Sensory Mapping of UHT Milk with Single-Origin Chocolate

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ABSTRACT

Like coffee, the popularity of speciality chocolate flavour or single-origin chocolate is growing in the Indonesian market. At the same time, sensory characteristic of the chocolate flavors is becoming more important, affecting both the taste and marketing of food product with chocolate flavor. As such, this study aims to describe UHT milk with single-origin chocolate through a complete sensory attribute mapping. A focus group discussion (FGD) resulted 15 texture attributes, 11 need-state attributes, 15 music attributes, 17 emotion attributes, 11 flavor attributes, and additional 70 color attributes. The complete sensory mapping test was performed using the CATA method based on attributes obtained from the FGD and analyzed using XLSTAT. The resulting product descriptions are as follows: cocoa Flores products were associated with soft and light textures, a need to focus and provide energy, pleasant classical and pop music, relaxed and warm emotions, flavors of ice cream, and light green, purple and brown colors. Cocoa Bali was linked to a smooth but rather hard texture, a need for rest and exercise, a cheerful musical style, happy emotions, a biscuit flavor, and a pink-yellow color. Cocoa Aceh was correlated with smooth and soft textures, state-of-the-art rest, energetic music, relaxed and energetic emotions, creamy flavor, and blue color. Meanwhile, cocoa Java was attributed with a smooth but rather hard texture, a state-of-the-art mood booster, cheerful music, relaxed emotions, ice cream flavor, and red-brown color. Thus, understanding specific sensory characteristics enables the producer to improve the product's development and marketing.

Keywords: *CATA, chocolate, emotion, single-origin chocolate, UHT milk*

INTRODUCTION

Today, consumers look for authentic experiences in their everyday life, including in their food. They are triggered by food and beverage products that bring authentic or original stories because they perceive them as a trait of exclusivity. Single-origin chocolate is very much fitting that trend: 75% of consumers think that single-origin chocolate is more premium and sustainable than standard chocolate flavor (Li *et al.,* 2021). Therefore, the demand for high-quality fine flavor chocolate, known as single-origin or single-estate chocolate, is getting stronger. Many food companies, especially, beverage industries increasingly find ways to grow their influence in this single-origin chocolate flavor specialty market.

Chocolate is a product made of cocoa beans and cocoa butter in different compositions (Devos *et al.,* 2021; Li *et al.,* 2021). Indonesia is a major producer of cocoa beans alongside the Ivory Coast and Ghana. Cocoa beans are a promising export from Indonesia with an increase in export value for 2015-2020 (Neilson *et al.,* 2020). Increased global interest in

chocolate has led to the rise in the price of cocoa derivatives (Rasouli-Pirouzian *et al.,* 2021), in this case, chocolate products. The single-origin trend could be successfully applied to commodities such as coffee, but it has not been successful for commodities such as chocolate (Hernandez and Granados, 2021). The single-origin trend focuses on increasing the competitive value by highlighting the unique flavor of a particular commodity in a specific geographical area (Januszewska *et al.,* 2020). In the fast-moving consumer goods (FMCG) industry, the food industry continues to produce innovations and to prepare product lines accepted by consumers in the future. One of the main appeals of chocolate flavors of single-origin is that they are more unique and have a higher perceived quality (Kumar *et al.,* 2021; Mandrile *et al.,* 2019). This also opens up the possibility of creating new products with the flavor of single-origin chocolate, replacing conventional chocolate flavors such as those in chocolate powdered beverages, milk and other chocolate-flavored products (Cain *et al.,* 2019).

Development processes must be in alignment with assessing sensory functionality. Human sensory

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evaluation is used to evaluate the texture and color of sensory attributes, such as color and texture (Palczak *et al.,* 2019). Other related product attributes are observed, such as emotion and need-state (Berget *et al.,* 2020). The method of sensory testing depends on the particular test for which the data is being gathered (de Melo *et al.,* 2021). In addition to the determination of the appropriate sensory test design, proper planning is necessary to select the correct method of sensory evaluation and means of screening (Gidlöf *et al.,* 2021). There are three different aspects to selecting sensory evaluation: discernment, mood-altering/disposition, and descriptive.

Previously, the hedonic test that was commonly used in industry to evaluate the acceptance by the consumer/panelist of specific attributes or the overall product was considered to be effective. In a hedonic test, a number of different products are evaluated in order to assess people's preference. However, there is no strong relationship between the like score and the consumer's choice of products over other products (Huang *et al.,* 2021). It is also possible that two products of the same category will receive the same mark on the basis of their solid specifications. The experiment with two different flavored chocolate milk products resulted in a preference value that was not significantly different. Therefore, a different method must be used to properly distinguish products even if they have the same hedonic score (Huseynov *et al.,* 2021; Iweala *et al.,* 2019).

