

Effects of repeated tasting sessions on acceptability, emotional responses, and purchasing behaviors of waste-to-value-added SCOBY (symbiotic culture of bacteria and yeast) ice cream

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Abstract

This study investigated the effects of repeated exposure on acceptability, emotional responses, and purchase intention of a novel symbiotic culture of bacteria and yeast (SCOBY) ice cream, compared to a control (no extra additives) and a guar gum ice cream sample, using three sessions: a survey (SCOBY information) and two tasting sessions (repeated-exposure effect). Participants initially conducted blind evaluations of all samples, followed by an informed tasting. The blind tasting sessions evoked high arousal emotions for the SCOBY ice cream and positive emotions for the control and guar gum samples. The second session showed a rise in liking for sweetness (5.6–6.5) and texture (5.6–6.7) of the SCOBY samples. Sensory attributes such as flavor (odds ratio = 1.7) and texture (odds ratio = 1.7), coupled with positive emotions such as “happy” (odds ratio = 3.8), “pleasant” (odds ratio = 0.4), and “interested” (odds ratio = 3.8) affected purchase intention. The findings of this study provide valuable insights into participants' liking and emotional responses during repeated exposures to stimuli.

Practical Applications

The study's findings show that repeated exposure to novel products enhances consumer acceptance and emotional responses, challenging the current formats of traditional sensory studies. This implies that the introduction of novel products can be successful with repeated tasting exposure strategies. The focus on improving familiarity with sensory attributes, especially flavor and texture, can positively impact purchase intention. This insight can guide product positioning, marketing campaigns, and flavor development efforts, encouraging the successful integration of innovative products into the market.

1 | INTRODUCTION

Food choice behavior is a multifaceted process influenced by physiological (Manippa et al., 2019), socioeconomic (Van Lenthe

et al., 2015), and psychological factors (Babicz-Zielińska, 2006). As consumer preferences and trends evolve, novel food products and innovations emerge in the market to cater to the needs and demands of consumers. Lack of familiarity and exposure to novel food products

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can pose significant challenges to their acceptability and competitiveness on supermarket shelves (Tuorila & Hartmann, 2020). Traditional foods often enjoy an advantage due to their long consumption history and established reputation among consumers. New and unknown novel products may trigger psychological barriers (Choe & Cho, 2011; Çınar et al., 2021), making consumers perceive them as risky or unhealthy. These factors can affect consumers' initial appreciation of these novel food products. For instance, in recent years, consumers have avoided unfamiliar or novel products that have been prepared using innovative technologies, including 3D printing (Lee et al., 2021), nanotechnology (Schnettler et al., 2013), *in vitro* meats (Hamlin et al., 2022), genetic modification (Chen, 2018), and upcycling waste products (Hellali & Korai, 2023). This is due to the lack of understanding and knowledge about these products. In addition, uncertainty and lower expectations regarding the sensory properties due to a lack of earlier experiences further contribute to the neophobic responses (Coderoni & Perito, 2021).

Waste-to-value-added products are a recent and innovative category aiming to utilize waste materials to create new, valuable, and sustainable products. The production of Kombucha using symbiotic culture of bacteria and yeast (SCOBY) is an excellent example of waste-to-value-added innovation (El-Shall et al., 2023). Typically, after each batch of Kombucha is brewed, a new layer of SCOBY forms on top, and the older SCOBY is discarded (Priyadharshini et al., 2022). Instead of disposing SCOBY as waste, it can be recycled to create various value-added products, contributing to a more sustainable food production system. In addition, incorporating SCOBY and Kombucha into ice cream is an innovative way to make frozen desserts that potentially provide health benefits (Spence et al., 2019). Kombucha contains various bioactive compounds, such as polyphenols, flavonoids, water-soluble vitamins, and organic acids metabolized by the SCOBY (Ayed et al., 2017; Jayabalan et al., 2014), which act as antioxidants, controlling cholesterol levels, aiding in weight management, and possessing anti-carcinogenic properties. Bogdan et al. (2018) also isolated health-beneficial lactic acid bacteria from Kombucha and SCOBY, indicating their high probiotic potential. SCOBY ice cream is considered a waste-to-value added product that not only offers a sustainable solution (taking into consideration economic and environmental issues) but also is a potentially healthier alternative for consumers (considering the social aspect in current sustainable models) (Jayabalan et al., 2014; Laavanya et al., 2021). Increasing the acceptability of SCOBY ice cream and overcoming its psychological barriers (such as food neophobia) might require a strategic approach focused on repetitive exposure and familiarization (Orjuela-Palacio et al., 2014; Song et al., 2019).

Regular exposure to a novel product through sight, smell, or taste is crucial for its success in the marketplace. The consumer's sensory experience of foods is a synergistic amalgamation of sensory modalities such as taste, flavor, odor, and texture (Korsmeyer & Sutton, 2011; Murphy, 2008). The effect of repeated exposure to novel products on these different sensory modalities remains to be explored. Past studies have highlighted the significant influence of repeated taste exposure on food preferences and acceptability among

children (Mohd Nor et al., 2021) and adults (Costa et al., 2014; Kinnear & De Kock, 2011; Orjuela-Palacio et al., 2014). Mohd Nor et al. (2021) found that repeated tasting sessions of steamed-pureed turnips over 3 months increased the liking and acceptance of vegetables among preschool children. Similar positive outcomes were also reported in other studies (Dominguez, 2013; Holley et al., 2015; Tuorila & Hartmann, 2020), demonstrating that repeated exposure to disliked vegetables could effectively enhance vegetable liking and intake in children.

