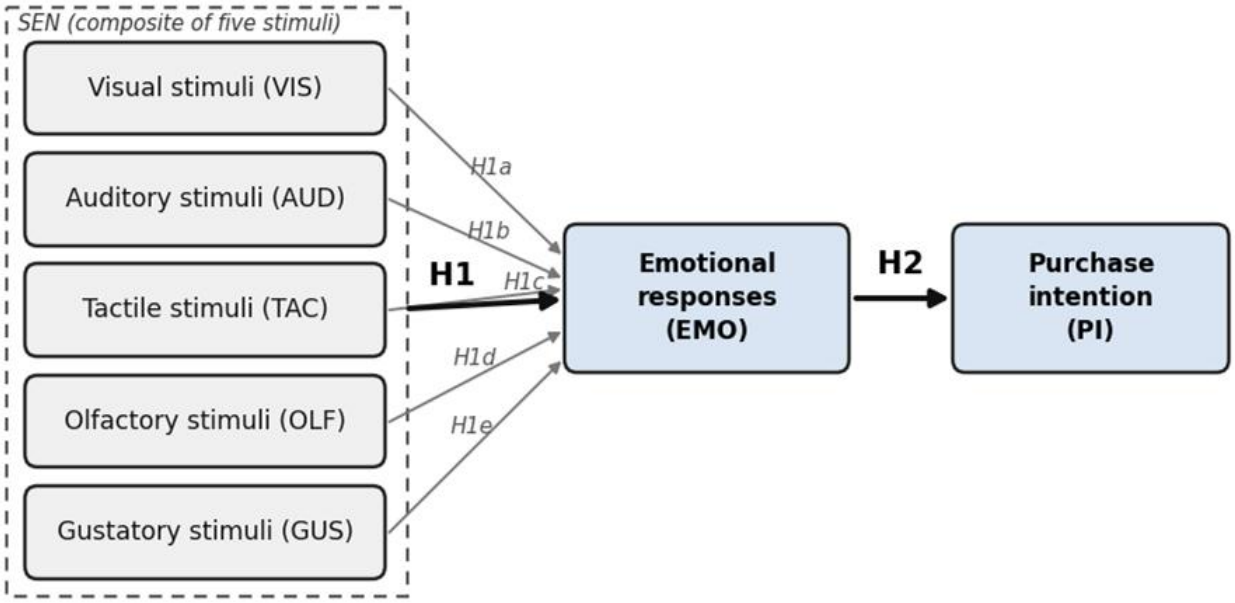


Figure 1: Research model

RESEARCH METHODOLOGY

3.1. Research Design, Sampling Procedures, and Participants

The present study is based on a deductive, quantitative, cross-sectional design built on a consumer survey (Bryman & Bell, 2011; Malhotra, 2020). The target population comprised adult retail consumers residing in Georgia who actively shop at brick-and-mortar retail stores. Given the absence of a comprehensive national sampling frame of retail shoppers, a non-probability convenience and snowball sampling methodology was utilized. To ensure sample validity and eliminate random unengaged participants, two mandatory screening filter questions were embedded at the outset of the survey: (1) respondents had to be at least 18 years of age, and (2) respondents had to have shopped in a physical retail store (supermarkets, hypermarkets, apparel, electronics, or department stores) within the preceding 30 days. Those who did not meet both screening criteria were automatically screened out.

The minimum sample size was calculated using Krejcie and Morgan's (1970) formula at a 95% confidence level and a 4% margin of error, which yielded 601 respondents. Prior to main data collection, a pre-test was conducted with 35 retail shoppers to evaluate questionnaire clarity, and online interface usability; feedback from the pre-test resulted in minor wording adjustments to ensure semantic clarity. The final questionnaire was administered online via Google Forms between October and December 2025 across major Georgian consumer social media communities, retail interest forums, and university networks. Participation was strictly voluntary, anonymous, and unremunerated.

In total, 764 completed questionnaires were received. Of these, 41 questionnaires were excluded because the standard deviation of the respective respondents' answers across all scale items was 0.2 or less, indicating unengaged, uniform responding (straight-lining). A total of 723 valid questionnaires remained for final empirical analysis, comfortably exceeding the required sample size of 601.

