Journal of Computer Information Systems

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/ucis20

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To cite this article: Pooja Goel, Aashish Garg, Anuj Sharma & Nripendra P. Rana (26 Jun 2023): Impact of Sensory Perceptions on the Urge to Buy Impulsively, Journal of Computer Information Systems, DOI: 10.1080/08874417.2023.2224748

To link to this article: https://doi.org/10.1080/08874417.2023.2224748

JOURNAL OF COMPUTER INFORMATION SYSTEMS
https://doi.org/10.1080/08874417.2023.2224748

Impact of Sensory Perceptions on the Urge to Buy Impulsively

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ABSTRACT

E-commerce retailers use augmented reality (AR) based apps for product presentations. This study investigates the influence of sensory perceptions in an urge to buy impulsively (UBI). This study further examines the mediating role of emotional states in the relationship between sensory perceptions and UBI. It also examines whether involvement moderates the impact of emotional states on the UBI. Data were collected from users who have used augmented reality (AR) features in Lenskart App and purchased products at least once during the last two months. Overall, the sensory perceptions elicited by AR apps significantly influence customers' emotional states, driving the UBI. The influence of emotional states on the UBI was also considerably moderated by product involvement. Several practical and theoretical implications for e-commerce retailers are also discussed.

KEYWORDS

Sensory; emotions; impulsive buying; e-commerce; AR apps

Introduction

In physical retailing stores, interiors like lighting, color, music, scent, and exteriors such as storefront window design, landscaping in the vicinity of the store, and wall-mounted flags elicit consumers' emotional responses.[1] Retailers use these cues to tweak the shopping surroundings to stimulate emotions of consumers to increase the likelihood of making purchases.[1] These cues were termed as atmospherics by Kotler.[2] These cues or atmospherics stimulate the consumers' senses, and marketers use these cues as sensory triggers to connect with customers for providing them with unique experiences. Thus, when retailers interact with consumers through their five senses, sight, sound, smell, touch, and taste, it is specified as sensory marketing.[3] Previous studies posited that multisensory marketing techniques could also alter consumer attitudes, intentions, and consumption behaviors.[4] Studies suggest that through senses, consumers also learn about and develop an understanding of companies, goods, and brands.[5] Therefore, sensory marketing is integral to consumption literature.[1]

Further, with the wider adoption of a multichannel strategy for selling products and services to consumers, retailers continuously revisit their marketing strategies related to e-commerce channels as they feel pressure to market their products online as consumers interact and evaluate products through a screen.[6] Scholars believe that e-commerce channels are deficient in providing sensory cues resulting in a limited product experience for consumers, which may further induce them to abandon their online shopping carts or frequent product returns.[6] In both scenarios, i.e., cart abandonment or product returns by consumers, retailers bear serious operational or/and financial losses particularly sold through e-commerce channels. However, with the encapsulation of AI-based technologies such as augmented reality (AR), virtual reality (VR), and hand scanners, retailers can infuse sensory elements into the online shopping environment.[7] Nearly every retailer (IKEA, Amazon, M.A.C, Burberry, and Nike) are using AR applications to provide immersive experiences to their customers.[7,8] According to a recent survey, the AR in the retail market is expected to reach US $17864.86 million by 2028 with a compound annual growth rate of 24.8%.[96]

Prior literature on AR apps (applications) in retailing has highlighted the influence of AR capabilities on various aspects of consumer behavior, such as relationships with brands,[10] or customer experience.[4] Apart from this, the interactivity attribute of AR apps has been explored extensively.[11]

Despite the invaluable contribution of earlier work in the domain, several gaps in the literature need to be filled in. First, previous research has looked at the impact of AR capabilities on consumers' acceptance, attitude, and purchase intention.[12]

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Nonetheless, in contrast to traditional buying, impulse buying (specifically in the case of online retailing) is also emerging as an essential subject and receiving considerable attention from scholars.[13,14] According to a recent estimate by Statista in 2021, approximately 50% of the e-commerce market, i.e., 9.09 trillion USD, constitutes impulse buying.[15] Furthermore, previous studies suggest that AR apps enable better product presentation (for example rotating a product at 360-degree rotation), which further leads to the UBI among consumers buying using e-commerce mode.[16]

Second, to date, past studies have adopted a narrow approach treating augmented reality capabilities as a single independent variable[8,10,17] or examined the influence of interactivity and vividness of AR apps on online shopping behavior[18] while ignoring the influence of individual elements of sensory perception, i.e., visual, acoustic, haptic, olfactory, and gustatory on consumers' buying behavior. Few studies[6] suggest that not all sensory interactions equally improve consumer's shopping behavior. For instance, haptic positively impacts consumers' willingness to pay compared to the auditory element.[6]

Third, earlier research has explored the impact of AR apps mainly in the context of various hedonic products such as makeup, clothing, and gaming.[19] Sensory interactions are not uniform across product types, requiring further explorations in different contexts.[20] To date, hardly any work explored the influence of AR-based apps on eyewear product buying behavior. The eyewear sector appears interesting as this market is growing massively and is anticipated to reach 323.77 billion USD by 2030.[21] Moreover, more than 40% of adult consumers browse or buy eyewear online, and the online eyewear market is predicted to expand by 9% annually in the next five years.[21] The experiential element of AR enables users to envision products (sunglasses/spectacles) on their own faces in their own spaces. Consumers interact dynamically with products that can assist online eyewear shoppers in choosing things that better suit their needs.

Fourth, several previous research studies have established the role of product involvement as a moderator in consumer buying behavior.[12] However, due to the varied perceptions of the value and risks of a product, product involvement differs among consumers. Past research has established that customers with high product involvement are more likely to feel strongly about certain goods, producing the emotions required for impulsive purchases.[22] Eyewear is emerging as a new category in the fashion industry with the consumers' increased consciousness regarding image and style.[23] Thus, consumers indulge in impulse buying of eyewear as well as any other fashion accessory.

Further, in consumer behavior literature, scholars have established that five sensory factors escalate the emotional responses among consumers. Previous studies followed the Pleasure-arousal-dominance (PAD) theory suggested by[24] to define the emotional state of consumers.[25] Another line of studies[26] explained the consumers' impulse buying behavior through the PAD model. Similar relationships were also established by other scholars.[27] To date, no study has explored the influence of sensory elements generated through AR-based apps on impulse buying behavior via PAD emotions. Authors believe that stimulus generated through AR-based apps elevates the feelings of pleasure and arousal, which further enhances the UBI in the consumer. *Lastly*, AR-based retailing apps have been studied more frequently in detail; data in this area is still limited[13]; hence more explorations are required.

Based on these considerations, this study seeks to comprehend the influence of sensory perception evoked due to AR characteristics on online impulse buying behavior. This study incorporates the stimulus-organism-response (SOR) framework[24] to construct and explain the influence of sensory perceptions (visuals, acoustic, haptic) invoked by the AR apps and its connection with the emotional state (arousal, pleasure) of consumers on the UBI for online eyewear buying. In exploring the same, some of the key research questions (RQs) for this research are:

RQ1: How do elements of sensory perception (visual, acoustic, and haptic) evoked through an AR app affect the UBI?