Furthermore, Costa et al. (2014) reported that repeated tasting sessions of a high-probiotic goat milk yoghurt positively influenced the sensory perception of Brazilian consumers. The hedonic liking of sports drinks (Kinnear & De Kock, 2011), sodium-reduced soups (Methven et al., 2012), red wines (Tempere et al., 2019), and high polyphenol yerba mate/black currant beverages (Orjuela-Palacio et al., 2014) also increased after participants engaged in repeated tasting sessions. While evidence supports that repeated exposure can increase preference for a particular food, there is limited information regarding its impact on the different sensory modalities and the purchase intention of novel products.

Emotions also play a vital role in influencing consumers' eating choices. While sensory liking is a primary measure of food preferences and choice behavior, newly launched products with higher liking scores in consumer panels can experience market failure (Dijksterhuis, 2016). To understand food product experiences comprehensively, it is essential to consider all the associations and emotional connotations that consumers assign to products based on their previous experiences (Alzheimer et al., 2021). Therefore, assessing consumers' emotional responses to novel products throughout their consumption journey, from the initial interaction and knowledge of the product to repeated tasting sessions and sensory liking, can provide valuable insights into food preferences and choices.

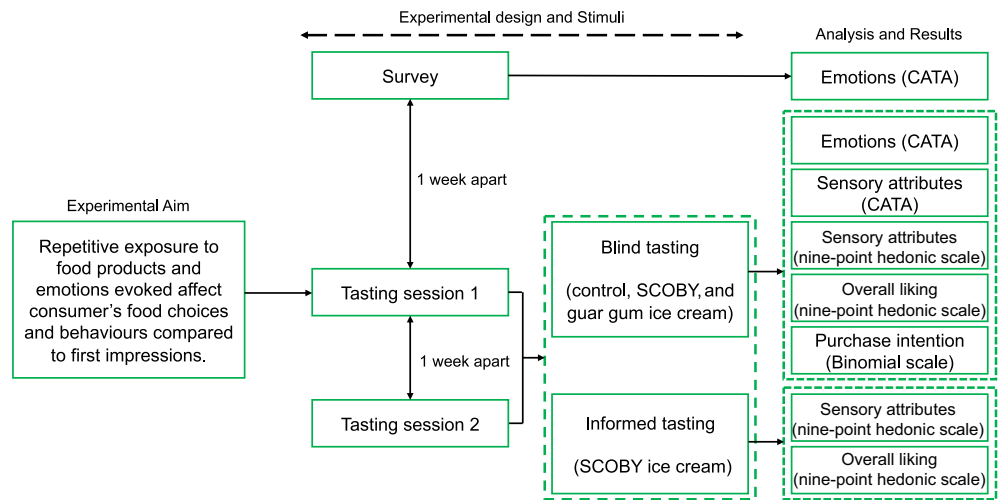
Therefore, this study aimed to evaluate the effects of repeated tasting sessions of a novel waste-to-value-added product, SCOBY ice cream, on its sensory attributes, acceptability, and emotional responses. The hypothesis in this study proposed that repeated tasting sessions of SCOBY ice cream (increasing the tasting exposure) could lead to higher levels of product liking and purchase intention. In addition, the study explored the emotional connotation evoked in consumers throughout their experiences with the ice cream, from their initial awareness of the product to the final tasting. The study's findings can offer valuable insights into the impact of repeated exposures on emotions and the perception of sensory attributes of a novel product and their effects on the product's willingness-to-buy.

2 | MATERIALS AND METHODS

2.1 | Research framework

The study focused on understanding how repeated exposure to a SCOBY ice cream affects consumers' choices, behaviors, and emotions compared to first impressions (Figure 1).

FIGURE 1 Experimental layout of the study.



2.1.1 | Survey

Initially, an online survey was conducted in April 2022 to familiarize participants (students, staff, and faculty from Lincoln University, New Zealand) with information about SCOBY and ice cream made with SCOBY (Table S1). The survey covered definitions of SCOBY and Kombucha, highlighting their health benefits. Participants were asked to express their elicited emotions after familiarizing themselves with the SCOBY and ice cream made with SCOBY information (Section 2.4.1). At the end of the survey, participants were asked about their willingness to taste the sample, with binary choices: “0 = interested in the tasting” and “1 = not interested in the tasting.” The participants who expressed interest in the tasting session were invited to provide their email addresses for future sessions.

2.1.2 | Tasting sessions 1 and 2

The participants who expressed interest in tasting in the survey were invited to the tasting sessions. Tasting sessions 1 and 2 were conducted with a one-week interval. During both tasting sessions, participants initially conducted blind evaluations of the control, SCOBY, and guar gum ice creams (identified by three-digit codes). Subsequently, an informed tasting (participants were told that they were about to taste a SCOBY ice cream) was conducted exclusively for the SCOBY ice cream in both sessions.

In both sessions, participants were briefed about the procedures and the use of the sensory software Redjade® (Martinez, CA, USA) to record their responses. After tasting each sample, water crackers (Arnott's, Auckland, New Zealand) were used for palate cleansing. The ice cream samples were served at a -10°C temperature in transparent cups marked with three-digit random codes placed on a white tray. The tastings occurred in the sensory laboratory facilities of the Department of Wine, Food, and Molecular Biosciences, Lincoln University, New Zealand. The tastings were conducted under fluorescent lighting and at room temperature.

2.2 | Participants

The initial online survey included 170 participants (completed surveys), with 91 participants expressing their interest in the tasting sessions of ice cream samples. However, five participants did not attend the Tasting session 2 for personal reasons. As a result, the statistical analysis was conducted using data from 86 participants (21 male, 64 female, and 1 nonbinary) who attended all the sessions (online and tasting). The age groups represented were 18–35 years (74.42%) and 35 years and above (25.58%). Most of the participants were Asian (45.19%), while the rest were from various ethnic backgrounds, including White/Caucasians (23.26%), NZ European (20.93%), Latin American (4.65%), Maori (3.49%), and African (2.33%). The participants were Lincoln University, New Zealand students and faculty recruited. The study did not include participants with any sensory deficiencies, such as ageusia and anosmia or food allergies. The study was conducted under the guidelines of the Lincoln University Ethic Committee (HEC2021-08), and written consent forms were obtained from all the participants before commencing the study.