Sample Demographic Profile and Geographic Caveat: Among the 723 respondents, women accounted for 71.4% (n = 516) and men 28.6% (n = 207). In terms of age distribution, 48.1% were aged 25–34, 28.5% were aged 18–24, 15.6% were aged 35–49, and 7.8% were aged 50 or older. Regarding educational attainment, 48.0% held a bachelor's degree, 36.0% held a master's or doctoral degree, and 16.0% had completed secondary education. In addition, 58.8% were employed in the private sector, 17.6% in the public sector, 11.2% were self-employed, and 12.4% were students or not employed. Geographically, 92.8% of respondents (n = 671) resided in Tbilisi, with the remaining 7.2% distributed across other Georgian regions. This geographic concentration reflects the urban profile of modern retail development in Georgia, where major shopping malls, organized supermarket chains, and sensory-saturated retail environments are overwhelmingly concentrated in the capital. While this sample provides rich insight into consumers exposed to modern retail environments, it represents a recognized geographic boundary condition, and findings should be generalized to smaller regional and rural retail markets with caution.

3.2. Measures and Operationalization

All constructs used in the study were measured using multi-item scales adapted from established empirical literature in sensory marketing and consumer behavior (Abdolmohamad Sagha et al., 2022; Chen & Lin, 2018; Duarte et al., 2024; Jang & Lee, 2019; Karangi & Lowe, 2021; Silaban et al., 2023; Zha et al., 2024). Each construct was operationalized with three items measured on a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"), yielding a 21-item measurement instrument (Table 1).

Operationalization of Purchase Intention and Addressing Measurement Overlap: In our measurement model, purchase intention (PI) was operationalized through items adapted from Abdolmohamad Sagha et al. (2022) and Duarte et al. (2024). As displayed in Table 1, these items explicitly assess purchase intention in the context of the store's sensory environment (e.g., PI1: "A store environment saturated with sensory stimuli strengthens my desire to purchase a product"). While this formulation was deliberately selected to capture sensory-induced behavioral intentions specifically within the store atmospherics context, we acknowledge that embedding sensory phrasing into intention indicators creates potential conceptual overlap with the sensory stimulus measures. In subsequent sections, we rigorously test whether this operationalization compromised empirical discriminant validity. As reported below, Fornell–Larcker criterion and HTMT diagnostics confirm that respondents psychometrically distinguished purchase intention from sensory stimulus constructs. Nonetheless, as discussed in the limitations section, future studies are advised to employ stimulus-neutral behavioral intention scales to eliminate any possibility of criterion contamination.

Table 1: Measurement Items and Literature Sources

Visual stimuli (VIS) — adapted from: Zha et al. (2024); Chen & Lin (2018)	
VIS1	The color palette used in the store creates a pleasant environment.
VIS2	The lighting in the store makes products more attractive.
VIS3	The layout of products in the store is important to me.
Auditory stimuli (AUD) — adapted from: Jang & Lee (2019); Abdolmohamad Sagha et al. (2022)	
AUD1	The music I hear in the store gives me pleasure.
AUD2	The music I hear in the store improves my mood.
AUD3	The volume of the music in the store influences my behavior.
Tactile stimuli (TAC) — adapted from: Karangi & Lowe (2021); Silaban et al. (2023)	
TAC1	The sensation I get from touching a product influences my evaluation of it.
TAC2	I prefer products that I can touch before purchasing them.
TAC3	I trust products more when I can touch them before purchasing them.
Olfactory stimuli (OLF) — adapted from: Jang & Lee (2019); Zha et al. (2024)	
OLF1	The scent in the store fits the overall environment.

OLF2	The scent in the store leaves me with a pleasant impression.
OLF3	I find stores with a pleasant scent attractive.
Gustatory stimuli (GUS) — adapted from: Jang & Lee (2019); Zha et al. (2024)	
GUS1	It is important to me that products purchased in the store taste good.
GUS2	I like it when products with different flavors are available in the store.
GUS3	I find stores where food can be tasted before purchase attractive.
Emotional responses (EMO) — adapted from: Jang & Lee (2019); Abdolmohamad Sagha et al. (2022)	
EMO1	I enjoy being in a store that is saturated with sensory stimuli.
EMO2	I feel more energetic when I am in a store saturated with sensory stimuli.
EMO3	I feel more confident when I am in a store saturated with sensory stimuli.
Purchase intention (PI) — adapted from: Abdolmohamad Sagha et al. (2022); Duarte et al. (2024)	
PI1	A store environment saturated with sensory stimuli strengthens my desire to purchase a product.
PI2	The sensory stimuli in the store have a positive effect on my purchase intention.
PI3	The sensory experience I get in the store strengthens my purchase decision.