Emotions such as happiness, sadness, discomfort, and stress have different meanings, such as temporary responses to specific situations (Jaeger *et al.,* 2019). Emotion mapping is used to determine how consumers feel (or attach to) specific products (Manstan *et al.,* 2020). Information about emotions is gathered using a sensory test: The Check-All-That-Apply test, which aims to understand the outcome from a sensory perspective while also clarifying consumer perceptions (Nezlek *et al.,* 2021).

The Emotional Mapping approach does not just rely on panelists' judgments to describe their emotions with food (Kim *et al.,* 2020; Li *et al.,* 2020). The application of cross-modall associations for emotion mapping forms the perfect framework for product differentiation (Knoeferle *et al.,* 2015; Reinoso-Carvalho *et al.,* 2020). Cross-modal association is a neurological mechanism in which sensations in one sense trigger sensations in the others; for example, sound could be described as shapes in color, colors could be described as sounds, and so on (de Melo *et al.,* 2021). Similar to odor, a flavor component could be perceived visually, tactilely, tastefully, and aurally. The information gathered can demonstrate the extent of the diverse meanings of the term.

Using both sensory and emotional mapping, the results are expected to be more thorough in describing the flavors of chocolate. Additional research

results can be used to further develop the product brand image. Therefore, an extensive description is required in order to distinguish single-origin chocolate milk products that do not exclusively consist of favorite values but in the form of product descriptions for each category of emotions, needs, and associations, and sensory stimuli (music, texture, color) that use emotional, sensory mapping (Waehrens *et al.,* 2018).

Sensory evaluation is used in the food industry to test product quality as well as determine consumer acceptance (Jaeger *et al.,* 2020a). The competition among the food industry increases the chance of winning new products. The hedonic test that is commonly used cannot provide detailed results because it is dependent on the preference value of the individual (Gunaratne *et al.,* 2019a). The taste of two different products with the same flavor type is indistinguishable. In addition to using traditional preference tests, we will also employ the emotional mapping approach and the cross-modal association approach to improve the discrimination. The objective of this study is to determine which single-origin chocolate had the strongest chocolate flavor and whether people would accept flavored milk.

The results obtained from this study will yield emotional profiles, performance, and descriptions of UHT chocolate milk products which could be further used to develop new product formulations. The information obtained could be used by flavorists to create flavors that consumers associate with happiness and the good life. Marketing activities can utilize collected data to build a superior product brand image.

MATERIALS AND METHOD

Materials

The primary material employed in this research investigation consisted of UHT milk infused with a single-origin chocolate flavor. Various flavor variants were examined, including cocoa Flores, cocoa Java, cocoa Aceh, and cocoa Bali. The selection of product flavors was determined through a focus group discussion (FGD) held at PT Mane Indonesia. Mineral water was utilized as a neutralizing agent. The research was carried out over a duration of six months, spanning from January to July of 2019, at the Sensory Department of PT Mane Indonesia located within the MM 2100 Industrial Estate on Manggar Street, Selayar, Bekasi Regency, West Java, Indonesia.

Research method

The research was divided into 3 stages, the first stage being the selection of panelists who consumed chocolate milk at varying frequencies. The second stage was the implementation of FGDs with consumer panelists to develop terms for each emotional

subgroup. The third stage focuses on sample testing using the CATA (Check-All-That-Apply) method with consumer panelists for emotional sensory mapping. Color (Kuo *et al.,* 2021), texture, related music, and associations were also requested from panelists (Ferreira, 2019; Yu *et al.,* 2021).

Panelist selection

The panelist selection stage was carried out to collect consumer backgrounds, including gender, age, and frequency of consumption of UHT chocolate milk by panelists (Ramírez-Rivera *et al.,* 2020). The selection stage involved the distribution of the questionnaire online to the members of the selected panel. The survey was made available online using Google Forms. Thirty participants that consumed chocolate milk at least once a week were selected. Fourteen out of the thirty selected participants were joining the Focus Group Discussion to determine and to justify the sensory attributes.

Sample preparation and presentation

The samples tested were UHT milk with a single-origin chocolate flavor. Samples were presented at the same temperature, namely at room temperature (25-27°C). The sample was presented as 25 mL in a 30 mL plastic cup with a three-digit code using the previous price label. Mineral water was served to the sample as a neutralizer each time a different sample was assessed. A small plastic spoon has also been provided to anticipate the formation of deposits in the sample (Yu *et al.*, 2021).

Emotional attribute development with FGD

Focus groups were held to identify the emotions associated with the product and what consumers believe are the differences in the product (Gunaratne *et al.,* 2019b). FGDs have been conducted twice with different focus group participants. The different FGD session moderators were designed for a more broad-based attribute and as a means of confirming the attribute set in the previous session. A total of seven consumers (two to three times a week) participated in each FGD session. FGD sessions have been held for 20 to 30 minutes each. Each panelist was asked to taste each sample on a separate occasion and to describe the emotions associated with it (Stallard, 2021). They were invited to present their thoughts and opinions within the specific framework provided by the moderator. The taste and the emotional attributes received while eating the product were due to the spontaneous discussion of the participants after no specific list of attributes had been given beforehand. This was conducted for every emotion that already exists, except for the emotion of color.