2.3 | Stimuli

The ice cream samples (control, SCOBY, and guar gum) were prepared in the food processing laboratory of Lincoln University, New Zealand. A focus group of six participants evaluated SCOBY ice cream variants with 5%, 10%, and 15% SCOBY content. After the sensory profiling and group discussion, the 10% SCOBY ice cream was selected for the tasting sessions. A similar concentration (10%) was used for the guar gum ice cream to control for the texture of the ice cream. Different ingredients were used for all samples: control (milk, cream, sugar, and salt), SCOBY (milk, cream, SCOBY, Kombucha, sugar, and salt), and guar gum (milk, cream, sugar, salt, guar gum, and water). The ingredients were weighed and mixed at room temperature for 15 min, then stored at 4°C for 2 h. After this period, the ice cream mix was frozen in 1000 g batches using a home-style ice cream maker (Cuisinart, Stamford, CT, USA) for 55 min at -27°C (Varela

et al., 2014). The prepared samples were stored at -10°C for 24 h before the tasting sessions.

2.4 | Questionnaire

2.4.1 | Self-reported emotions using Check-All-That-Apply

The shorter version of EsSense Profile[®] (Nestrud et al., 2016), consisting of 25 emotions (EsSense25), was used in the study. The reported emotions with a frequency of over 20% were selected after achieving consensus in a focus group ($N = 6$). The resulting Check-All-That-Apply (CATA) questionnaire was developed with the following emotions: “happy,” “disgusted,” “calm,” “tame,” “interested,” “nostalgic,” “pleasant,” “mild,” “worried,” “wild,” “good,” “bored,” “warm,” “understanding,” “secure,” “enthusiastic,” “active,” “free,” “good-natured,” “guilty,” “aggressive,” “loving,” “satisfied,” “joyful,” and “adventurous” for the study.

2.4.2 | Self-reported sensory attributes using CATA

A total of 21 sensory attributes related to appearance (“creamy,” “crystallized,” and “easy to spoon”), aroma (“fresh milk,” “vanilla,” and “milk fat”), flavor (“caramel,” “fatty,” “sweet,” “sour,” “milk powder,” and “acidic”) and texture (“sandy,” “mouth coating,” “rough,” “meltdown,” “hard,” “smooth,” “frothy,” “grainy,” and “fluid”) were used in the study. The sensory attributes were selected based on previous studies (Dooley et al., 2010; Jardines et al., 2020; Varela et al., 2014), and the consensus of participants after tasting the ice cream in preliminary focus groups ($N = 6$).

2.4.3 | Traditional method of sensory and hedonic liking

The traditional approach measured sensory and hedonic liking with a nine-point hedonic scale (ranges from 1 = disliked extremely to 9 = like extremely) (Moskowitz & Sidel, 1971). The evaluation was conducted for various attributes related to ice cream samples, including appearance, color, aroma, flavor, sweetness, sourness, texture, and overall liking.

2.4.4 | Purchase intention

A binomial scale (yes or no) was used to evaluate participants' purchase intention by asking, “Will you buy this product if it is available at a reasonable price from where you normally shop?”

2.5 | Statistical analysis

Analysis of variance (ANOVA) was used to evaluate hedonic scores of sensory attributes and the overall liking of the ice cream samples in

both tasting sessions. The difference between the samples and sessions was evaluated using a Tukey as a post hoc test at a 5% significance level. The frequency counts of emotional terms and sensory attributes describing the samples were calculated. Cochran's Q test was used to find the difference between the samples and sessions by evaluating sensory/emotion terms used in the CATA questionnaire and purchase intent frequencies. Correspondence analysis (CA) and principal coordinate analysis (PCoA) using Euclidean distance were used for further detailed analysis. Logistic regression and proportional odds were used to assess the relationship of purchase intention as an independent factor with emotions and sensory attributes of the ice cream as the predictors.

3 | RESULTS AND DISCUSSION

3.1 | Self-reported emotions using CATA

Table 1 illustrates the frequency of emotions evoked toward the SCOBY ice cream after the survey and tasting sessions. During Tasting session 1, participants experienced more positive and fewer negative emotions after tasting the guar gum ice cream than the control and SCOBY ice cream. High frequencies of emotions such as “nostalgic” (0.14), “pleasant” (0.65), “good” (0.56), “satisfied” (0.44), and “joyful” (0.42) were reported for the guar gum ice cream. However, negative emotions such as “worried” (0.16) and “disgusted” (0.22), as well as high arousal emotions such as “enthusiastic” (0.16) and “adventurous” (0.21), were evoked after tasting the SCOBY ice cream in tasting session 1. In Tasting session 2, positive emotions were more prevalent for the control ice cream than for the guar gum and SCOBY ice cream samples. Participants elicited emotions such as “happy” (0.58), “pleasant” (0.72), “good” (0.68), “satisfied” (0.47), and “joyful” (0.32) after tasting the control. However, they experienced “worried” (0.19) and “adventurous” (0.24) when tasting SCOBY ice cream in session 2.

Positive emotions such as “pleasant” (0.41) and “good” (0.40) exhibited a significant increase towards SCOBY ice cream from the survey session to Tasting session 1. However, no significant increase was reported from Session 1 to Session 2. Notably, emotions such as “satisfied” (0.28) significantly increased from the survey to the Tasting session 2. The negative emotion “worried” had also significantly increased from the survey to Tasting session 1, but no significant increase was observed in Session 2. No significant change was observed in the case of other emotions.