RQ2: How does emotional state (arousal and pleasure) mediate between sensory perception elements and the UBI?

RQ3: How does product involvement moderate the relationship between emotional state and the UBI?

The structure for the remaining parts of this paper is as follows: The next section discusses the theoretical framework, provides the rationale for the proposed model, and formulates hypotheses. The subsequent section discusses the research methodology of this research. The further section analyses the results and presents them. The section after that provides a discussion on the findings of this research against the backdrop of the available literature in this area, followed by implications for theory and practice. The next section provides the key limitations of

this research and the directions for future research. Finally, the paper ends with conclusive remarks.

Theoretical framework and hypotheses development

Theoretical framework

The role of sensory perceptions in triggering the UBI through emotional states can be explained by the Stimuli-Organism-Response (SOR) framework. The SOR model was created by Mehrabian and Russell in 1975,[28] and it states that stimulus (S) causes an emotional reaction (O), which subsequently shapes consumers' behavioral response (R). To date, most studies on the buying habits of mobile shoppers have used various technology acceptance frameworks like "Technology Acceptance Model" (TAM),[29] "Unified Theory of Acceptance and Use of Technology" (UTAUT),[30] "Innovation Diffusion Theory" (IDT),[31] or others to investigate the influencing variables of consumer behavior, often overlooking the connection between customer emotion and behavior. This is why the authors have applied the theory of SOR to mobile shopping in order to understand better how customers' impulsive purchase tendencies (Response) are formed in response to the sensory elements (Stimulus) of mobile shopping with emotional states (Organism) as a mediator. Additionally, the present research has included PAD model within the SOR framework, that have a significant impact on consumers' impulsive buying behavior. Since SOR model is one of the most prominent models for researching consumer behavior, extensive research based on the SOR model has been carried out in a variety of different information systems and online contexts like the influence of web aesthetics on customers' PAD,[25] Data Analytics Recommendation,[32] Grocery Shopping Apps.[33] The SOR framework, commonly recognized as the Mehrabian-Russell (M-R) framework, has also been utilized in several studies to investigate the impact of environmental cues on impulsive online purchases.[34] Based on this model, in the present research, it is contended that while purchasing eyewear through the Lenskart app, consumers will form strong emotional states stimulated by sensory aspects generated through AR features, which further will trigger the UBI among them.

Sensory perceptions as a stimulus

A stimulus is an external cue that influences a person's behavior.[35] During shopping experiences, customers are subjected to external cues, which shape their buying behavior.[36] These external cues include various ambiance elements like lighting, music, scent, etc. In a virtual shopping environment, the use of various digital technologies produces sensory impressions that successfully arouse customers and trigger their emotions, thus directing their shopping behaviors.[34] Digital world does not encompass all the physical environment sensory aspects such as taste, temperature, and smell but also comprises haptic, visual, and acoustic aspects.[37] Thus, the current study has included sensory experiences (haptic, visual, acoustic) as the stimuli to examine impulse buying behavior while using Lenskart App. The haptic sensation, also known as the "Need for Touch" gives an understanding of customers' preferences for information obtained through touch.[38] Haptics in the virtual environment involves the utilization of haptic interfaces, like smartphones and AR technologies, to enable consumers to touch, feel, and move items in immersive virtual settings.[39] The second sensory experience, "Visual Sensation", has been recognized as the highly prominent of all the senses.[40] When customers find the visual aesthetic of anything appealing, it strongly influences their sensory stimuli. The visual sensory aspect of the online shopping environment includes numerous factors such as lighting, colors, design, and so on,[41] which creates a greater impression of being in a real shopping environment.[42] The third sensory experience element, "Acoustic" also labeled as auditory sensory cues, implies hearing and listening to music in retail environments. Auditory stimuli, for example music, are seen as essential and distinguishing in producing great consumer encounters in an online shopping scenario.[43] Hence, in the present research, the background music while searching for the products on the Lenskart app serves as an environmental stimulus.

Emotions as organism

In accordance with the SOR framework, the organism is characterized by emotional and cognitive intermediate states and processes that mediate the relationship between stimulus and response. Emotional states have been incorporated into research models of several studies that used the SOR framework.[44,45] Emotions are of paramount importance in linking environmental stimuli and their effects on human behavior in the SOR framework. According to Mehrabian & Russell,[24] dimensional emotional states can be categorized into three dimensions: pleasure, arousal, and domination (PAD emotions). Pleasure is the extent to which persons feel pleased, joyous, satisfied, and fulfilled in the environment. Arousal implies an individual state of feeling stimulated, excited, or alert. The extent to which an

individual experience under the control of a situation is characterized as dominance. Both pleasure and arousal have contended as positive emotions which are evoked while experiencing AR services.[4] Since dominance has had an insignificant role in assessing individuals' behavioral responses in previous research,[46] the present study has incorporated pleasure and arousal as emotional states.

Urge to buy impulsively as a response

The outcome of consumers' reactions to external stimuli and their internal organisms is referred to as response.[47] In the present research, the UBI is regarded as a response. UBI can be defined as "a state of desire that is experienced upon encountering an object in the environment".[48] UBI indicates that when people buy goods, they do not thoroughly consider the necessity for the goods. AR technology is rapidly being used in shopping applications for smartphones to improve consumers' mobile shopping interactions, ultimately influencing consumers' UBI.[17] Previous research has used the UBI as a significant proxy for impulsive buying for a variety of reasons.[49] Several studies in the Information system context also have examined consumer impulsiveness in case of website attributes,[50] website quality,[51] live streaming shopping,[52] and website characteristics.[53] Hence, in the current study, the UBI has been considered a response for the consumers who have used AR-based Lenskart app while purchasing online. The theoretical framework for this study is depicted in Figure 1.

Hypotheses development

Sensory to emotions

A consumer's perceptions of a product are heavily influenced by sensory experiences, which play a pivotal part in the consumer decision-making process.[54,55] Sensory marketing is recognized as an important approach to enhance a brand's interaction with a customer by appealing to all senses and evoking emotions. Literature indicates that customers' emotions are successfully controlled, relaxed, and improved via sensory marketing.[56] Thus, stimulating a consumer's senses is essential to forming their emotional responses. For instance, studies[45] demonstrated the influence of the store's atmosphere ((i.e., lighting, cleanliness, scent, design, layout, music, and employee interaction) on customers' emotions toward the brand and their propensity to make a purchase. Similarly, scholars[57] confirmed substantial causal relationships between sensory perceptions, positive/negative emotions, behavioral intentions, and purchasing behavior. All three sensory perceptions, i.e., acoustic, haptic, and visual, significantly affect consumers' emotions. Researchers have recognized music as an environmental stimulant that shapes consumers' perceptions of companies stimulate emotions, and develops an emotional relationship with customers, eventually sparking behavioral reactions. Music relaxes consumers, acts as a mood changer, and good moods stimulate positive