Sensory mapping using *Check All That Apply* (CATA)

The CATA test method was carried out with modification by consumer panelists (Jaeger *et al.,* 2020b; Vidal *et al.,* 2020). Test panelists consisted of consumers who had a frequency of drinking chocolate milk at least once a week. Sensory evaluation was conducted in two stages, and samples were selected to minimize the effects of bias (Krishna *et al.,* 2021): 1) Panelists were required to evaluate the sample with information about their emotions (Torrico *et al.,* 2021); 2) Panelists were asked to choose between 9 different hedonic intensity scales. In the test, panelists were allowed to take breaks and had no time limit to complete the test.

Analysis of CATA emotional sensory mapping data

Emotional sensory mapping data with the Check-All-That-Apply (CATA) and the results analyzed with the CATA Analysis Tools (McNae *et al.,* 2016; Whiting *et al.,* 2011). The data analysis carried out the Chi-square test, the Correspondence analysis and the Principal Coordinated Analysis (PCoA). The CATA Q-Test of Cochran was used to determine the frequency of attributes between two groups and whether there was a significant difference ($p<0.05$) or not ($p≥005$) (Li *et al.,* 2020). Correspondence Analysis (CA) was used to depict the association between the CATA attributes and the available samples based on the results of the frequency table. The findings have been visualized in a two-dimensional map showing how the response varies by attribute. Principal Coordinate Analysis described the differences in the relationship between attributes. It was used to determine the distance between attributes or the correlation between variables, and then projection in the best possible graph.
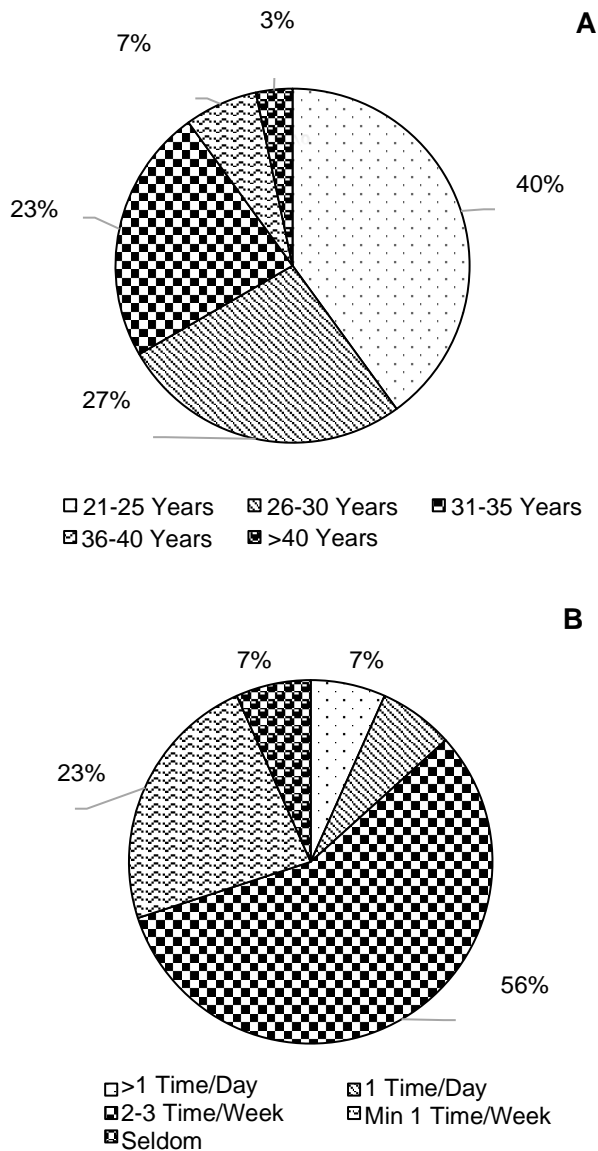
RESULTS AND DISCUSSION

Panelist profile

A total of one hundred panelists were selected from a pool of consumers with 33% male participants and 67% female participants. The panel members came from the 20s to the 46th year of age (Figure 1A).

The consumption frequencies chocolate milk was presented in Figure 1B. The participants in the study were selected because they represent the target consumers in some way. Other chocolate-based products not consumed by all respondents, included chocolate bars, cocoa powder drinks, and chocolate bars (40%). Most panelists do or consume chocolate milk on a weekly basis. Adults' consumption of chocolate milk and their selection of items in the supermarket were also evaluated. If people consumed a product multiple times, the more relevant the

data would be. This data showed that the consumers who had more experience interacted with the chocolate milk products, could give more information about improving and understand what really the consumers' needed. Figure 1B illustrates how many people drink chocolate milk every day.