Eating experiences induce varied emotions based on product familiarity (Jaeger et al., 2005). Familiar foods tend to evoke positive emotions, while novel products often result in negative emotional responses due to the perceived risks of unfamiliar products (Pliner et al., 1993). The combined unfamiliar acidic or sour taste with the mouthfeel perception of SCOBY ice creams could potentially influence the emotional responses of consumers. The above results align with the findings of Vanhonacker et al. (2010), indicating a general reluctance among consumers to embrace innovation in traditional foods due to the perceivable changes in sensory properties. Despite

TABLE 1 Frequency counts of emotions evoked from survey and Tasting sessions 1 and 2.

Attributes	Survey	Tasting session 1			Tasting session 2		
		Control	Guar gum	SCOBY	Control	Guar gum	SCOBY
Satisfied	0.12 ^A	0.24 ^a	0.44 ^b	0.27 ^{aAB}	0.47 ^b	0.37 ^{ab}	0.28 ^{aB}
Good	0.24 ^A	0.47 ^a	0.56 ^a	0.46 ^{aB}	0.68 ^b	0.51 ^a	0.40 ^{aAB}
Pleasant	0.12 ^A	0.49 ^{ab}	0.65 ^b	0.42 ^{aB}	0.73 ^b	0.43 ^a	0.41 ^{aB}
Worried	0.03 ^A	0.14 ^{ab}	0.03 ^a	0.16 ^{bB}	0.03 ^a	0.06 ^a	0.19 ^{bB}
Happy	0.17 ^A	0.28 ^a	0.48 ^b	0.32 ^{aA}	0.58 ^b	0.40 ^a	0.33 ^{aA}
Disgusted	0.15 ^A	0.09 ^a	0.04 ^a	0.22 ^{bA}	0.03 ^a	0.04 ^a	0.17 ^{bA}
Calm	0.11 ^A	0.36 ^a	0.21 ^a	0.21 ^{aA}	0.28 ^a	0.26 ^a	0.19 ^{aA}
Joyful	0.11 ^A	0.22 ^a	0.42 ^b	0.21 ^{aA}	0.32 ^b	0.17 ^a	0.20 ^{abA}
Mild	0.10 ^A	0.31 ^b	0.24 ^{ab}	0.15 ^{aA}	0.20 ^a	0.38 ^b	0.21 ^{aA}
Loving	0.05 ^A	0.12 ^a	0.21 ^a	0.16 ^{aA}	0.24 ^b	0.09 ^a	0.07 ^{aA}
Adventurous	0.26 ^A	0.06 ^a	0.07 ^a	0.21 ^{bA}	0.04 ^a	0.07 ^a	0.24 ^{bA}
Enthusiastic	0.09 ^A	0.05 ^a	0.16 ^b	0.16 ^{bA}	0.11 ^a	0.11 ^a	0.14 ^{aA}
Nostalgic	0.01 ^A	0.05 ^{ab}	0.14 ^b	0.03 ^{aA}	0.16 ^a	0.11 ^a	0.09 ^{aA}
Wild	0.10 ^A	0.05 ^a	0.04 ^a	0.11 ^{aA}	0.03 ^a	0.03 ^a	0.12 ^{bA}
Bored	0.09 ^A	0.09 ^a	0.05 ^a	0.03 ^{aA}	0.03 ^a	0.20 ^b	0.07 ^{aA}
Tame	0.04 ^A	0.12 ^a	0.05 ^a	0.05 ^{aA}	0.07 ^a	0.12 ^a	0.05 ^{aA}
Interested	0.58 ^A	0.27 ^a	0.37 ^a	0.43 ^{aA}	0.42 ^a	0.37 ^a	0.46 ^{aA}
Warm	0.03 ^A	0.05 ^a	0.06 ^a	0.05 ^{aA}	0.16 ^a	0.09 ^a	0.07 ^{aA}
Understanding	0.06 ^A	0.06 ^a	0.10 ^a	0.09 ^{aA}	0.07 ^a	0.010 ^a	0.06 ^{aA}
Secure	0.06 ^A	0.05 ^a	0.07 ^a	0.03 ^{aA}	0.10 ^a	0.05 ^a	0.09 ^{aA}
Active	0.09 ^A	0.09 ^a	0.12 ^a	0.07 ^{aA}	0.15 ^a	0.07 ^a	0.07 ^{aA}
Free	0.04 ^A	0.07 ^a	0.11 ^a	0.10 ^{aA}	0.15 ^a	0.07 ^a	0.06 ^{aA}
Good-natured	0.12 ^A	0.20 ^a	0.25 ^a	0.20 ^{aA}	0.31 ^a	0.17 ^a	0.19 ^{aA}
Guilty	0.01 ^A	0.04 ^a	0.06 ^a	0.03 ^{aA}	0.03 ^a	0.05 ^a	0.04 ^{aA}
Aggressive	0.01 ^A	0.03 ^a	0.05 ^a	0.09 ^{aA}	0.04 ^a	0.01 ^a	0.06 ^{aA}

Note: Cochran's Q test is used to find the difference between the frequency of emotions reported in the Check-All-That-Apply (CATA) questionnaire. Small alphabet letters (a, b) in superscript show significant differences ($p < .05$) in samples within each tasting session. Capital alphabet letters (A, B) in superscript shows significant difference ($p < .05$) in the symbiotic culture of bacteria and yeast (SCOBY) ice cream between survey and tasting sessions 1 and 2.

this, the current study suggests that consumers demonstrated a degree of openness to innovation by eliciting positive emotions such as “satisfied,” “pleasant,” and “good” toward SCOBY ice creams in the tasting sessions.