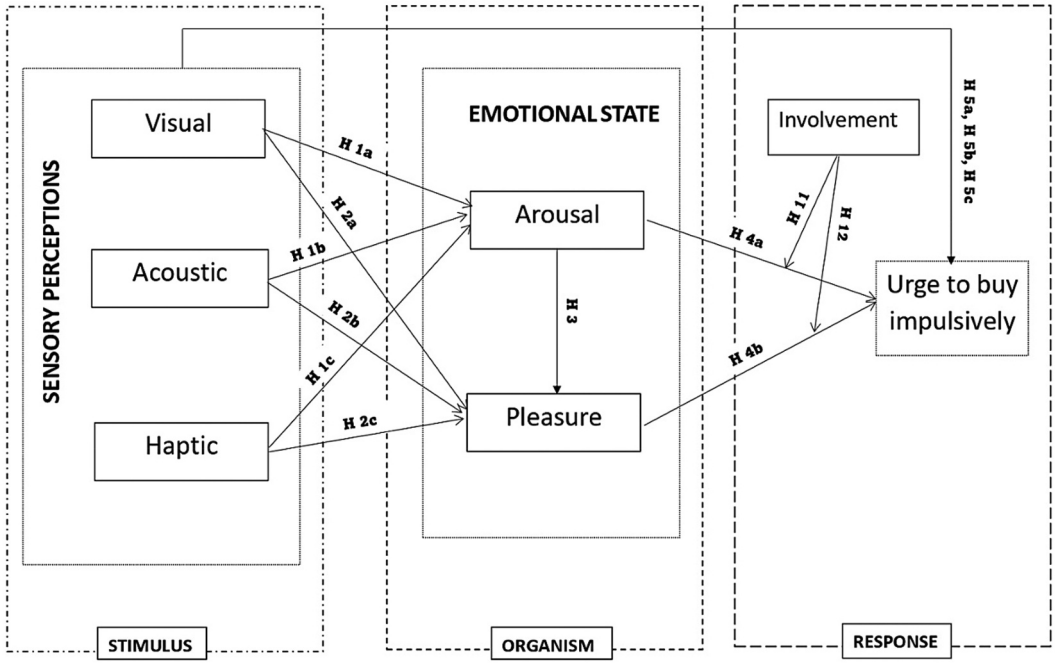

Figure 1. Theoretical framework.

emotions.[58] Similarly, haptic cues which consumer experiences in the online retail environment have a positive impact on the emotions of the consumers. The use of AR enables online products to be more realistic and tangible, such that envisioning touching a thing may develop and deepen the experience of ownership.[59] This high feeling of possession may induce positive emotions like pleasure and arousal in a virtual shopping environment. People's emotional responses can also be influenced by the lighting and design of online shopping applications.[57] The usage of 3D and appealing images in AR apps can increase the consumer's positive emotions when purchasing online. Thus, the haptic cues, background music, and real-time product visuals in the AR Lenskart app can stimulate positive emotions like pleasure and arousal. In light of the above discussion, it is hypothesized that:

H1: Arousal emotional state is influenced by a) visual, b) acoustic, and c) haptic perceptions.

H2: Pleasure emotional state is influenced by a) visual, b) acoustic, and c) haptic perceptions.

Arousal to pleasure

Previous research on PAD emotions has revealed that human emotions are closely connected to one another and that individual emotions do not behave alone but rather may be studied and explained in terms of their interrelationships.[60] This implies that for some people, pleasant emotions are more likely to coincide with high arousal, expressing joy and excitement, while for others, pleasant emotions may be more probably linked with low arousal (negative relationship), expressing relief and fulfillment.[61] In the case of the Lenskart app, sensory cues shaped through AR features will stimulate feelings of both positive emotions, i.e., arousal and pleasure, and individuals with high arousal and pleasure will express more joy and excitement while shopping online. Several studies have also established a positive link between pleasure and higher arousal levels.[62] Similar observations were made by other scholars too.[63] Thus, it is hypothesized that:

H3: Arousal emotional state positively influences pleasure emotional state.

Emotions to UBI

The connection between emotions and buying decisions has been well-documented in past literature.[64] Individual responses are predicted by one's emotional reactions to one's surroundings cues, as proposed by the model of Mehrabian and Russell.[24] Previous research has shown that both positive and negative emotions influence impulsive purchases.[64] It has been argued that positive emotions, like pleasure and arousal, have been linked to higher spending among impulse buyers.[22,44] Impulsive shoppers have a strong urge to be delighted and receive an emotional lift from purchasing items on a regular basis. Several studies have also demonstrated the relevance of positive emotions in inciting impulsive buying.[13,65] Therefore, positive emotional states might impact the urge to make impulsive purchases.[66] According to previous studies, this research predates that when customers browse products in AR apps, consumers may interpret the information utilizing their emotions, increasing the sense of arousal and pleasure, and thus increasing the UBI. In light of the above discussion, it is hypothesized that:

H4: UBI is positively influenced by a) Arousal emotional state, b) Pleasure emotional state.

Sensory to UBI

The authors contend that both external stimuli and consumers' internal emotional states are crucial in understanding impulsive buying.[67] Several scholars have clearly identified the various sensory components (Such as sight, sound, and sense of touch) as features of AR Apps that form a multisensory experience.[42] Enhancing aesthetic value by using visual components like fonts, graphics, and so on in virtual shopping apps can significantly impact consumers' impulsive tendencies.[68] Users are more likely to explore and ultimately make purchases from a shopping app if it has a pleasant visual. Thus, according to research, visual attractiveness is positively related to impulsive online purchases.

Marketers often include audible cues to encourage customers to spend more time in a shopping app. Marketers of shopping applications use music to engage with clients and stimulate their subconsciousness in order to produce a positive acoustic experience. Studies have indicated that music acts as a standalone impulse-buying stimulant and interacts with other elements to influence further consumer spending.[59] An online shopping app's background music, in conjunction with the app's design and other features, thus might increase the UBI.

When making a purchase, consumers depend on haptic product information gained through touch, such as the product's weight, comfort, shape, etc.

When it comes to making purchases online, AR can be a great tool to supplement more traditional online channels, especially for customers with a strong desire for touch.[69] In the case of online shopping app purchases, interacting with virtual content integrated into the real world can be a suitable replacement for interacting with products themselves; this can be useful to users and result in high impulsive buying tendencies.

A more rich atmosphere containing appealing haptic, visual, and acoustic cues usually enhances the added significance of the item, subtly recommending a purchase. Attractive visuals, good background music, and the use of haptic cues to make online products feel more realistic and tangible in AR apps trigger the elements of impulsive behavior,[70] which enhances the propensity to engage in impulsive buying. In light of the above discussion, it is hypothesized that:

H5: UBI is positively influenced by a) visual, b) acoustic, and c) haptic perceptions.