A

- ☐ 21-25 Years   ☒ 26-30 Years   ◩ 31-35 Years
- ▨ 36-40 Years   ◼ >40 Years

B

- ☐ >1 Time/Day   ☒ 1 Time/Day
- ◼ 2-3 Time/Week   ⊡ Min 1 Time/Week
- ▨ Seldom

Note: A= Proportion of panelist age distribution; B= Frequency of consumption of panelists' chocolate milk

Figure 1. Data of panelists and the consumption

Results of the focus group discussion

Moreover, the findings of the Focus Group Discussion (FGD) were listed in Table 1. Focus groups utilized sensory responses and emotional attributes to generate conceptual maps. Categories of sensory attributes were organized around color, music, texture, necessity, and emotion, as well as flavor (Rojas *et al.,* 2020). The results could be seen in Table 2 for sensory and emotional attributes. The FGD outlined the attributes in detail, and they are all listed in their entirety in the data entry format. Color testing took place, and a color chart was provided afterwards. PT Mane Indonesia was the first used the cross-modal association mechanism in Indonesia with the adaptation to the method of Jaeger *et al.* (2020c), which tests how people taste a product (flavor) using the sense of taste and smell, with stimuli that were already felt on other senses, such as sight, touch, and hearing (color). However, state and emotionnal categories were very important for marketers when it came to building brand perceptions and positioning (Larson *et al.,* 2014; de Melo *et al.,* 2021; Shu and Peck, 2011).

Flavor

The flavors of the products differed significantly (P= 0.043, using Cochran's Q Test), with statistically significant results at a 5% significance level. A biplot could be seen in Figure 2A to depict the relationship between the four products' flavors. Based on the results of the correlation analysis in Figure 2B, the taste of the four products shows a distinct enough difference to be easily discerned as illustrated by their placement in the various quadrants. Many panel members associate cocoa Aceh with the flavor of cream, umami, and with a weaker connection, fruit products. People may see things that are sweet and caffeinated when they consume cocoa drinks like cocoa Flores. Cocoa Bali was predominantly used in baking, whereas cocoa Java was used for both baking and chocolate consumption. Cocoa Java exhibited stronger chocolate flavor than the other samples.

The PCoA graph was created using the results of the CATA Analysis and depicts the relationship between flavor attributes and preference values. From the PCoA analysis of Figure 3, it could be concluded that several flavors exist, such as milk, ice cream, chocolate, fruit, caramel, vanilla, biscuits, and sugar. As a result, the most positively influencing common flavor attribute for panelists is chocolate, milk, creamer, and biscuits, with correlations of 0.226, 0.173, 0.130, and 0.67, respectively (Figure 2B).

Preference mapping was a graphic visualization technique that was implemented using a multivariate analysis method, which helps to collect information on how product sensory attributes influence customer preference (Tan *et al.,* 2020; Ubeda *et al.,* 2017). Another method of visualizing the data was to use a contour plot. The contour plot indicated the percentage of points on the map that are located in each region (Jaeger *et al.,* 2020b). This sheet can be seen at Figure 3.

Table 1. List of sensory and emotional attributes of the FGD results

Texture	Need-state	Music	Emotion	Flavor
Ice block	Sleep	Jazz	Energized	Biscuits
Oil	Get together	Pop	Enjoy	Ice cream
Powder	Relax	Energetic	Courage	Milk
Wool	Exercise	Cheers	Dizzy	Creamer
Silk	Stress reliever	Reggae	Young	Caramel
Glass	Energized	Country	Focus	Sugar
Sand	Rest	Melody	Enough	Coffee
Wood	Mood booster	Classic	Enthusiasm	Vanilla
Stone	Focus	Rock	Relax	Umami
Cotton	Starting day	Acoustic	Sleepy	Chocolate
Foam	Me time	Slow	Warm	Fruits
Chiffon		RnB	Balanced	
Clay		Electric	Happy	
Mucus		90's	Serious	
Sticky		Great fun	Spirit	
			Share	
			Calm	

Table 2. Summarize of sensory mapping of UHT milk with single-origin chocolate

UHT Milk with Single-Origin Chocolate	Textures	Need-states	Musics	Emotions	Flavors	Colors
Cocoa Flores	Powder	Focus	Cheers	Relax	Chocolate	J5
	Silk	Mood booster	Pop	Enjoy	Ice cream	I7
	Foam	Energized	Clasic	Warm	Milk	B1
Cocoa Bali	Powder	Relax	Great fun	Warm	Milk	J6
	Clay	Rest	Pop	Happy	Biscuit	C6
	Silk	Exercise	Cheers	Enjoy	Chocolate	C7
Cocoa Aceh	Powder	Energized	Pop	Relax	Milk	B3
	Cotton	Rest	Great fun	Enjoy	Creamer	I6
	Silk	Relax	Energetic	Energized	Chocolate	D3
Cocoa Java	Powder	Energized	Great fun	Enjoy	Milk	J6
	Foam	Start the day	Pop	Energized	Chocolate	I6
	Clay	Mood Booster	Cheers	Relax	Ice cream	I7

This contour plot has a red area showing the highest level of satisfaction, which was at least 80%. All panelists give preference or satisfaction scores over the mean in the cocoa Bali and cocoa Java brands. An overwhelming 60% of participants reported being satisfied with the quality of cocoa Flores, who was in the yellow area, while only 25% of the panelists assigned an above-average preference to the cocoa Aceh sample. The panelists were searching for various flavor attributes including biscuits, chocolate, vanilla, coffee, and milk in chocolate milk. Many of the panelists noted that the primary flavors they did not like were sugar and fruit flavor. This was according to the PCoA model, which predicts that there was a positive correlation between the chocolate liking value and the chocolate's attributes.