To explore the relationship among emotions, samples, and purchase intention, the CA and PCoA were conducted (Figure 2). CA explained 75.30% of the data's variability, with Principal Component 1 accounting for 55.91% and Principal Component 2 for 19.40%. According to the CA, high-arousal emotions such as “enthusiastic,” “wild,” “adventurous,” “understanding,” “disgusted,” and “interested” were associated with both the survey and the SCOBY ice cream Tasting sessions 1 and 2. The outcome indicated that heightened arousal emotions were evoked by consuming unfamiliar food, attributed to food neophobia (Jaeger et al., 2022), thereby influencing product liking. These findings align with prior studies (Danner et al., 2014; De Wijk et al., 2012) demonstrating that escalated physiological arousal levels affect preferences for food with high flavor intensity, intricate

compositions or those perceived as dangerous. Notably, the adverse impact of arousal can manifest upon exposure to the product name before tasting the food. On the other hand, positive emotions such as “pleasant,” “satisfied,” “happy,” “loving,” and “joyful” were associated with the guar gum ice cream in Session 1 and the control ice cream in Session 2.

PCoA indicated that positive emotions such as “satisfied” and “good” were positively related to purchase intention. These findings align with Kuenzel et al. (2010) results, suggesting that familiar flavors, as seen in the control and guar gum ice creams in the present study, evoked positive emotions. Köster (2003) highlighted that associations between flavor and emotions are learned and significantly influence product liking and purchasing behaviors. Consequently, these learned flavor–emotion associations increase familiarity, enhancing food acceptability and liking.

In contrast, unfamiliar or novel flavors, as observed in the SCOBY ice cream in the present study, elicited negative and high arousal

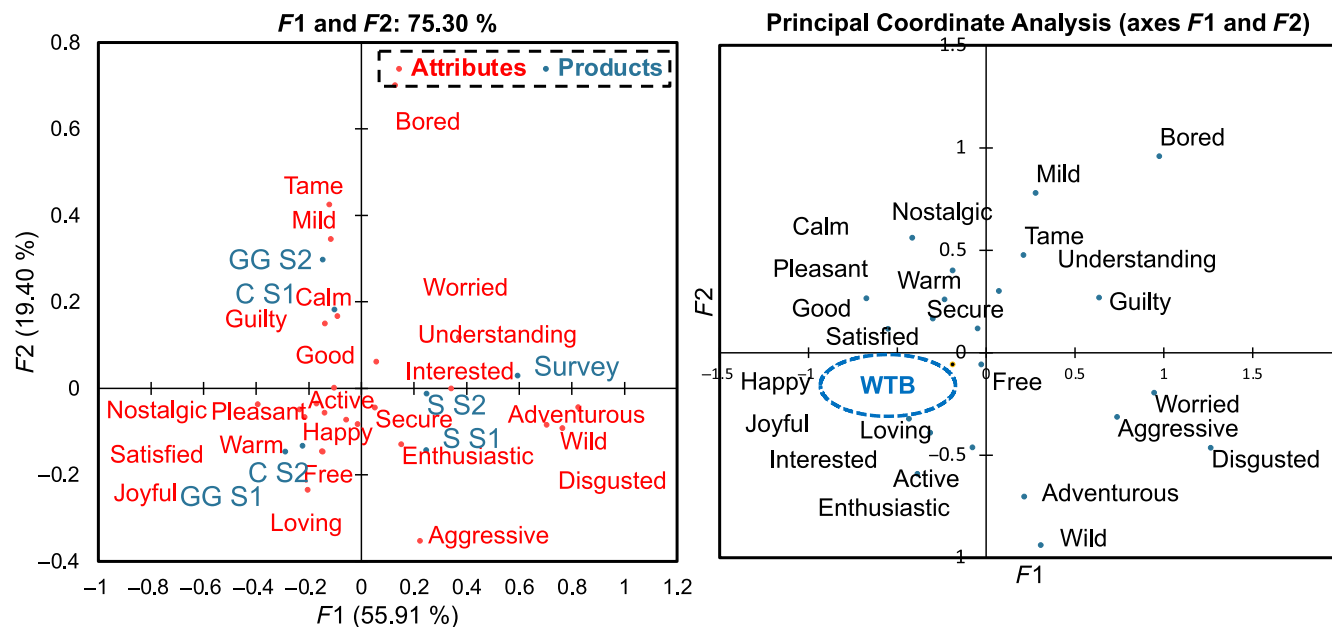


FIGURE 2 Correspondence analysis and Principal coordinate analysis (PCoA) of emotion terms used for control, symbiotic culture of bacteria and yeast (SCOBY), and guar gum ice cream in survey and Tasting sessions 1 and 2. Alphabet letters C, S, and GG specify control, SCOBY, and guar gum ice cream, respectively. S1 and S2 specify Sessions 1 and 2, respectively.

emotions. This trend was consistent in our study, where the SCOBY's acidic taste led to negative emotions compared to the control and guar gum ice creams. Similar findings were also reported in the case of plant-based yoghurts, where consumers associated the acidic/sour taste with negative emotional responses (Jaeger et al., 2023). Moreover, for consumers, these are unexpected flavors for ice cream, which might give rise to food safety concerns, as these sensory attributes are signs of spoiled food (Ledenbach & Marshall, 2009; Shaheen et al., 2018). Previous research consistently demonstrated that unfamiliar food triggers negative emotions due to food neophobia and limited familiarity with the taste of the novel product. Jaeger et al. (2022) identified a correlation between food neophobia and negative, high-arousal emotional responses, suggesting that individuals with high food neophobia elicit high arousal emotions such as “adventurous” compared to individuals with low food neophobia. Sweet–sour interactions may elicit negative emotions, as these interactions exhibit “suppressive effects” on each other (Keast & Breslin, 2003; Martin et al., 2002; Wilkie & Phillips, 2014). Martin et al. (2002) proposed that the overall taste intensity rises with increasing sourness in wine samples, irrespective of the sugar level.

