The Impact Of Packaging Design On Sensory Attributes

Dr. Eddy Yansen[1], Dr. Elizabeth Furio Perez[2*],
Andamar Pradipta[2],
Kelly Anvolia[1]

[1] Department of Master in BioManagement, Indonesia
International Institute for Life Sciences (i3L)
School of Business.
[2] Department of International Business Management, Indonesia
International Institute for Life Sciences (i3L) School of Business.
*Corresponding Author: elizabeth.perez@i3l.ac.id

Abstract

Packaging plays a crucial role in product marketing, facilitating communication between the product and customers during the initial purchase. It also holds the potential to shape the multisensory customer experience by capturing attention, establishing hedonic and sensory expectations, and influencing consumer response. Moreover, packaging transparency serves as a vital technical parameter for evaluating and validating specific food packaging materials. This study examines four distinct packaging designs: transparent box, opaque box, double layer transparent box, and double layer opaque box. Sensory attributes were assessed using CATA (check-all-that-apply), while attribute intensity was measured using line scaling. The findings indicate that double layer packaging offers a wider range of sensory attributes and intensity concerning aroma and taste, such as light color, buttery aroma, milky aroma, brittle texture, and milky taste. Overall, significant differences were observed between single layer and double layer packaging, while no significant distinctions were found between transparent and opaque packaging.

Keywords: Transparent packaging, Opaque packaging, Double layer packaging, Sensory attributes.

1.0 Introduction

The role of packaging in product marketing is crucial as it serves as a means of communication between the product and the customers during the initial purchase (Dadras, 2015). Effective packaging also contributes to the multisensory customer experience, by capturing consumers' attention, setting hedonic and sensory expectations, and shaping their experience and response to the product (Krishna et al., 2017; Sousa et al., 2020). The design elements of packaging, such as its shape, name, and speech sounds, are capable of influencing the perception of taste, aroma, and flavor, thus increasing brand value (Velasco et al., 2013). Moreover, the transparency of the packaging material is an essential technical parameter that plays a vital role in the evaluation and validation of food packaging materials (Guzman-Puyol et al., 2022).

Research suggests that marketing strategies that alter the packaging or label of a product can cause placebo effects that influence the perceived effectiveness and pleasure of an otherwise identical product (Enax et al., 2015). Packaging shape can affect taste intensity, while packaging material can influence consumers' perception of coffee quality (Poslon et al., 2021). Furthermore, packaging design elements, such as shapes, typefaces, names, and sounds, can affect consumer perception of sweet and sour tastes (Velasco et al., 2013).

Consumer-based sensory evaluation techniques are becoming increasingly common in product development (Varela & Ares, 2012). This study will employ the Check-all-that-apply (CATA) and line scaling methods as sensory evaluation techniques. Line scaling, a technique for intensity scaling, offers a less constrained and more continuous representation of panelists' options, making it a suitable technique for collecting data on specific attributes' intensity (Lawless & Heymann, 2010). CATA questions are structured questions that require respondents to check off all the terms from a list that apply to the focal sample (Jaeger et al., 2015).

The purpose of this study is to investigate the impact of packaging cues on the sensory attributes and taste perception of plain crackers. The study aims to identify packaging designs that yield the most favorable sensory attributes and taste to enhance packaging marketing strategies. This study employs a quantitative experimental research approach conducted in a controlled sensory lab setting. The research targeted individuals aged 18-25 years

old, with a socioeconomic status (SES) of A and was conducted at the Indonesia International Institute for Life Sciences (i3L).

2.0 Research Methodology

2.1. Participants

This study involved a target market consisting of 80 participants aged between 18 and 25 years old with a socioeconomic status (SES) of A (monthly income > Rp 5,000,001). According to Cohen et al. (2007:102), experimental methodologies require a minimum of 15 participants, and as suggested by (Gall et al.1996; Singh, A. 2022), there should be at least 15 participants in both the control and experimental groups for comparison. The participants voluntarily enrolled and provided informed consent by signing a standard consent form. They were divided into four groups of 20 participants each, and recruitment was conducted through email and social media platforms (LINE and WhatsApp).