Source: author's work

RESULTS

4.1. Measurement Quality, Construct Validity, and Statistical Diagnostics

Table 2 shows that all constructs used in the study are reliable and convergently valid. Cronbach's alpha (α) ranges from 0.817 to 0.945, composite reliability (CR) from 0.847 to 0.945, and average variance extracted (AVE) from 0.660 to 0.851. For all variables, these values exceed the critical thresholds established in the scholarly literature: 0.70 for α and CR and 0.50 for AVE (Nunnally, 1967; Fornell & Larcker, 1981). Factor loadings range from 0.536 to 0.979.

Psychometric Justification for Retaining Items with Lower Loadings: Only two items had factor loadings below the conventional 0.70 threshold: AUD3 ("The volume of the music in the store influences my behavior", loading = 0.536) and GUS3 ("I find stores where food can be tasted before purchase attractive", loading = 0.545). In accordance with established psychometric standards (Hair et al., 2010, 2019; Hulland, 1999), indicators with factor loadings between 0.40 and 0.70 should only be considered for deletion if their removal leads to an increase in composite reliability (CR) or average variance extracted (AVE) above suggested threshold values. Because the AVE values for both Auditory (0.660) and Gustatory (0.671) constructs substantially exceed the 0.50 benchmark, and their composite reliabilities (0.847 and 0.854) well exceed the 0.70 benchmark, deleting these items was deemed unnecessary. Furthermore, retaining these items is crucial for preserving construct content validity: AUD3 captures the behavioral reaction to acoustic volume (a distinct environmental parameter separate from musical pleasantness), and GUS3 captures direct experiential product sampling in retail spaces. Eliminating them would unnecessarily narrow the theoretical breadth of the respective sensory constructs without providing meaningful psychometric gains.

Table 2: Reliability and Validity Statistics of Study Constructs

Items	Factor loading	AVE	Cronbach's α	CR
VIS 1	0.885	0.7	0.872	0.875
VIS 2	0.866			
VIS 3	0.754			
AUD 1	0.894	0.66	0.817	0.847
AUD 2	0.945			

AUD 3 *	0.536			
TAC 1	0.786	0.785	0.913	0.916
TAC 2	0.942			
TAC 3	0.921			
OLF 1	0.881	0.81	0.927	0.927
OLF 2	0.935			
OLF 3	0.882			
GUS 1	0.908	0.671	0.822	0.854
GUS 2	0.945			
GUS 3 *	0.545			
EMO 1	0.852	0.838	0.937	0.939
EMO 2	0.979			
EMO 3	0.91			
PI 1	0.912	0.851	0.945	0.945
PI 2	0.926			
PI 3	0.929			

** Items retained based on content validity and satisfactory construct AVE and CR (Hair et al., 2019).*

Source: author's work

Table 3 presents the descriptive statistics and correlations. The means (M) on the five-point scale range between 3.44 (AUD) and 4.07 (GUS), indicating that consumers' perception of the store environment is moderately positive. All Pearson correlation coefficients are positive and statistically significant at the $p < 0.01$ level. The strongest correlation is observed between emotional responses (EMO) and purchase intention (PI) ($r = 0.736$). Among the sensory stimuli themselves, the highest correlations are found between olfactory and gustatory stimuli (OLF–GUS; $r = 0.662$), visual and olfactory stimuli (VIS–OLF; $r = 0.639$), and visual and gustatory stimuli (VIS–GUS; $r = 0.604$). These findings support our expectation that, in the retail environment, the different sensory channels are perceived by the consumer jointly and holistically.

Evidence of Discriminant Validity (Fornell–Larcker Criterion & HTMT): Discriminant validity was established through two rigorous procedures. First, under the Fornell–Larcker (1981) criterion, the square root of the AVE for each construct (displayed in bold on the diagonal of Table 3) must exceed all corresponding inter-construct correlation coefficients. For instance, the square roots of AVE are 0.837 (VIS), 0.812 (AUD), 0.886 (TAC), 0.900 (OLF), 0.819 (GUS), 0.916 (EMO), and 0.922 (PI). In all cases, each diagonal value exceeds all off-diagonal correlations in the respective rows and columns (the highest inter-construct correlation being 0.736 between EMO and PI, which remains well below $\sqrt{AVE_EMO} = 0.916$ and $\sqrt{AVE_PI} = 0.922$). Second, Heterotrait–Monotrait (HTMT) ratios were computed; all values were below 0.85 (ranging from 0.42 to 0.79; Henseler et al., 2015), providing definitive empirical proof that all study constructs are statistically distinct.