Mediation of emotions

An individual's emotional state is largely influenced by environmental cues, which ultimately leads to specific behavioral patterns.[24] When customers decide based on their senses (sight, sound, smell, and touch), they instantly use their emotions as crucial cues.[57] Based on studies in consumer psychology, it has been observed that certain (positive or negative) emotional responses triggered by sensory inputs mediate the effects of these factors on impulsive purchases. There is scant literature on the mediation effect of emotions in driving impulsive buying, such as, in the case of the impact of a media format[71] and the effect of consumer beliefs regarding online businesses on their likelihood of making impulsive purchases.[72] In a few other online buying behavior contexts also, including online live streaming apps[44] and mobile shopping,[34] consumer emotions (pleasure and arousal) have been recognized as a significant mediator of impulsive buying. Additionally, arousal may also potentially mediate the relationship between stimuli and pleasure.[73] Considering the above discussion, it is hypothesized that:

H6: Arousal mediates the impacts of a) visual, b) acoustic, and c) haptic perceptions on pleasure.

H7: Arousal mediates the impacts of a) visual, b) acoustic, and c) haptic perceptions on the UBI.

H8: Pleasure mediates impacts of a) visual, b) acoustic, and c) haptic perceptions on the UBI.

H9: Pleasure mediates the relationship between arousal and the UBI.

H10: Arousal and pleasure serially mediate the impacts of a) visual, b) acoustic, and c) haptic perceptions on the UBI.

Moderation of involvement

Involvement, like motivation, is a feeling that develops within the mind of the customer. Involvement is defined as "a person's perceived relevance of the object based upon inherent needs, values, and interests."[74] The degree of involvement reflects the significance of the product or service being purchased, the consumer's interest in using the product, and the depth of information he seeks before making a final decision.[22] In many studies, the notion of customer involvement has been used to investigate how online customers behave, for example, in the case of grocery shopping apps,[33] and medical equipment.[75] Customers exhibit either a high or low level of involvement during the purchasing process. Higher levels of product involvement can intensify customer emotions, which can further moderate the influence on impulsive buying decisions. Hence, the level of involvement backed by the emotional state may moderate consumers' UBI. In light of the above discussion, it is hypothesized that

H11: Product involvement moderates the impact of arousal on the UBI. As the level of product involvement increases, the impact of arousal on an UBI becomes stronger.

H12: Product involvement moderates the impact of pleasure on the UBI. As the level of product involvement increases, the impact of pleasure on an UBI becomes stronger.

Research methodology

The researchers utilized AMOS (Version 22) for confirmatory factor analysis and testing of the hypothesis as the research questions sought to study the influence of sensory perceptions evoked due to AR characteristics on the UBI. AMOS has established itself as a more robust

and accurate tool for evaluating the modeled relationships in the framework of impulsive buying.

Measures

To assess the variables, a seven-point Likert scale (1 = "Strongly disagree" to 7 = "Strongly agree") was used. The survey instrument employed in the study included seven constructs with 28 scale item measures that were in line with previous conceptualizations (Table 3). The visual, acoustic, and Haptic were operationalized following Haase & Wiedmann.[54] Arousal emotion was measured using 4 items derived from Hsieh et al.[76] and Yang et al.[62] Pleasure was measured with five items borrowed from Huang et al.[77] and Yang et al.[62] UBI was operationalized following Zheng et al.[15] The involvement was measured using three items adopted from Shen & Khalifa.[27] Moreover, the description section of the questionnaire was included, comprising a brief overview of the study objectives and explanations of the constructs. Before conducting the formal collection of data, a pilot survey with participants was carried out to ensure whether the respondents properly comprehended the measuring items, assuring measurement reliability and validity. After pilot testing confirmed reliability and validity, the researchers distributed the self-administered final questionnaire on several online platforms.

Research design

In this study, Lenskart, one of the leading eyewear companies in India that uses AR, is considered the research context. Lenskart has developed one of the most cutting-edge technologies available to make online eyewear product buying as simple as possible.[78] Lenskart's Virtual AR feature allows customers to try on products in real-time and can be used for eyeglasses and sunglasses. The target population of this research was users who have used AR features in the Lenskart app and purchased products at least once during the last two months. The two-month time frame was selected so that customers could accurately recollect their experiences while filling out the questionnaire. A screening question, "Had you purchased any product on Lenskart App after virtually trying it in the last two months?" was included to confirm the appropriateness of all responses. Only those who responded "yes" were allowed to respond to the next questions. During July and August 2022, data were collected using a convenience sampling methodology via an online survey. 413 responses were received who had purchased products from the Lenskart app in the previous two months after virtually trying products. Furthermore, 18 of the 413 responses were eliminated, and the data analysis was performed on 395 responses.

Control variables

Several systematic individual differences in demographics might potentially affect the results of the present study due to the nonrandom nature of the online survey used to gather data. As a result, this research used a few control variables which may influence the urge to buy impulsiveness of consumers. These control variables comprise Gender, Age, Monthly income, and Occupation.

Results

Sample characteristics

Table 1 demonstrates the demographic attributes of this research. Most of the respondents were male (209, 52.9%), between age limits of 31–45 years (138, 34.95%). More than half of those surveyed earn less than ₹50,000 a month. The majority of responders were self-employed (144, 36.465).

Common method bias (CMB)

The present research is cross-sectional in design, so each questionnaire was completed at a specified time by each respondent. As a result, the research is susceptible to common method bias.[79] Initially, we employed Harman's[80] strategy to investigate the existence of common method bias.[81] According to the findings, the explained variation of a single component accounted for around 31% of the overall variance. The findings of Harman's single component analysis showed that the single factor extracted did not explain more than 50% of

Table 1. Sample description.

Item	Categories	N	Percentage rates (%)
Gender	Male	209	52.9
	Female	186	47.1
Age	18–30	158	40
	31–45	138	34.95
	45–60	91	23.03
	61 and above	8	0.02
Income (Monthly in Indian ₹)	0 - ₹30,000	101	25.56
	₹30,001–₹50,000	139	35.19
	₹50,001–₹100,000	113	28.61
	More than ₹100,000	42	10.63
Occupation	Student	128	32.41
	Self-employed	144	36.46
	Service	97	24.56
	Others	26	6.58

the variance, showing that CMB was not a concern in the current study.

Confirmatory factor analysis

The multi-item constructs' reliability and validity were tested before assessing structural model path coefficients. The goodness-of-fit ratings in this research stated that the measurement model fitted the data well (See Table 2). Cronbach's alpha and composite reliability (See Table 3) were more than 0.7, showing satisfactory internal consistency.[82] Each item had a standardized path loading value of more than 0.5, and all were statistically significant, which was acceptable for convergent validity.[82] Moreover, the average variance extracted for each variable was above 0.5, depicting good convergent validity.[82]

The discriminant validity was assessed by assessing "the square root of AVE" and "inter-construct correlations." Table 4 depicts that all the scores of the square root of AVE were above the inter-construct correlations of all the variables, thus depicting good discriminant validity.[82] Moreover, based on HTMT criteria also Table 5, all the readings were clearly below the maximum admissible limit of 0.90.[83] As a result, there were no concerns with discriminant validity. As all the reliability and validity requirements were fulfilled, the model was suitable for final analysis.