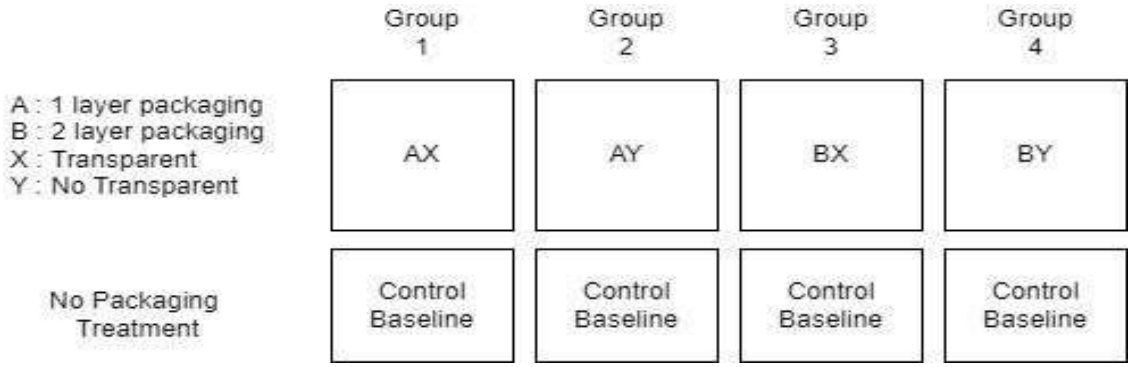

Figure 1. Participant Group Distribution.

Participants' age, gender, and monthly spending were recorded for classification purposes. Eligible panelists should not have any allergies to crackers, particularly flour and gluten. The experiment duration ranged from 15 to 20 minutes. The specific age group was chosen to eliminate the gradual decline in sensory perception that often occurs with age in most human senses. Additionally, potential thematic incompatibility resulting from varying age compositions within the experiments was eliminated.

2.2. Product and Design

In this experiment, plain crackers with the brand Saltcheese Crackers by Khong Guan were used. The crackers were purchased through e-commerce and then repackaged in different packaging designs, while ensuring uniformity in cracker shapes. The study focused on transparent and opaque packaging, utilizing four different packaging designs: transparent box, opaque box, double layer transparent box, and double layer opaque box (see Figure 2). The packaging color and shape were standardized as they significantly influence consumers' sensory expectations and perception (Li et al., 2020; Marques da Rosa et al., 2018; Sousa et al., 2020). A neutral brown color was chosen, representing an angular shape that evokes sweet and buttery flavors (Marques da Rosa et al., 2018). Food-grade plastic made of low-density Polyethylene (LDPE), considered the optimal packaging material for crackers (Sumiyarto et al., 2015), was used for the transparent and double layer packaging. The box was constructed with food-grade cartons.

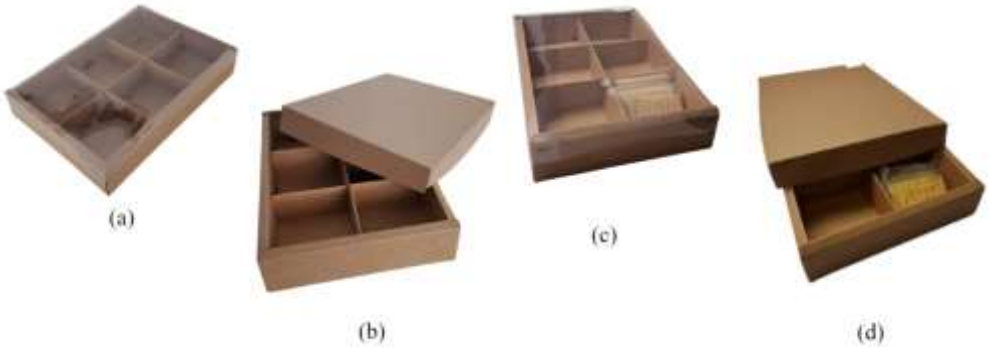

Figure 2. Examples of the packaging: (a) transparent box, (b) opaque box, (c) double layer transparent box, and (d) double layer opaque box.