3.2 | Self-reported sensory attributes using CATA

Table 2 shows the frequency counts of the selected sensory attributes found in the control, guar gum, and SCOBY ice creams, considering Sessions 1 and 2. During Session 1, the participants associated “creamy” (0.68), “fresh milk” (0.51), “sweet” (0.68), “meltdown” (0.35), and “smooth” (0.46) with the guar gum ice cream. While “sandy” (0.17), “sour” (0.47), “acidic” (0.35), and “crystallized” (0.30) were

linked with the SCOBY ice cream. In Session 2, the SCOBY ice cream was described as “sour” (0.51) and “acidic” (0.44), which made this product different from the control and guar gum ice creams. In this regard, the control ice cream elicited attributes such as “smooth” (0.61), “easy to spoon” (0.72), “vanilla” (0.58), “fresh milk” (0.44), and “frothy” (0.14) in Session 2.

For the SCOBY ice cream, the perception of the “sandy” attribute decreased significantly in Session 2 (0.06) compared to Session 1 (0.17). When analyzing all the attributes together, CA indicated that Principal Component 1 accounted for 72.60% of data variability, while Principal Component 2 explained 16.59%, resulting in an overall explanation of 89.20% (Figure 3). Sensory attributes such as “crystallized,” “sandy,” “grainy,” “acidic,” and “sour” were consistently associated with the SCOBY ice cream in both sessions. On the other hand, attributes such as “fatty,” “creamy,” “caramel,” and “mouth coating” were linked to the guar gum ice cream in Session 2 and the control ice cream in Session 1.

Moreover, the overall liking of the ice cream samples was positively correlated with sensory attributes such as “sweet,” “caramel,” “mouth coating,” “creamy,” and “smooth.” Conversely, attributes including “grainy,” “sandy,” “frothy,” “sour,” and “acidic” were negatively related to overall liking. Perception of ice cream quality depends on various sensory attributes, such as flavor, sweetness, texture, and cold sensation (Koeferli et al., 1996; Syed et al., 2018). In this study, attributes including “sweet,” “caramel,” “creamy,” “fresh milk,” “smooth,” and “vanilla” aligned with the overall liking of the ice cream. Similar findings were reported in previous research (Guinard et al., 1997; Jardines et al., 2020), where sweetness ratings associated with caramel, vanilla, and creamy attributes enhanced the overall liking. In contrast, flavors such as salty, sour, bitter, and metallic were

TABLE 2 Frequency counts of sensory attributes elicited for samples in Session 1 and Session 2.

Attributes	Session 1			Session 2		
	Control	Guar gum	SCOBY	Control	Guar gum	SCOBY
Creamy	0.62 ^a	0.68 ^b	0.46 ^{aA}	0.69 ^b	0.69 ^b	0.48 ^{aA}
Caramel	0.04 ^a	0.04 ^a	0.04 ^{aA}	0.07 ^a	0.06 ^a	0.06 ^{aA}
Easy to spoon	0.62 ^a	0.65 ^a	0.57 ^{aA}	0.72 ^b	0.40 ^a	0.68 ^{bA}
Vanilla	0.49 ^b	0.54 ^b	0.28 ^{aA}	0.58 ^b	0.32 ^a	0.36 ^{aA}
Fatty	0.35 ^b	0.22 ^{ab}	0.19 ^{aA}	0.24 ^a	0.36 ^a	0.24 ^{aA}
Milk fat	0.41 ^a	0.42 ^a	0.36 ^{aA}	0.37 ^{ab}	0.40 ^b	0.26 ^{aA}
Fresh milk	0.38 ^b	0.51 ^b	0.19 ^{aA}	0.44 ^b	0.30 ^a	0.24 ^{aA}
Sweet	0.46 ^a	0.68 ^b	0.43 ^{aA}	0.67 ^a	0.46 ^a	0.43 ^{aA}
Sandy	0.09 ^{ab}	0.06 ^a	0.17 ^{bA}	0.09 ^a	0.07 ^a	0.06 ^{aB}
Sour	0.01 ^a	0.03 ^a	0.47 ^{bA}	0.01 ^a	0.00 ^a	0.51 ^{bA}
Milk powder	0.19 ^a	0.30 ^a	0.24 ^{aA}	0.17 ^a	0.15 ^a	0.14 ^{aA}
Crystallized	0.20 ^{ab}	0.11 ^a	0.30 ^{bA}	0.12 ^a	0.22 ^a	0.22 ^{aA}
Mouth coating	0.36 ^b	0.22 ^{ab}	0.19 ^{aA}	0.31 ^a	0.38 ^a	0.27 ^{aA}
Rough surface	0.12 ^a	0.04 ^a	0.07 ^{aA}	0.05 ^a	0.19 ^b	0.14 ^{abA}
Meltdown	0.21 ^a	0.35 ^b	0.25 ^{abA}	0.22 ^a	0.19 ^a	0.26 ^{aA}
Hard	0.05 ^a	0.03 ^a	0.04 ^{aA}	0.06 ^a	0.21 ^b	0.03 ^{aA}
Smooth	0.37 ^{ab}	0.46 ^b	0.28 ^{aA}	0.61 ^b	0.46 ^{ab}	0.41 ^{aA}
Frothy	0.06 ^a	0.04 ^a	0.03 ^{aA}	0.14 ^b	0.05 ^{ab}	0.04 ^{aA}
Grainy	0.14 ^a	0.14 ^a	0.15 ^{aA}	0.10 ^a	0.11 ^a	0.14 ^{aA}
Acidic	0.03 ^a	0.00 ^a	0.35 ^{bA}	0.00 ^a	0.00 ^a	0.44 ^{bA}
Fluid	0.03 ^a	0.05 ^a	0.03 ^{aA}	0.06 ^a	0.01 ^a	0.05 ^{aA}

Note: Cochran's Q test is used to find the difference between the frequency of emotions reported in the Check-All-That-Apply (CATA) questionnaire. Small alphabet letters (a, b) in superscript show significant differences ($p < .05$) in samples within the tasting sessions. Capital alphabet letters (A, B) in superscript show significant differences ($p < .05$) in the symbiotic culture of bacteria and yeast (SCOBY) ice cream between tasting sessions 1 and 2.

considered defects and undesirable traits in frozen dairy products (Jardines et al., 2020).