The path coefficients were evaluated using the Structural Equation Modeling (SEM) method and are presented in Table 6 and Figure 2. Referring to Table 6, among all the sensory perceptions, visual (H1a, $\beta = 0.332$, t-value = 5.953) and haptics (H1c, $\beta = 0.352$, t-value = 6.514) have a substantial positive impact on arousal emotions. While

Table 2. Fit index statistics.

Fit Index	Abbreviation	Recommendation	Resultant Value	Reference
Chi-square/Degree of Freedom	χ^2/df	Between 1 to 3	1.676	Bagozzi and Yi (1988), Hair et al. (2010)
Root Mean Square Error of Approximation	RMSEA	<0.06	0.038	
Comparative Fit Index	CFI	>0.90	0.983	
Normed Fit Index	NFI	>0.90	0.959	
Tucker Lewis Index	TLI	>0.95	0.980	

Table 3. Convergent validity statistics.

Variable	Loadings	Average Variance Explained	Composite Reliability	Cronbach's Alpha
Visual (VIS)		0.704	0.905	0.904
The content shown in Lenskart App is aesthetic.	0.816***			
The content shown in Lenskart App is attractive.	0.859***			
The content shown on Lenskart App is visually appealing.	0.803***			
The content shown on Lenskart App is a visual treat.	0.873***			
Acoustic (ACO)		0.613	0.864	0.866
The background sound used in Lenskart App is euphonic.	0.806***			
The background sound used in Lenskart App is good.	0.790***			
The background sound used in Lenskart App is melodic.	0.734***			
The background music of Lenskart App is pleasant.	0.812***			
Haptic (HAP)		0.679	0.894	0.895
I perceive the products shown in the Lenskart App to be comfortable to use.	0.852***			
I perceive the products shown in the Lenskart App to be handy.	0.818***			
I perceive the products shown in the Lenskart App to be soothing.	0.784***			
I perceive the products shown in the Lenskart App to be well-shaped.	0.845***			
Pleasure (PLE)		0.735	0.933	0.932
I feel joyful after using Lenskart App.	0.829***			
I feel pleasure after using Lenskart App.	0.856***			
I feel gratified after using Lenskart App.	0.847***			
I feel pleased after using Lenskart App.	0.870***			
I feel contented after using Lenskart App	0.853***			
Arousal (ARO)		0.808	0.955	0.953
When I used Lenskart App, I felt stimulated.	0.865***			
When I used Lenskart App, I felt excited.	0.891***			
When I used Lenskart App, I felt bright.	0.883***			
When I used Lenskart App, I felt calm.	0.930***			
Urge to buy impulsively (UBI)		0.849	0.958	0.959
I experienced a sudden urge to buy after using Lenskart App.	0.910***			
I developed desire to buy items that did not pertain to my specific shopping goal after using Lenskart App.	0.932***			
After using Lenskart App, I wanted to buy the eyewear although initially it was not in my plan.	0.938***			
The urge to buy the eyewear was very strong after using Lenskart App.	0.890***			

*** implies "statistically significant at *p*-value <.001;" AVE = "Average Variance Explained;" CR = "Composite Reliability".

Table 4. Discriminant validity statistics using Fornell and Larcker.

	VIS	ACO	HAP	PLE	ARO	UBI
VIS	**0.839**					
ACO	0.548	**0.783**				
HAP	0.591	0.503	.824			
PLE	0.776	0.569	.687	.857		
ARO	0.580	0.432	.585	.687	**0.899**	
UBI	0.609	0.449	.532	.675	0.546	**0.922**

VIS implies "Visual," ACO implies "Acoustic," HAP implies "Haptic," PLE implies "Pleasure," ARO implies "Arousal," UBI implies "Urge to buy impulsively." Bold diagonal values represent "square root of average variance extracted estimates".

Table 5. HTMT values.

Construct	VIS	ACO	HAP	PLE	ARO	UBI
VIS						
ACO	0.547					
HAP	0.595	0.505				
PLE	0.775	0.568	.688			
ARO	0.582	0.433	.584	.689		
UBI	0.610	0.451	.534	.676	0.544	

VIS implies "Visual," ACO implies "Acoustic," HAP implies "Haptic," PLE implies "Pleasure," ARO implies "Arousal," UBI implies "Urge to buy impulsively".

acoustic (H1b, β = 0.073, t-value = 1.424) had no substantial impact on the arousal emotions. Thus, H1a and H1c were supported, but H1b was not supported. In addition, results exhibited a significant relationship of, i.e., visual (H2a, β = 0.436, t-value = 9.220), acoustic (H2b, β = 0.106, t-value = 2.690), and haptics (H2c, β = 0.227, t-value = 5.208) with the pleasure emotions. Thus, H2a, H2b, and H2c were supported. In the case of the direct impact of arousal on pleasure, a significant positive relation was found (H3, β = 0.256, t-value = 6.348), thereby supporting H3. H4a and H4b proposed structural relationships of emotional states with the UBI of the respondents. Both arousal (H4a, β = 0.121, t-value = 2.323) and pleasure (H4b, β = 0.377, t-value = 4.793) reported a significant impact on UBI of the consumers, supporting H4a and H4b. Lastly, the present study also examined the direct effect of sensory perceptions on consumers' UBI. Only visual perceptions (H5a, β = 0.176, t-value = 2.682) showed a significant positive effect on the UBI, while both acoustic (H5b, β = 0.048, t-value = 0.993) and haptics (H5c, β = 0.074, t-value = 1.322) had no significant effects, thus supporting H5a only.

Mediation

Considering the recommendations for mediation proposed by Hayes[84] and Zhao et al.[85] for mediation analysis, we investigated the mediation of pleasure and arousal in the influence of sensory perceptions on the UBI. The current study used a 95% "confidence interval" (CI) and 2000 "bootstrapped samples for testing the mediation effects." The mediation of arousal in the relationships between sensory perceptions and pleasure emotion was also examined. The findings of the mediation effects are presented in Table 7. The indirect effects of sensory perceptions on pleasure through arousal were significant in the case of visual perceptions (H6a, β = 0.085; $p < .05$; CI = (LCI = 0.051 to UCI = 0.118)) and haptic perceptions (H6c, β = 0.090; $p < .05$; CI = (LCI = 0.050 to UCI = 0.122)) only, not in case of acoustic perceptions (H6b, β = 0.019; $p > .05$; CI= (LCI= −0.005 to UCI = 0.041)). Thus, H6a and H6c were supported, while H6b was not supported. In the case of the mediation effect of sensory perceptions on the UBI through arousal, significant indirect effects were present in the case of visuals (H7a, β = 0.040; $p < .05$; CI = (LCI = 0.013 to UCI = 0.091)) and haptics (H7c, β = 0.042; $p < .05$; CI = (LCI = 0.014 to UCI = 0.093)) only, not for acoustics (H7b, β = 0.009; $p > .05$; CI = (LCI= −0.001 to UCI = 0.130)). This supports H7a and H7c but not H7b. While examining the mediating effects of pleasure in the relationships between sensory perceptions and the UBI, all the indirect effects were significant, with p-values <0.05 and confidence levels between the prescribed limits. Hence, H8a, H8b, and H8c were supported by the results. Moreover, the indirect effect of arousal (H9, β = 0.096; $p < .05$; CI = (LCI = 0.057 to UCI = 0.151)) on the UBI was also statistically significant, thus supporting H9. The serial mediation of acoustic and pleasure in the relationships between sensory perceptions and the UBI also showed significant indirect

Table 6. Standardized parameter estimates.