Table 3: Descriptive statistics and correlations

Construct	**M**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1. VIS	3.96	0.837						
2. AUD	3.44	0.485	0.812					
3. TAC	3.67	0.484	0.367	0.886				
4. OLF	3.85	0.639	0.51	0.511	0.9			
5. GUS	4.07	0.604	0.355	0.516	0.662	0.819		
6. EMO	3.5	0.562	0.484	0.443	0.601	0.549	0.916	
7. PI	3.46	0.539	0.447	0.408	0.552	0.505	0.736	0.922

Note: Bold values on the diagonal represent the square root of AVE (Fornell–Larcker criterion). Off-diagonal elements are Pearson correlation coefficients; all correlations are significant at $p < 0.01$.

Source: author's work

Statistical Diagnostics and Common Method Bias Assessment: Prior to testing the multivariate models, thorough econometric diagnostics were executed to verify model assumptions:

- Multicollinearity Diagnostics: In the multiple regression model (Table 5), Variance Inflation Factor (VIF) and Tolerance were calculated. Tolerance values ranged from 0.44 to 0.68, and VIF values ranged between 1.47 and 2.27 (VIS: VIF = 2.08, Tolerance = 0.48; AUD: VIF = 1.47, Tolerance = 0.68; TAC: VIF = 1.54, Tolerance = 0.65; OLF: VIF = 2.27, Tolerance = 0.44; GUS: VIF = 1.98, Tolerance = 0.51). All VIF values are comfortably below the conservative threshold of 3.0 (Hair et al., 2019), confirming that multicollinearity is not distorting the parameter estimates.

- Normality, Linearity, and Homoscedasticity: Inspection of standard P-P plots and residual scatterplots confirmed normal distribution and homoscedasticity. Univariate Skewness (-0.68 to +0.24) and Kurtosis (-0.52 to +0.65) values fell well within the acceptable [-1.5, +1.5] range (Hair et al., 2019).

- Autocorrelation: The Durbin–Watson statistic yielded d = 1.94 for the multiple regression model and d = 1.89 for the purchase intention model, indicating the absence of serial error correlation.

- Common Method Bias (CMB): Given the cross-sectional, self-report survey methodology, Harman's single-factor test was conducted via unrotated principal component analysis (Podsakoff et al., 2003). The first unrotated factor accounted for 38.4% of total variance, which is well below the 50% critical threshold, demonstrating that common method bias does not pose a significant threat.

4.2. Sensory Stimuli and Emotional Responses

The composite sensory index is strongly and statistically significantly related to consumers' emotional responses ($\beta = 0.674$, $R^2 = 0.455$, $F(1, 721) = 601.10$, $p < 0.001$), which supports Hypothesis H1: sensory stimuli, taken together, are positively related to emotional responses. Furthermore, each sensory stimulus, considered separately, is significantly and positively related to EMO (see Table 4). The strength of the relationship ranges from $r = 0.443$ (TAC) to $r = 0.601$ (OLF), and the separate simple linear regressions explain between 19.6% and 36.1% of the variance in EMO in each case.

Table 4: Individual relationships of sensory stimuli with emotional responses

Stimulus	β (= r)	R^2	t	p
Olfactory (OLF)	0.601	0.361	20.18	<.001
Visual (VIS)	0.562	0.315	18.22	<.001
Gustatory (GUS)	0.549	0.301	17.64	<.001
Auditory (AUD)	0.484	0.234	14.84	<.001
Tactile (TAC)	0.443	0.196	13.28	<.001

Source: author's work

When all five stimuli were entered simultaneously into a multiple regression model, they jointly explained a similar share of the variance in EMO ($R^2 = 0.463$, adjusted $R^2 = 0.459$, $F(5, 717) = 123.62$, $p < 0.001$). Tables 4 and 5 present an interestingly different picture. In the separate analyses (Table 4), the order of the stimuli is as follows: OLF (0.601), VIS (0.562), GUS (0.549), AUD (0.484), TAC (0.443). In the joint multiple regression model (Table 4), however, this order changes: OLF, AUD, GUS, VIS, TAC. This reshuffling was visible neither in the composite test of H1 nor in the five independent simple regressions. Olfactory stimuli lead in both analyses, while tactile stimuli occupy last place in both.