The perception of texture in ice cream significantly influences consumer preferences. In the present study, attributes such as "sandy," "grainy," and "frothy" were negatively associated with overall liking and willingness to purchase. Similar findings were also reported in a study based on plant-based ice cream, where consumers associated attributes such as "frothy," "grainy," "hard," and "gritty" with plant-based alternatives, resulting in lower overall liking of the product (Jardines et al., 2020).

3.3 | Traditional method of sensory and hedonic liking

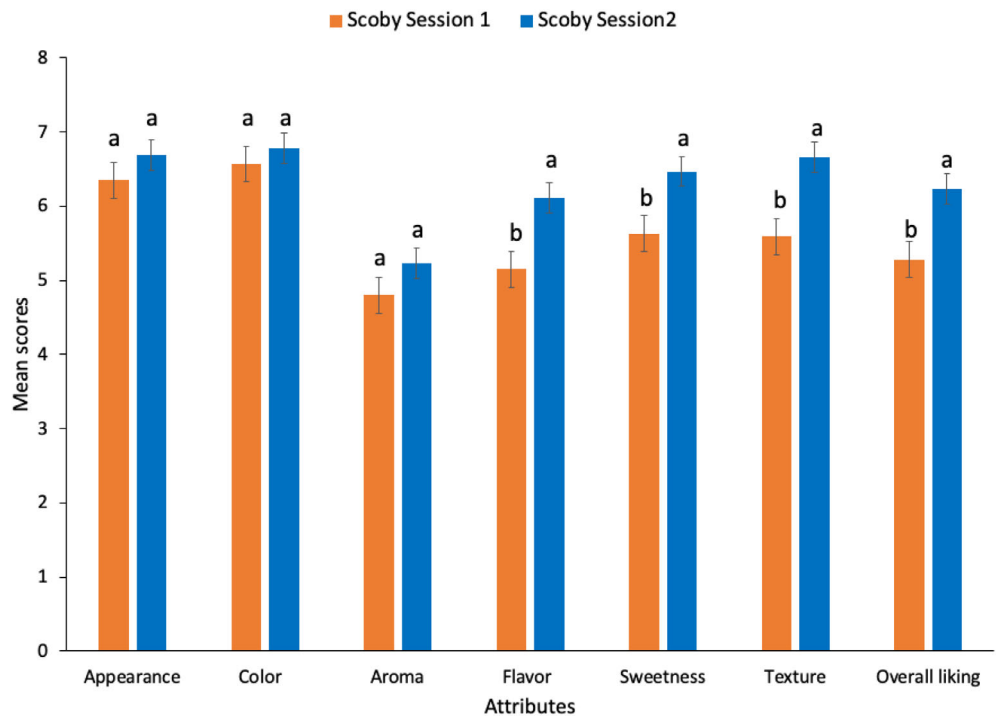
Table 3 shows the mean and standard deviation of the sensory attributes liking scores for the control, guar gum, and SCOBY ice creams. In the blind Tasting session 1, no significant differences were observed in the ice cream samples' appearance, color, and aroma. However, participants rated the guar gum ice cream higher for the flavor (6.57), sweetness (6.73), texture (6.82), and overall liking (6.82). In

Session 2, liking scores of all sensory attributes were significantly higher for the control ice cream than for the guar gum and SCOBY ice cream samples. Control ice cream received higher scores for appearance (7.19), flavor (7.05), texture (6.86), and overall liking (7.13) compared to the other ice cream samples.

In the blind and informed Tasting session 1 of the SCOBY ice cream, no significant difference was observed in the liking scores of the sensory attributes, except for the appearance. Participants reported a significant drop ($p < .05$) in the appearance liking of the SCOBY ice cream in the informed session (6.35) compared to the blind session (6.78). However, in the blind and informed Tasting session 2 of the SCOBY ice cream, no significant differences in the liking scores of the sensory attributes were observed.

Figure 4 depicts the mean values of the sensory attributes and overall liking of the SCOBY ice cream from the informed Tasting sessions 1 and 2. Between Sessions 1 and 2, no significant change in appearance, color, and aroma liking was observed for the SCOBY ice cream. However, there were substantial increases in the scores for flavor (from 5.2 to 6.1), sweetness (from 5.6 to 6.5), texture (from 5.6 to 6.7), and overall liking (from 5.3 to 6.2) in the Tasting session 2 compared to Tasting session 1. Repeated exposure to the SCOBY ice

FIGURE 4 Mean scores of sensory attributes reported on nine-point hedonic scales in Tasting sessions 1 and 2.



exposure to the SCOBY ice cream reduced its perceived complexity, contributing to enhanced liking and acceptance among participants.

3.4 | Purchase intention

Logistic regression was used to assess the impact of emotions and sensory attributes on purchase intention, using the terms' probabilities and respective odd ratios (Table 4). The positive and negative emotions elicited during the survey and tasting sessions significantly influenced the purchase intention. During the survey, the emotion "happy" was found to have a significant positive effect on purchase intention, with an odds ratio of 86.06. In Tasting session 1, the emotions "interested," "satisfied," and "pleasant" were found to have a positive effect on purchase intention, with odds ratios of 3.78, 2.53, and 0.36, respectively. However, in Tasting session 2, negative emotions such as "worried," "bored," and "calm" had a negative effect on the purchase intention of consumers, with odds ratios of 0.18, 0.08, and 0.36, respectively.