Hypothesis	Relationships	Standardized effects size *(β)*	t-values	*p*-values	Hypothesis Testing Results
H1a	VIS → ARO	0.332	5.953	***	Supported
H1b	ACO → ARO	0.073	1.424	.154	Not Supported
H1c	HAP → ARO	0.352	6.514	***	Supported
H2a	VIS → PLE	0.436	9.220	***	Supported
H2b	ACO → PLE	0.106	2.690	.007	Supported
H2c	HAP → PLE	0.227	5.208	***	Supported
H3	ARO → PLE	0.256	6.348	***	Supported
H4a	ARO → UBI	0.121	2.323	.020	Supported
H4b	PLE → UBI	0.377	4.793	***	Supported
H5a	VIS → UBI	0.176	2.682	.007	Supported
H5b	ACO → UBI	0.048	0.993	.321	Not Supported
H5c	HAP → UBI	0.074	1.322	.186	Not Supported

*** denotes *p*-value <.001. VIS implies "Visual," ACO implies "Acoustic," HAP implies "Haptic," PLE implies "Pleasure," ARO implies "Arousal," UBI implies "Urge to buy impulsively".

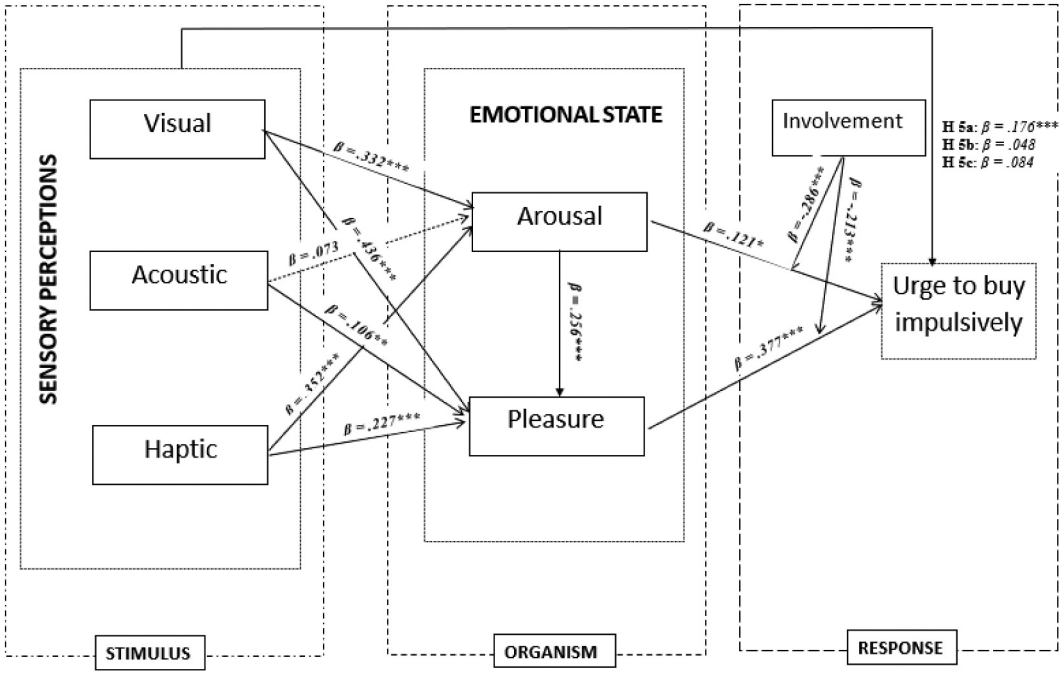

Figure 2. Result for the structural equation model.

Table 7. Mediation results.

			Bias Corrected Bootstrap 95% Confidence Level		
Hypothesis	Relationships	Indirect Effects	LL	UL	Mediation effect
H6a	VIS → ARO → PLE	0.085***	0.051	0.118	Present
H6b	ACO → ARO → PLE	0.019^{NS}	−0.005	0.041	Absent
H6c	HAP → ARO → PLE	0.090***	0.050	0.122	Present
H7a	VIS → ARO → UBI	0.040*	0.013	0.091	Present
H7b	ACO → ARO → UBI	0.009 ^{NS}	−0.001	0.030	Absent
H7c	HAP → ARO → UBI	0.042*	0.014	0.093	Present
H8a	VIS → PLE → UBI	0.165***	0.118	0.273	Present
H8b	ACO → PLE → UBI	0.040**	0.017	0.082	Present
H8c	HAP → PLE → UBI	0.086***	0.052	0.151	Present
H9	ARO → PLE → UBI	0.096***	0.057	0.151	Present
H10a	VIS → ARO → PLE → UBI	0.085***	0.020	0.063	Present
H10b	ACO → ARO → PLE → UBI	0.019 ^{NS}	−0.002	0.021	Absent
H10c	HAP → ARO → PLE → UBI	0.090***	0.021	0.064	Present

*** implies *p*-value <.001; ** indicates *p*-value <.01; * indicates *p*-value <.05; ^{NS} indicates not significant. VIS implies "Visual," ACO implies "Acoustic," HAP implies "Haptic," PLE implies "Pleasure," ARO implies "Arousal," UBI implies "Urge to buy impulsively".

effects for visual (H10a, β = 0.085; $p < .05$; CI = (LCI = 0.020 to UCI = 0.063) and haptics (H10c, β = 0.090; $p < .05$; CI = (LCI = 0.021 to UCI = 0.064)), while insignificant indirect effects for acoustics (H10b, β = 0.019; $p > .05$; CI = (LCI= −0.002 to UCI = 0.021)). Hence, H10a and H10c were supported by results, while H10b was not supported.

Moderation analysis

Applying interaction effects, the moderating effect of involvement was studied employing Hair et al.[97] directions. Table 8 summarizes that the moderating impacts of involvement were statistically significant in the case of impact of arousal (β = −0.286; $t = -10.535$; $p < .05$) as well as pleasure (β = −0.213; $t = -5.865$; $p < .05$) on the UBI. The slope graph (see Figures 3 and 4) with interactions established to investigate the moderation effects more comprehensively. The interactions for low and high customer involvement are depicted in both slope graphs. The graph clearly illustrates that as the arousal of customers increases from low to high, the UBI increases in the case of customers with high involvement and decreases for customers with low involvement. Also, in the case of pleasure emotional states, as the pleasure of customers increases from low to high, the UBI increases significantly in the case of customers with high involvement, while there is a slight

Table 8. Moderation results.