2.3. Data Collection

Data collection took place in the sensory lab at i3L. The panelists underwent two sensory tests: Check-all-that-apply (CATA) and the Line scaling method. The samples were presented monadically, with one sample presented at a time for each packaging type. The panelists evaluated the samples individually in a sensory booth under white lighting, rinsing their mouths between samples. Please refer to Appendix 1 for a detailed description of the methods.

2.3.1 Check-all-that apply (CATA)

In the CATA test, the panelists were provided with a list of words and asked to select all the terms that applied to each sample. The questionnaire included a series of taste lexicons (refer to Appendix 2). CATA employed multiple-choice questions, a common practice in marketing research, to limit attribute responses. The questions presented a list of terms, and the panelists were required to select the terms that best described the sample (Espitia-López et al., 2019).

2.3.2 Line Scaling Method

The Line Scaling Method was employed for assessing the intensity or degree of liking of selected attributes. Each panelist was provided with a piece of paper containing a 15 cm line, and the questionnaire details can be found in Appendix 3. Panelists were instructed to fill out the attribute of their choice and mark along the line to indicate the desired intensity or degree of liking. The length of the mark was measured from the left using a 0.5 mm specification ruler to obtain precise measurements of the panelists' responses. This method allowed for a continuous representation of the panelists' preferences and provided a quantitative measure of attribute intensity (Lawless & Heymann, 2010).

2.4. Data Analysis

IBM SPSS Statistic 25 was employed for data analysis. To compare the distribution of a dichotomous variable across three or more related samples, the CATA data was initially subjected to the Cochran Q test. In cases where the result was significant, a post-hoc McNemar test was performed to determine specific attribute differences between two products (Lawless & Heymann, 2010). The Mann-Whitney test was utilized to analyze the line scale data and evaluate changes in intensity in response to different packaging attributes. A significance level of 5% ($p < 0.05$) was applied for all statistical tests.

3.0 Research Result

3.1 Sensory attributes frequency

The results were obtained by using CATA to see the different sensory attributes within the samples, and Line scaling was used to see the different intensity sensory attributes within the samples. There were four groups of treatment samples

and a control sample. The control sample was simply served on a piece of paper plate. For the treatment samples, Group 1 was served in a transparent box, Group 2 in an opaque box, Group 3 in a double layer transparent box, and Group 4 in a double layer opaque box. CATA allows us to see which sensory attributes are dominant in the samples and whether they differ between sample groups.

Table 1. Control Group Sensory Attribute Frequency

Sensory Attribute	**Frequency (n = 86)**	**Sensory Attribute**	**Frequency (n = 86)**
ButteryAroma	91.86%	UmamiTaste	30.23%
LightColor	90.70%	MilkyTaste	30.23%
SaltyTaste	84.88%	SweetAroma	22.09%
Crispy	82.56%	Brittle	22.09%
ButteryTaste	77.91%	PaleColor	18.60%
SaltyAF	52.33%	GreasyAF	15.12%
SweetTaste	48.84%	AiryTexture	13.95%
SweetAF	48.84%	GreasyTexture	13.95%
Dry	46.51%	Hard	12.79%
Toasted	39.53%	Soft	8.14%
StarchyAF	37.21%	Cardboard	3.49%
MilkyAroma	36.05%	BitterAF	3.49%
Crumbly	30.23%	DarkColor	2.33%

According to table 1, the most dominant sensory attribute on the control sample was Buttery Aroma (91.86%), followed by the light color, salty taste, crispy, buttery taste, and Salty Aftertaste, all of which were chosen by more than 50% of the panelists.