In Tasting session 1, the sensory attributes "fresh milk" and "easy to spoon" were found to have a significant positive effect on purchase intention. In Tasting session 2, the sensory attributes "vanilla," "sweet," and "smooth" were identified as significant factors affecting purchase intention. The attribute "fatty" had a negative impact on the purchase intention, with an odd ratio of 0.35 in Tasting session 1 and 0.40 in Tasting session 2. The sensory attributes sweetness (odd ratio = 1.60), flavor (odd ratio = 1.73), texture (odd ratio = 1.67), and overall liking (odd ratio = 4.71) were drivers of purchase intention for ice cream. The sensory attributes flavor, texture, and sweetness were significant predictors of purchase intention. Repeated tasting increased the familiarity levels of the novel SCOBY ice cream's taste,

flavor, and texture. In consumer's everyday experiences, food is perceived synergistically, integrating various sensory modalities. Familiarizing consumers with the sensory modalities through repeated exposure heightens product liking and enhances the purchase intention of the novel product (Orjuela-Palacio et al., 2014).

Emotions and sensory attributes significantly influence the acceptance and liking of foods (Clark, 1998). Positive-valence emotions such as "happy," "pleasant," and "satisfied" after tasting played a crucial role in predicting purchase intention (Gutjar, Dalenberg, et al., 2015; Gutjar, de Graaf, et al., 2015). Conversely, negative-valence emotions such as "bored" and "worried" had a negative impact on food acceptance and purchase intention. Previous studies also observed this effect (La Barbera et al., 2018; Mehta et al., 2022; Santiago-Cruz et al., 2021). The sensory attributes significantly influenced participants' decision to purchase an ice cream. Attributes such as "easy to spoon," "vanilla," "sweet," "smooth," and "fresh milk" enhanced the appeal and purchase likelihood. On the other hand, the perception of the "fatty" attribute of ice cream had a negative effect on purchase intention.

The purchase intention experienced an increase from Tasting session 1 to 2 (41.86% to 54.65%, data not shown). However, this change was not statistically significant according to the Cochran's Q test ($p \geq .05$). Repeated tasting is an effective method to enhance the liking and preference of food products. However, the data on the number of tasting sessions are inconsistent and vary widely with different age groups. Previous studies suggest that one tasting session was enough to increase liking scores in both young children and adults (Wardle, Herrera, et al., 2003). In contrast, up to 15 tasting sessions were required for infants and school children to enhance their food preferences (Wardle, Cooke, et al., 2003). Moreover, the number of repeated exposures also depends on the type of food.

Session	Predictor	β	SE β	Wald's χ^2	p	$E\beta$ (odds ratio)
Survey	Happy	4.46	2.18	4.17	.04	86.06
Tasting session 1	Emotions					
	Interested	1.25	0.49	6.64	.01	3.78
	Pleasant	1.78	0.44	16.36	.03	0.36
	Satisfied	0.93	0.44	4.44	.03	2.53
	Understanding	-2.13	0.94	5.11	.02	0.12
	Sensory attributes (CATA)					
	Easy to spoon	0.78	0.33	5.50	.02	2.18
	Fatty	-1.04	0.40	6.83	.01	0.35
	Fresh milk	0.97	0.36	7.20	.01	2.64
	Sensory attributes (nine-point Hedonic scale)					
	Sweetness	0.47	0.22	4.49	.03	1.60
Overall liking	1.55	0.42	13.43	.00	4.71	
Tasting session 2	Emotions					
	Happy	1.33	0.47	8.15	.004	3.78
	Calm	-1.03	0.47	4.83	.03	0.36
	Worried	-1.72	0.81	4.51	.03	0.18
	Bored	-2.57	1.16	4.93	.03	0.08
	Sensory attributes (CATA)					
	Vanilla	0.79	0.33	5.78	.02	2.21
	Fatty	-0.91	0.38	5.70	.02	0.40
	Sweet	0.79	0.33	5.93	.02	2.21
	Smooth	0.93	0.34	7.47	.01	2.53
	Sensory attributes (nine-point Hedonic scale)					
Flavor	0.55	0.26	4.57	.03	1.73	
Texture	0.51	0.18	7.97	.01	1.67	

Note: Based on the logistic regression analysis, using the full model with emotions and sensory attributes. The analysis of maximum likelihood estimates was used to obtain the parameter estimates. The significance of parameter estimates was based on the Wald χ^2 value at $p < .05$.

Horne et al. (2004) suggested that 2–3 exposures adequately enhanced the liking of fruits, while more exposures were necessary for vegetables.

4 | CONCLUSION

In conclusion, this study investigated the multifaceted dynamics encompassing repeated exposure, emotional responses, sensory attributes, and their collective influence on the purchase intention of the novel product. Repeated exposure to the novel SCOBY ice cream enhanced liking and affected emotional responses among participants. Emotions such as “happy,” “interested,” and “satisfied” elicited after repeated tasting were crucial in predicting the purchase intention. Sensory attributes also played a significant role in influencing the purchasing behavior of the participants. The findings underscore the importance of emotional responses and sensory experiences in shaping consumer's willingness to buy a product. Positive emotions and favorable sensory attributes contribute to a product's acceptability.

The present study reinforces that repeated exposure can gradually shift perceptions and enhance liking for a novel product, which can have significant implications for product launches and marketing strategies.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Research data are not shared.

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TABLE 4 Parameter estimates, probability and odd ratio estimates for predicting purchase intention in a survey, Tasting sessions 1 and 2 with emotions and sensory attributes.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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