Music

According to Cochran's Q test, there were no significant differences between music categories at the 5% significance level. Figure 4 showed a visualization of the product-music plot generated by the music-product biplot map. Based on the correspondence analysis, it could be concluded that cocoa Flores was connected to both "slow" and "acoustic" music. Cocoa Aceh was a part of the same musical genre as cocoa Bali, but cocoa Bali was another part of the same musical genre as cheerful and 90-s music. People who like "reggae" and "jazz" will also like cocoa Java. Survey results showed low levels of chocolate milk usage among "rock" music fans.

CATA Analysis was used to generate Principal Coordinate Analysis (PCoA) which plots the music types, attributes, and favorite values on a chart. In Figure 4, you can see that groups like "country," "jazz," and "classic" have correlations of "electric," "reggae," and "energetic" music to attributes like "fun" and "cheerful," while groups like "country," "jazz," and "classic" have correlations of "slow" and "melodic" music to attributes like "fun" and "cheerful." When it comes to the correlation between the value of being liked and music types, music that has a positive correlation has a value of 0.197.

Texture

In Figure 5, an interactive product map depicting the correlation between product texture and texture attributes could be seen. The total F1 (principle com-

ponent 1) plus F2 (principle component 2) measured 84.27% variability among panelists.

As expected, cocoa Aceh was correlated with oil texture, while cocoa Java was correlated with wood texture.

Figure 3. Preference mapping of UHT milk with single-origin chocolate
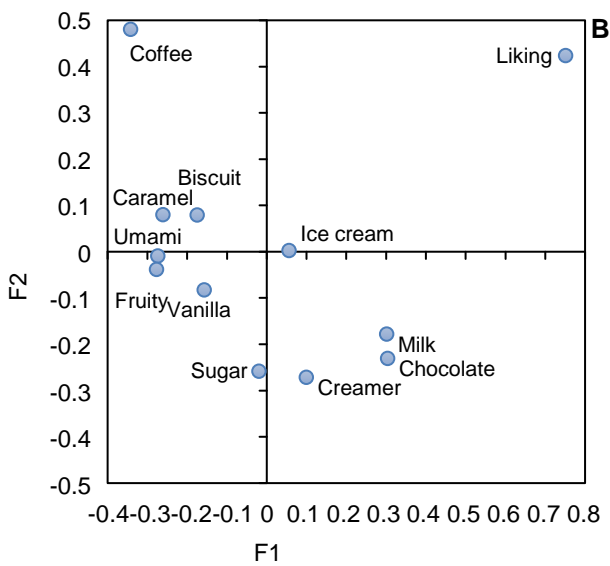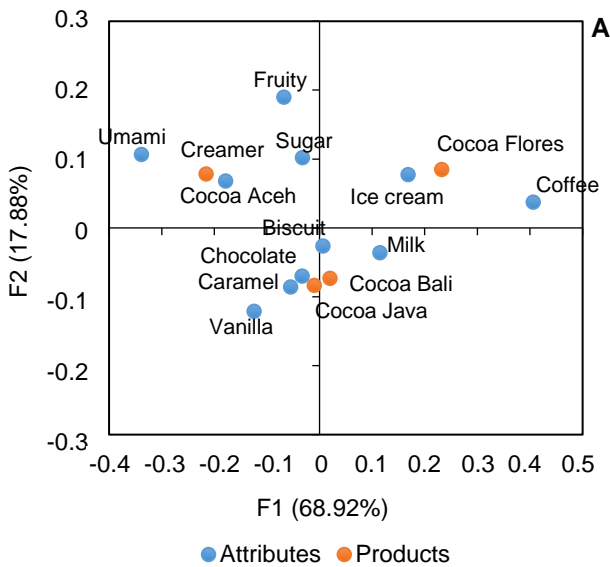
Note: A= Representation of the relationship between flavor attributes and UHT milk with single-origin chocolate; B= Liking correlation of UHT milk with single-origin chocolate