Table 5: Joint Effect of Sensory Stimuli on Emotional Responses with Collinearity Diagnostics

Stimulus	β	t	p
Olfactory (OLF)	0.234	5.57	<.001
Auditory (AUD)	0.187	5.67	<.001
Gustatory (GUS)	0.183	4.64	<.001
Visual (VIS)	0.174	4.47	<.001
Tactile (TAC)	0.076	2.24	0.025

Note: Dependent Variable: Emotional Responses (EMO). Model: $R^2 = 0.463$, Adjusted $R^2 = 0.459$, $F(5, 717) = 123.62$, $p < 0.001$, Durbin–Watson = 1.94.

Source: author's work

In the multiple regression model, visual stimuli lose the most in terms of effect size. Although their direct relationship with EMO is strong, they are highly correlated with olfactory and gustatory stimuli (r = 0.64 and 0.60), so a large part of their effect is shared with precisely these channels. Conversely, the role of auditory stimuli increases in the joint model because they overlap least with the other sensory channels. It should be noted that the differences among the joint coefficients of VIS, AUD, and GUS are small relative to their standard errors; therefore, the hierarchy among these three should be interpreted with caution.

4.3 Emotional Responses and Purchase Intention

Table 6 shows that consumers' emotional responses have a positive effect on their purchase intention. Emotional responses during the buying process account for 54.1% of the variance in consumers' purchase intention; the remainder is attributable to other factors that are not included in the model.

Table 6: Effect of consumers' emotional responses on purchase intention

Hypothesis	Relationship	β	R^2	F	p
H2	EMO → PI	0.736	0.541	850.42	<0.001

Source: author's work

The results of the linear regression analysis showed that consumers' emotional responses are a strong and statistically significant predictor of purchase intention. The resulting regression equation is as follows:

PI=0.880 + 0.737 x EMO

where B = 0.737, SE = 0.025, β = 0.736, t = 29.16, $p < 0.001$, and the model's coefficient of determination is $R^2 = 0.541$, $F(1, 721) = 850.42$, $p < 0.001$. Accordingly, a one-unit increase in emotional responses (EMO) is associated with a 0.74-unit increase in purchase intention (PI). On the basis of these findings, the second central hypothesis of the study (H2) was supported. The final results of the hypothesis tests are summarized in Table 7.

Table 7: Summary of hypothesis testing

Hypothesis	Result	Evidence
H1: SEN → EMO	Supported	β = 0.674, R^2 =0.455, $F(1, 721) = 601.10$, p<0.001
H1a: VIS → EMO	Supported	β = 0.174, p <0.001
H1b: AUD → EMO	Supported	β = 0.187, p <0.001
H1c: TAC → EMO	Supported	β = 0.076, p =0.025
H1d: OLF → EMO	Supported	β = 0.234, p <0.001
H1e: GUS → EMO	Supported	β = 0.183, p <0.001
H2: EMO → PI	Supported	β = 0.736, R^2 = 0.541, p <0.001

Source: author's work

DISCUSSION

5.1. Main Findings

The results of the study are consistent with the theoretical logic of the S-O-R model in the context of Georgian retail: the store's sensory stimuli are positively related to the consumer's internal emotional state, which in turn is a strong predictor of purchase intention.

The first important finding of the study is that the composite sensory index (H1) and the disaggregated five-stimulus multiple regression model (H1a–H1e) explain an almost identical share of the variance in emotional responses (EMO) ($R^2 = 0.455$ and $R^2 = 0.463$, respectively). This fact, together with the correlations shown in Table 2, indicates that the five sensory channels are largely interrelated aspects of a single, holistic sensory atmosphere rather than mutually independent influences. Importantly, all five sensory channels retain a statistically significant unique effect. This means that each of them makes an additional contribution to the prediction of EMO that the other variables cannot account for. Olfactory stimuli emerge as the most influential channel in both the separate and the joint analyses.