Hypothesis	Paths	Standardized Estimate (*β*)	t-values	*p*-values	Findings
H11	ARO*INV→UBI	−0.286	−10.535	***	Moderation present
H12	PLE*INV→UBI	−0.213	−5.865	***	Moderation present

*** denotes *p*-value <.001. INV implies "Involvement," PLE implies "Pleasure," ARO implies "Arousal," UBI implies "Urge to buy impulsively".

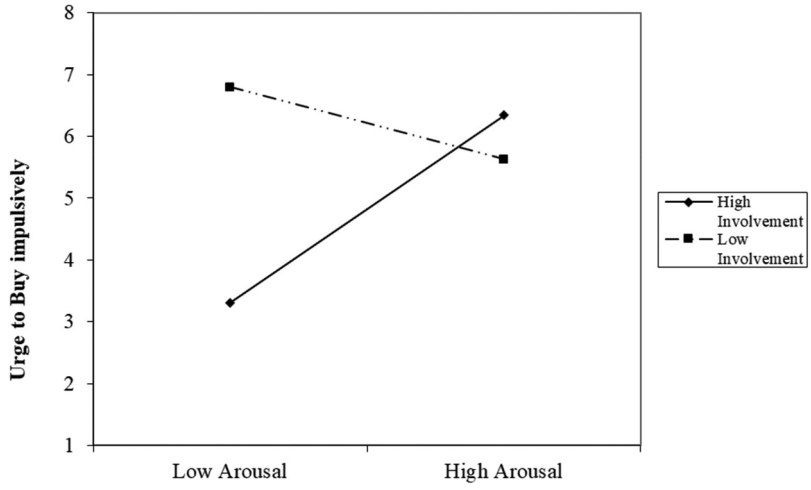

Figure 3. Moderation of involvement between arousal and urge to buy impulsively.

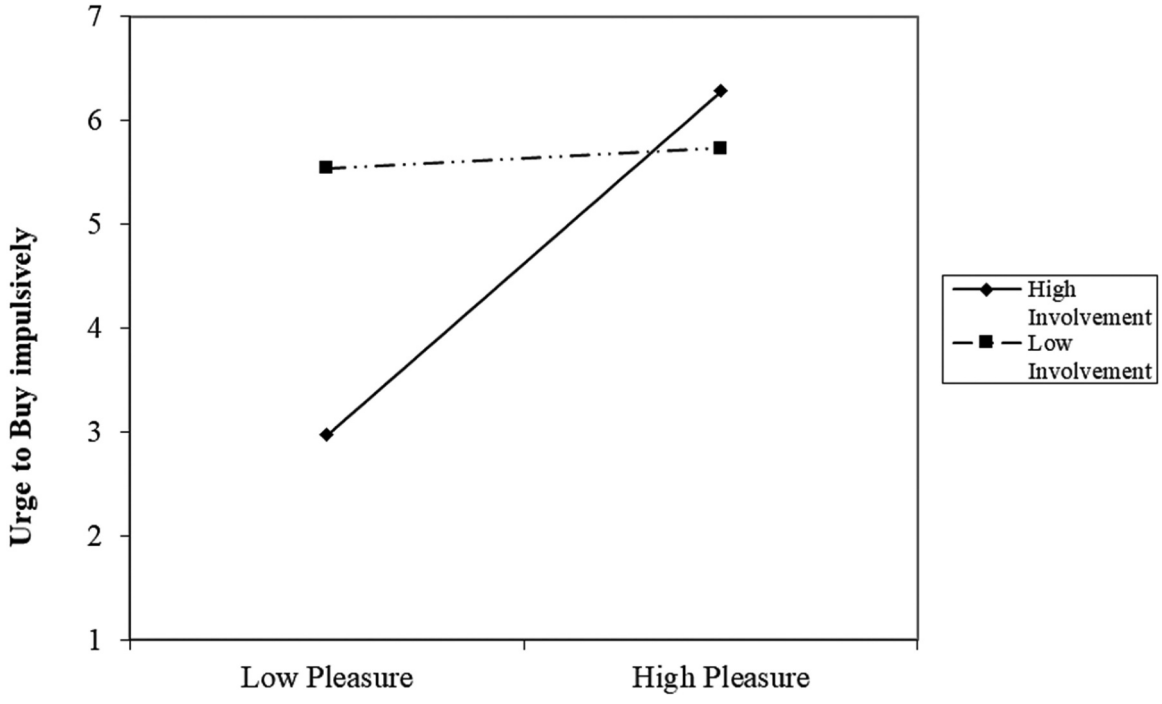

Figure 4. Moderation of involvement between pleasure and urge to buy impulsively.

increase in the case of customers with low involvement. Hence, both H11 and H12 were supported by the results.

Discussion

The present research is an early attempt to examine how sensory perceptions can lead to a UBI after achieving an emotional state of arousal and pleasure. Informed by literature and utilizing the SOR theoretical framework, the present study developed a research model comprising 15 hypotheses, out of which data supported 12. This section draws a comparison between our findings and the existing literature, followed by theoretical and practical implications.

The value of the sense of touch and the use of haptics by marketers to alter consumer behavior has long been recognized in the service and retail literature.[86] However, research on how haptics may be used to improve a user's digital consuming experience is still in its infancy.[39] Several studies have reported that in an online environment, consumers use product information and images to recall their memories attached to similar products,[87] possibly reducing the need to touch the product.[4] Hence, while buying eyewear products through these apps, consumers gather haptic cues by swapping the products that may be regarded as a proxy of physical touch. Reverberating the findings of earlier studies,[88] our study also empirically establishes that haptic elements of the Lenskart try-on app activate hedonic shopping motivation and play an essential role in predicting arousal and pleasure.[60] Consequently, consumers develop a strong sense of enjoyment and arouse their interest in the product, which further leads to impulse buying. Heller et al.[6] made a similar observation as they argued that virtual touch could increase impulsivity, lessen the uncertainty, and reduce the perception of evaluation challenges.

Further, the result indicates that due to visual effects, Lenskart offers highly interactive product presentations in comparison to static images. Earlier studies have also shown that the visual sense pre-dominates the other sensory modalities and is typically the one that is used and depended upon the most.[41] Our study echoes the findings of Hilken et al.[89] which established that the visual component of sensory perceptions blends the consumers' individual experiences of their physical surroundings with digitally simulated interactive visuals. These simulations enhance the emotional state as consumers effortlessly switch among various angle views just by making small head movements that finally lead to immersion in the products. Lenskart App offers interactive images of the products from several visually aesthetic and appealing angles. Acoustic, the last sensory perception examined in this research, showed a significant positive relationship with pleasure and an insignificant relationship with arousal. This finding implies that while exploring Lenskart, people do enjoy the background music, but it does not contribute to engaging impulsively with the product. Also, acoustic sensory perception showed no substantial influence on the UBI. This finding provides a distinct perspective, as existing literature supports the role of acoustical elements on purchase decisions.[59] Consumers with strong assessment calibration frequently respond to touch modality in comparison to voice control.[6] Since Lenskart offers primarily online optical care solutions and most consumers may prefer to involve cognitively rather than emotionally for buying power glasses or lenses, these findings could be justified.