Figure 2. Sensory mapping attributes ideality and liking of UHT milk with single-origin chocolate
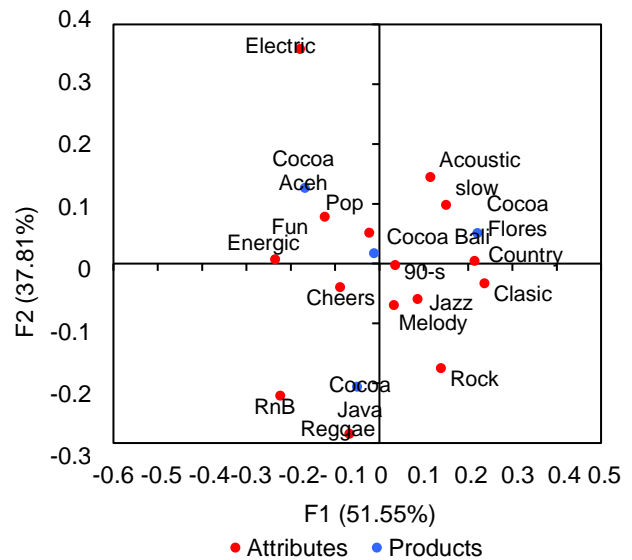
Figure 4. Music attributes biplot of UHT milk with single-origin chocolate

Correspondence analysis showed that cocoa Bali and cocoa Flores were similar. Cocoa Flores and cocoa Bali, which were located in the same quadrant of the graph, were comparatively close to each other. Despite this, cocoa Flores was often believed to be related to ice block texture, and this is generally followed by a correlation to rock and powder texture.

The PCoA model was the outcome of the CATA analysis, which discusses the correlation between texture attributes and likeability values. In Figure 5, the PCoA illustrated that light and soft textures, such as powder, foam, silk, wool, chiffon, and cotton, all have a negative correlation with darker and coarser textures, such as wood, stone, ice blocks, and glass. Furthermore, a positive correlation has been obser-

ved between the dominant texture attribute (powder texture) that has a positive effect on panelist preference and glass texture, with a value of 0.032, and with powder texture, with a value of 0.215.
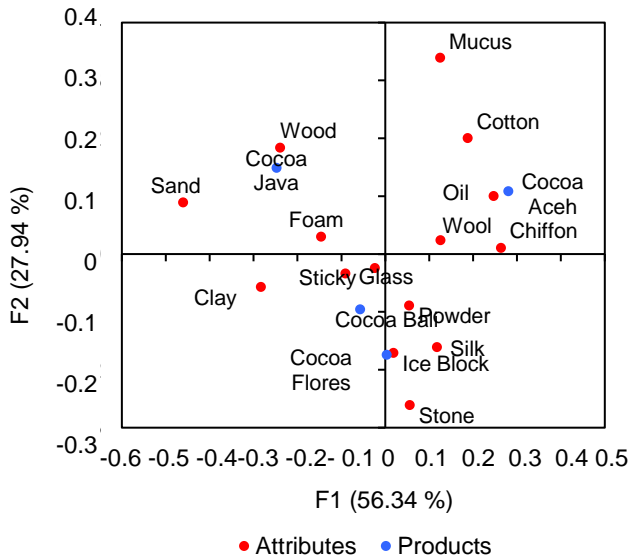

Figure 5. Perceived textural association of UHT milk with single-origin chocolate

Emotions

Data from the Biplot revealed good sample variabilities of 90.82% among the emotion panelists who had sampled the UHT milk with single-origin chocolate. To illustrate how the product and the objectively measured emotional attributes correlate, the visual representation in Figure 6 was used.
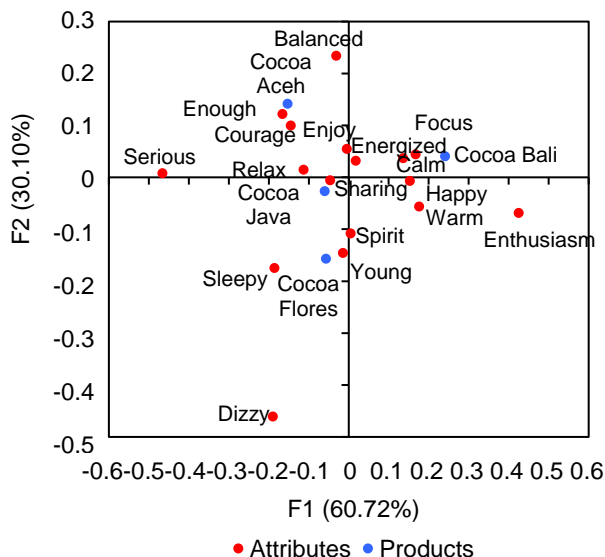
Figure 6. Perceived emotions during UHT milk with single-origin chocolate

The four products were located in four different quadrants: except for cocoa Java and cocoa Flores, all of the products were distributed. Cocoa Aceh was correlated with feelings of courage, enough, and balanced. Cocoa Bali had the effect of creating a sense of focus, calm, and happy. Cocoa Java and cocoa Flores were close enough, but have different emotional associations; cocoa Java correlates with the feeling of sharing and relax, while cocoa Flores correlates with feeling youthful, sleepy, and full of spirit.