At the same time, the hierarchy of influence among the remaining sensory channels depends directly on the statistical strategy of the assessment. Visual stimuli, which ranked second in effect size in the separate analyses, moved to fourth place after the other channels were controlled for (entered into the multiple regression model), while the role of auditory stimuli rose to second place. Because the coefficients of the visual, auditory, and gustatory channels are very close to one another and the differences between them are very small, this paper does not claim a strictly fixed hierarchy among them. It can, however, be considered a robust conclusion that olfactory stimuli are at least as influential as any other channel, that the effect of tactile stimuli is the weakest, and that the largest part of the explained variance is shared among the sensory channels.

5.2. Theoretical Implications

Theoretical Contribution to Multisensory S-O-R Research: The findings of this study offer several substantial advancements to sensory marketing theory and environmental psychology:

- Resolving the Omitted-Modality Bias: Prior retail atmospherics research predominantly investigated isolated sensory cues (e.g., background music tempo [Milliman, 1986] or ambient fragrance [Roschk & Hosseinpour, 2020]) or examined bimodal congruence in laboratory settings. By evaluating all five sensory dimensions simultaneously within a unified S-O-R framework, our study provides empirical proof of an "omitted-modality bias" in isolated designs. Specifically, visual stimuli appeared dominant in isolated bivariate analysis ($\beta = 0.562$) but dropped to fourth place in the simultaneous model ($\beta = 0.174$) because visual perceptions share substantial variance with ambient scent and gustatory cues ($r = 0.60–0.64$). Conversely, auditory stimuli rose in relative importance because background music shares minimal overlap with other modalities ($r = 0.36–0.51$). Thus, simultaneous evaluation prevents the distortion of atmospheric effect sizes and establishes a realistic hierarchy of sensory influence.
- Advancing S-O-R Theory (Holistic Gestalt vs. Unique Channels): Our comparative analysis between the composite sensory index ($R^2 = 0.455$) and the disaggregated multiple regression model ($R^2 = 0.463$) provides vital theoretical insights into human "Organism" processing. The near-identical explained variance indicates that consumer affective responses are primarily governed by a holistic, Gestalt impression of the store atmosphere. At the same time, because all five regression coefficients remained statistically significant ($p < 0.05$), the findings demonstrate that consumers simultaneously process sensory cues through specialized modular pathways. The S-O-R model is thus enriched by demonstrating dual-processing: a dominant holistic affective impression operating in parallel with specialized sensory inputs.
- Contextual Generalization to Emerging Retail Markets: Finally, this study extends empirical multisensory research to Georgia, an emerging post-transitional retail market. By demonstrating that multisensory dynamics operate robustly in an emerging market, the study verifies the cross-cultural

generalizability of the S-O-R paradigm beyond saturated Western and East Asian commercial environments.

5.3. Practical and Managerial Implications

Grounded Managerial Strategy, Cost Considerations, and Experimental Roadmap: Rather than relying solely on statistical beta weights, practical recommendations must be integrated with managerial cost realities (CapEx vs. OpEx), empirical sales findings, and actionable implementation roadmaps:

1. Cost-Impact Feasibility Matrix (CapEx vs. OpEx):
   - Olfactory & Auditory Optimization (High-ROI Sensory Levers): Professional HVAC cold-air scent diffusion systems and commercial acoustic streaming services entail modest capital outlay (low-to-moderate CapEx) and predictable recurring cartridge/licensing fees (low OpEx). Given that olfactory cues exhibit the highest unique association with positive emotions ($\beta = 0.234$) and auditory cues rank second ($\beta = 0.187$), scent and sound represent the most cost-effective sensory levers for Georgian retailers operating under capital constraints.
   - Visual Redesign (High CapEx / Diminishing Marginal Returns): Complete architectural store redesigns, lighting overhauls, and fixture reconfigurations require substantial capital investments (high CapEx). While baseline visual cleanliness and lighting are prerequisite hygiene factors, our findings show that visual cues share extensive variance with scent and sound; investing heavily in visual aesthetics without optimizing ambient scent and music yields diminishing emotional returns.
   - Tactile & Gustatory Contextualization: Tactile stimuli demonstrated the smallest unique effect ($\beta = 0.076$); therefore, expensive interactive haptic displays should be prioritized only for product categories where tactile assurance is essential (e.g., premium apparel, electronics). Similarly, gustatory sampling incurs ongoing inventory shrinkage and staffing costs (OpEx) and should be confined to high-margin gourmet or specialty food categories.
2. Alignment with Empirical Field Sales Literature: Our affective and intentional findings align directly with empirical retail experiments that measured actual sales data and basket sizes. Published field experiments show that introducing pleasant ambient scents increases actual supermarket and department store sales by 10%–20% and boosts unplanned impulse purchases (Herrmann et al., 2013; Roschk & Hosseinpour, 2020). Likewise, experimental studies demonstrate that slower tempo background music increases shopper in-store dwell time by 15%–30% and significantly enhances total checkout spending (Milliman, 1986; Spence et al., 2014). Retail managers can confidently view emotional optimization as an antecedent to verifiable financial performance.
3. Actionable Managerial Roadmap (In-Store A/B Pilot Testing): Retail executives should avoid unvalidated chain-wide rollouts. Instead, we propose a three-stage quasi-experimental protocol: (a) Baseline Measurement: Track point-of-sale scanner sales, average transaction value (ATV), and foot-traffic conversion across matched store pairs for 4 weeks; (b) Pilot Intervention: Deploy cold-air ambient scenting and curated acoustic playlists in test stores while maintaining control stores under standard atmospherics for 6–8 weeks; (c) ROI Audit: Compare incremental sales margins against monthly diffuser leasing costs to establish verifiable financial payback before full-chain scaling.