Furthermore, the outcomes of the study state that arousal intensifies pleasure, and these two emotional states mediate the relationship between sensory perceptions and the UBI. This finding is aligned with earlier findings, where pleasure and arousal are highlighted as key dimensions in enhancing engagement and the UBI.[45] Thus, the findings of the research reveal that consumers with higher sensory perceptions experience more pleasure and arousal while interacting with the products resulting in impulse buying behavior.

Finally, this study established the moderating effect of involvement in the relationships between arousal, pleasure, and the UBI. Consumers will develop less UBI despite the high levels of pleasure and arousal if they have less interest in the product. In other words, consumers may enjoy the experience of using the app, but this enjoyment will not convert into impulse buying behavior if they have less connection with products in terms of needs, values, and interests.[90]

Conceptual implications

This research adds to the theoretical discussions around the applications of sensory perceptions in shaping consumer buying behavior where empirical evidence of three sensory perceptions (haptic, acoustic, and visuals) leading to emotional response (arousal and pleasure) resulting in UBI are scarce. Findings from this study support those from prior studies[91,92] that have applied the SOR framework to the realm of online retailing, particularly those that have focused on impulsive purchasing. While doing so, scholars have examined the influence of external stimuli on impulse buying behavior. Another line of studies established the role of consumers' emotional state (internal factors) on their purchasing behavior.[65] This study fills the gap in the literature by establishing a link between sensory perceptions and the consumer's emotional state. The innovative aspect of the present study is the proposed theoretical model, which examines the effect of sensory perceptions and the emotional state of consumers on UBI. As a result, the novelty of this study hinges on an expanded theoretical understanding of the customer journey in an online retail context as well as some crucial elements using an integrated model by including PAD model within SOR framework that significantly impact consumers' impulsive buying behavior.

This study adds to the existing literature by focusing on the role of sensory perceptions in consumer impulse buying behavior such that shoppers are more prone to indulge in the UBI with elated sensory perceptions. So

far, impulse buying behavior has not taken into consideration the multisensory perceptions.

Next, the results of this study affirmed that sensory perceptions (except acoustics) influence pleasure. Nevertheless, a location's or industry's specific needs may influence the weight and consequences of each sense. This research focused more intensely on the recent increase in the number of consumers who visit eyewear apps to shop for ocular healthcare-related products and luxury shopping.[93] Hence, this research extends a fresh theoretical base for the sensory aspects of eyewear businesses' sensory marketing.

Finally, this study uncovers the moderating role of involvement in the relationships between pleasure & UBI and arousal & UBI. Innate requirements, values, and interests are instrumental in deciding a person's relevance to an object. Hence, consumers attach a product to their self-image and develop a decision-making attitude.[94] In this context, we add to the existing literature by showing how consumers with low involvement are comparatively less influenced to buy impulsively in spite of activating various senses through technologies. This particular finding establishes involvement as a key variable for scholars exploring impulse buying behavior.

Practical implications

This study examined successful sensory marketing for online eyewear. The results can be used to plan long-term expansion in the competitive online eyewear market. Based on the finding that "visuals," a sensory marketing component, influence buyers' feelings of arousal and pleasure and the urge to buy it, marketers should note that product visuals become even more important in the absence of offline product viewing. Upload high-definition photos of products from different angles to the mobile app. Try-on apps should also allow users to clearly see their faces during product trials from multiple angles so they can appreciate and become immersed in the products. Today, eyewear is both a necessity and a fashion statement. Consumers spend on eyecare.[9] Therefore, they look for varieties that appeal to them visually. In addition, the frames' colors and textures should be shown clearly so that customers will recognize them when they receive them. It will lower product returns.

Next, the study affirms the role of two emotional states, i.e., arousal and pleasure, in enhancing the UBI. The managers should regularly need work on these two emotions as these emotions are powerful in determining consumer behavior. The managers should continuously include congruent (directly related to the product) and incongruent (not related to the product) sensory attributes to engage and surprise the consumers.

Haptic effects on arousal and pleasure were the study's second most important finding. The study shows that sensory elements influence consumer product shape and comfort. The app lets consumers touch and evaluate products. Marketers should consider this. Advanced artificial intelligence should recommend app products based on consumers' face-cuts. Marketers should use advanced AR technologies to simulate consumers trying on the glasses/products. It will improve shopping, increasing UBI.

Acoustic is strongly associated with arousal but not pleasure or the UBI. Unlike previous studies, Fürst et al.[95] argued that not all sensory attributes fit every product. The study's acoustic element was negligible. Since most Lenskart customers visit for utility, they're probably immersed in visual and haptic experiences. This study's authors believe managers should not underestimate the importance of acoustic elements and do everything they can to turn pleasure into arousal to increase sales.

Lastly, as per the outcomes of this research, the consumer's involvement is crucial to converting the response into behavior. Marketers should note that anyone who has visited the app is a potential customer. As per the findings of this study, if the consumer is not finding any value in the currently available product, he will not indulge in the UBI. Therefore, companies should offer innovative products, introduce new product lines, and widen their offerings so potential consumers may find something to engage with. It will create an opportunity for companies as consumers cross-selling and an increased share of the wallet.

Limitations and future research scope

Our research has some drawbacks that should be addressed. First, this survey includes only Lenskart app customers. In other product categories, sensory perception may influence impulsive buying. Until further research confirms the findings across multiple product categories, researchers and marketers should be cautious about generalizing the results. Second, since this study used only Indian data, cultural factors may influence impulsive purchases. Thus, researchers should carefully generalize results to other cultures. Researchers and practitioners may benefit from examining impulsive purchase patterns and strategies across cultures. Thirdly, the study only looks at UBI. Sensory perceptions cause impulsive buying, which future researchers must study. Finally, participants were asked to recall their experiences while filling out the questionnaire. Thus, the

study may be influenced by remembered arousal. Experiments can shed more light on this topic. Future studies may also include different affective states as an organism and may incorporate some other control variables to get clearer insights in this area.

Conclusions

Based on the SOR framework, the study explores sensory perceptions' influence on the UBI and the mediation effect of emotional states for virtual eyewear buying. The moderation effect of involvement in the association between emotional states and the UBI was also examined. Overall, the sensory experiences prompted by AR applications greatly impact the consumers' emotional states, which in turn fuels the UBI. The influence of emotional states on the UBI was also significantly moderated by the involvement of the consumers. This study offers a general framework for comprehension, not only for academics but also for practitioners.[96,97] Researchers in the future should analyze the different aspects of AR in order to delve deeper into the phenomenon of online impulsive behavior.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Acknowledgement: Open Access funding for this paper has been provided by Qatar National Library.

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