Further, a CATA analysis graphs described the correlation between emotional attributes, panelist preference values, and the relationship between emotional attributes. PCoA graph showed that focus, balance, happiness, enthusiasm, energy were negatively associated with serious, moderate, and sleepy emotions. Positive emotions and enjoyment were correlated with a panelist's liking value.

Need-states

Need states were identified as needs for people with psychological issues, as well as their own perception of themselves. A marketing strategy in which products' need states were regulated to be relevant to customers (Clark *et al.,* 2021). Anova levels differed significantly between products, with the 5% significance level used in the Need-states Analysis. A biplot map showing how product use correlates with need-state attributes could be seen in Figure 7.
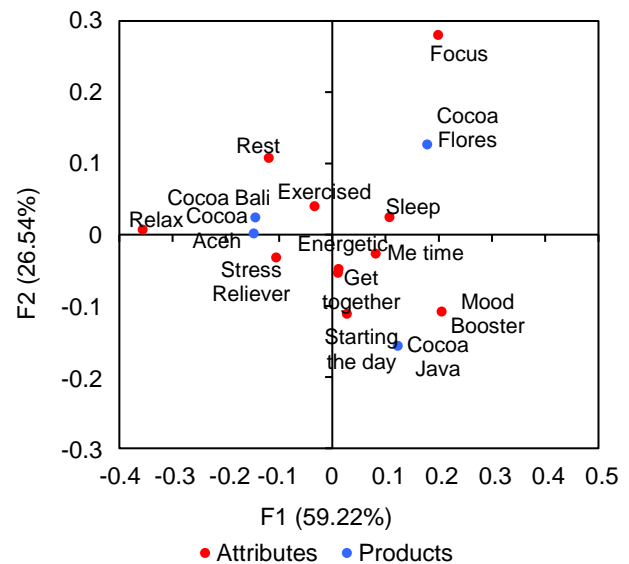

Figure 7. Need-states mapping of UHT milk with single-origin chocolate

Cocoa Java was linked to the desire for a morning pick-me-up and getting things started (mood booster and starting the day). Cocoa Flores was primarily associated with the emphasis on concentra-
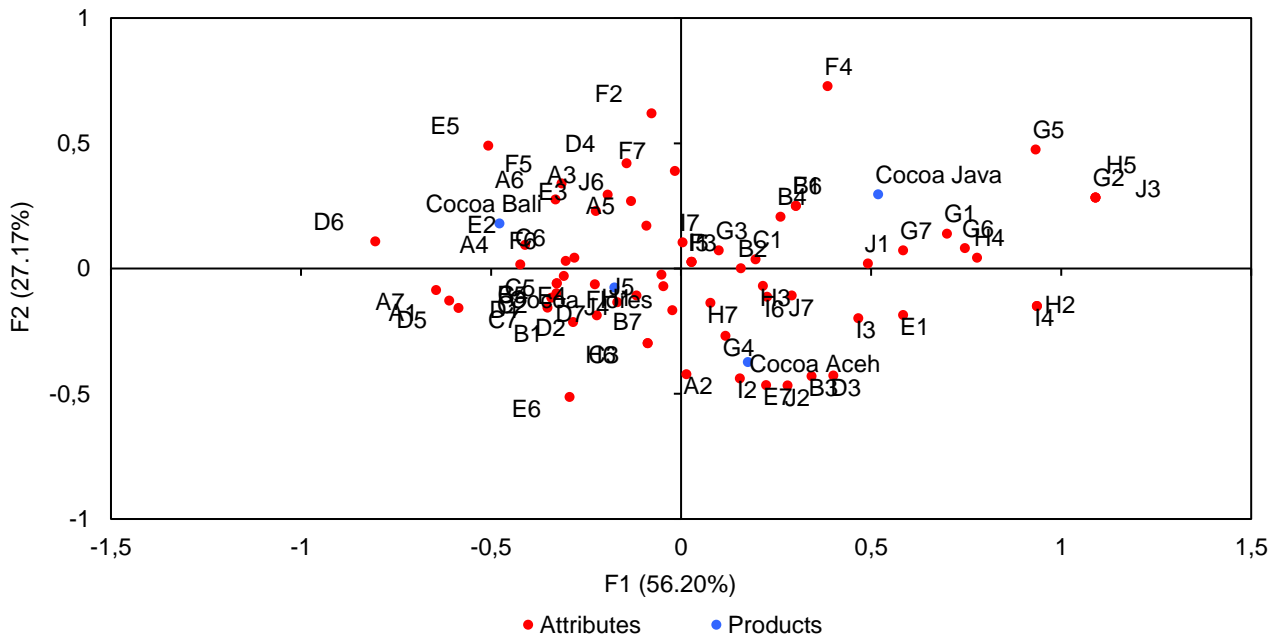
tion (focus) and sleep. Cocoa Bali and Aceh both help alleviate stress, promote exercise, offer rest, and relax you. Since the four products shared a great deal in common, the distance to energy demand and assembly attributes are also similar.