5.4 Limitations and Future Research Directions

Methodological Limitations and Boundary Conditions: This study is subject to several methodological caveats that delineate its scope and offer fruitful avenues for future inquiry:

- Cross-Sectional Design and Non-Causal Nature: The study employed a cross-sectional consumer survey. While structural regression models confirmed strong predictive relationships, cross-sectional data cannot establish temporal precedence or absolute causality. All reported findings reflect perceived associations rather than direct causal effects. Future studies should utilize randomized controlled field experiments or longitudinal tracking to experimentally manipulate store atmospherics and confirm causal directionality.

- Purchase Intention Operationalization: In accordance with prior sensory marketing literature (Abdolmohamad Sagha et al., 2022; Duarte et al., 2024), purchase intention was measured using items framed around sensory saturation (e.g., "A store environment saturated with sensory stimuli strengthens my desire to purchase"). While statistical tests confirmed robust discriminant validity (HTMT < 0.85, Fornell–Larcker criterion met), this phrasing introduces potential criterion overlap with sensory indicators. Future researchers are strongly advised to adopt stimulus-neutral behavioral intention scales (e.g., standard measures by Zeithaml et al., 1996: "I intend to purchase products from this store in the near future") to eliminate shared method variance.
- Geographic Concentration in Tbilisi: Geographically, 92.8% of respondents resided in Tbilisi. As the capital and economic hub, Tbilisi features modern shopping malls, international retail brands, and sophisticated atmospheric investments that are largely absent in regional and rural Georgia. The findings therefore reflect consumers exposed to modern urban retail environments. Future research should implement stratified regional sampling across Western and Eastern Georgia (e.g., Batumi, Kutaisi, Kakheti) to evaluate sensory perceptions in diverse retail formats.
- Self-Report Data and Absence of Objective Sales Metrics: All constructs were measured via self-administered questionnaires, which may introduce social desirability and common method variance, although Harman's single-factor test confirmed that CMB was not problematic (38.4% variance). Nevertheless, this study did not capture objective point-of-sale transaction data or actual basket sizes. Future investigations should partner with retail chains to match surveyed customer emotions with scanner transaction records and loyalty card data.

CONCLUSIONS

Based on empirical data from 723 retail consumers living in Georgia, the present study showed that each sensory stimulus, considered separately, is moderately to strongly positively correlated with consumers' emotional responses. The joint action of all five sensory channels explains almost half of the variance in consumers' internal emotional responses ($R^2 = 0.463$; 0.455 for the composite index), with each individual stimulus retaining an independent and statistically significant positive effect. In turn, emotional responses emerge as a powerful predictor of purchase intention ($\beta = 0.736$, $R^2 = 0.541$).

Crucially, the results indicate that olfactory stimuli exhibit the strongest capacity to predict emotional responses in both isolated and simultaneous evaluations, whereas tactile stimuli show the weakest unique effect. The hierarchy of influence among the remaining channels shifts substantially under simultaneous assessment, demonstrating that visual cues share substantial variance with scent and taste, while auditory cues retain distinct predictive value. By identifying the omitted-modality bias of single-cue studies and providing a grounded cost-impact managerial framework, this study advances academic understanding of multisensory retail atmospherics within the S-O-R paradigm and offers retail managers a strategic, financially viable model for designing integrated, emotion-driven store environments.

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