A Principal Coordinate Analysis (PCoA) graph was generated by using the CATA Analysis, and it depicted the relationship between the attributes of needs and the preferences of participants. According to the PCoA graph, personal characteristics that trigger rest, stress relief, and sleep, begin each day and were negatively correlated with other personal characteristics. There was a huge variation in energy, focus, mood booster, and exercise based on whether or not one required some time alone or needed to relax. Relaxation and stress relief attributes each have a correlation coefficient of 0.115 with respect to the need attributes.

Color

Color categories were ranked by their frequency from a pool of 70 color attributes resulted 35 colors with high variabilities of total principle components 87.70%. The color sample data was analyzed using Cochran's Q Test, and no significant differences were found between the color categories with each other at the 5% significance level, except for the B3 code ($p =$ 0.035). A bioplot map depicting the correlation bet-ween color and UHT milk with single-origin chocolate could be seen in Figure 8.

The correspondence analysis showed that cocoa Bali and cocoa Flores do not differ too greatly in color correlation. Cocoa Bali is similar in color to cocoa Flores, but cocoa Bali is a little lighter. Where cocoa Flores and Bali are mainly correlated with colors G8, G9, G5, and C2, cocoa Java is only correlated with colors G7, G6, and C1. Cocoa Aceh is blended with a number of colors including E7, D3, and B3.

Figure 8. Color percerption mapping of UHT milk with single-origin chocolate

Examining the relationship among flavor attributes, emotional attributes and consumer need-states

The data summarized for each sensory attribute category could be seen based on how closely each product conforms to that attribute. Attributes were assigned to each product based on attributes in each chocolate milk product. The sensory characteristics and flavor profile of chocolate milk could be observed in Table 2. Products in different categories exhibit very different emotional attributes, but the greatest differences in emotional attributes are found in the color category.

Sensory mapping was used to design products that consumers will be most satisfied with (Stapleton *et al.,* 2016). Therefore, the correlation between the flavor attribute and the perceived emotion is important because it helps us to understand the relationship between the sensory attributes and the perceived feelings generated during the consumption of the product (Rita *et al.,* 2020). Emotional and need attributes correlated with the Pearson test for flavor attribute perception. The Pearson correlation illustrates the relationships between each subject and all the other subjects. A correlation is presented for various flavor attributes and emotional and needs attributes in Table 2.

A strong correlation existed between emotions such as feelings of warmth, relaxation and creaminess, as well as the characteristic flavor of vanilla, which has emotional qualities in common with joy, balance, and enthusiasm (Li *et al.,* 2014). The flavors of biscuits, chocolate, and caramel were usually paired with feelings of calm, enjoyment, and tranquility. Mood booster and need for rest were associated with the ice cream's sweetness and the ice cream's creaminess. Some kinds of fruit flavors and creamer were commonly found alongside relaxation, exercise, and stress relief, and vanilla (Keeler *et al.,* 2015).

This data were used in the development of new flavors for the food industry (Castro-Delgado *et al.,* 2020). In order to design and develop new flavors according to industry demand, flavorists were provided with technical parameters and industry food regulations, and more information about the target consumers, brand positioning, and emotional benefits (Kenney and Adhikari, 2016). Flavorists were capable of creating an appropriate emotional experience in the product. It provides more detailed and sensitive feedback than the other methods (Waehrens *et al.,* 2016). There were specific categories to which different kinds of data analysis could be applied. Textural data could be used as a reference for presentation tools, color data could be used for room lighting, and music data could be used for the musical environment when consuming products. At the same time, emotions and data were used to connect individuals' specific needs and emotions with the relevant products.

For marketing to be successful, the food and non-food industries heavily invested in brand design and packaging as an essential component (Pio-Ávila *et al.,* 2019). The sensory and emotional triggers of consumers could be identified by using sensory mapping data (English *et al.,* 2019; Gallo *et al.,* 2017). A musical emotional sensory mapping data had been applied to marketing strategies, specifically. The application was known as "concerto timer," which functions to indicate the ideal time for consumption and to create a relaxing musical atmosphere for said consumption (Knoeferle, 2015).

CONCLUSIONS

It can be conclude that sensory mapping through cross-modal associations provides more detailed information than conventional sensory evaluations in order to distinguish products with specific values that were slightly different from product emotional associations. Color, music, and emotion had distinct emotional dimensions, and those dimensions could be seen through how they vary in color, music, and emotion.

Cocoa Flores was typically associated with the feeling of softness and lightness, as well as an emphasis on clarity and focus, pleasant classical and pop music, as well as being calming and warm. Also, it features chocolate, green, purple, and brown flavors. Cocoa Bali was noted for a hard but smooth texture, rest and exercise, an optimistic mood, biscuit flavor, and a vibrant color that is some shade of pink-yellow. Cocoa Aceh was known for having a smooth and soft texture, lively music, relaxation, creamy flavor, blue color, and being in an energetic/emotional state. Cocoa Java was generally associated with a smooth yet hard texture, a need for a mood boost, cheerful music, relaxed emotions, and an ice cream flavor with a red-brown color.

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