Table 2. Group 1 Sensory Attribute Frequency

Sensory Attribute	**Frequency (n = 21)**	**Sensory Attribute**	**Frequency (n = 21)**
ButteryAroma	90.48%	StarchyAF	33.33%
ButteryTaste	76.19%	PaleColor	23.81%
LightColor	71.43%	MilkyAroma	23.81%
Crispy	66.67%	Crumbly	23.81%
SaltyAF	61.90%	GreasyAF	23.81%
SaltyTaste	57.14%	DarkColor	19.05%
Dry	47.62%	Brittle	19.05%
Toasted	42.86%	GreasyTexture	19.05%
SweetAF	42.86%	SweetAroma	14.29%

Hard	38.10%	AiryTexture	14.29%
SweetTaste	38.10%	Soft	9.52%
UmamiTaste	33.33%	BitterAF	9.52%
MilkyTaste	33.33%	Cardboard	4.76%

Table 2 shows that the most dominant sensory attribute on the group 1 sample was the same as the control, Buttery Aroma (90.48%), followed by the buttery taste, light color, crispy, salty aftertaste, and salty taste, all of which were selected by more than 50% of the panelists.

Table 3. Group 2 Sensory Attribute Frequency

Sensory Attribute	**Frequency (n = 21)**	**Sensory Attribute**	**Frequency (n = 21)**
Crispy	95.24%	PaleColor	19.05%
SaltyTaste	95.24%	Crumbly	19.05%
ButteryAroma	90.48%	Hard	19.05%
LightColor	85.71%	SweetTaste	19.05%
ButteryTaste	85.71%	SweetAF	19.05%
SaltyAF	66.67%	GreasyAF	19.05%
Toasted	47.62%	Cardboard	14.29%
Dry	42.86%	GreasyTexture	14.29%
StarchyAF	42.86%	MilkyAroma	9.52%
UmamiTaste	28.57%	Soft	9.52%
SweetAroma	23.81%	DarkColor	4.76%
Brittle	23.81%	BitterAF	4.76%
MilkyTaste	23.81%	AiryTexture	0.00%

Can be seen on table 3 that crispy texture and salty taste (95.24%) were the most dominant sensory attributes on the group 2 sample, followed by the buttery aroma, light color, buttery taste, and salty aftertaste, all of which were chosen by more than 50% of the panelists. However, there was no airy texture.

Table 4. Group 3 Sensory Attribute Frequency

Sensory Attribute	**Frequency (n = 21)**	**Sensory Attribute**	**Frequency (n = 21)**
SaltyTaste	95.24%	PaleColor	33.33%
ButteryAroma	85.71%	UmamiTaste	28.57%
LightColor	80.95%	Cardboard	23.81%
Crispy	80.95%	AiryTexture	23.81%
ButteryTaste	76.19%	GreasyTexture	23.81%
Dry	71.43%	Hard	23.81%

SweetTaste	66.67%	SweetAroma	19.05%
StarchyAF	66.67%	MilkyAroma	19.05%
Toasted	57.14%	Brittle	19.05%
SaltyAF	57.14%	DarkColor	14.29%
MilkyTaste	47.62%	GreasyAF	14.29%
Crumbly	42.86%	Soft	9.52%
SweetAF	42.86%	BitterAF	0.00%

Table 4 shows that the salty taste (95.24%) was the most dominant sensory attribute on the group 3 sample, followed by the buttery aroma, light color, crispy, buttery taste, dry, sweet aftertaste, starchy aftertaste, toasted aroma, and salty aftertaste, all of which were chosen by more than 50% of the panelists. However, there was no bitter aftertaste.

Table 5. Group 4 Sensory Attribute Frequency

Sensory Attribute	**Frequency (n = 23)**	**Sensory Attribute**	**Frequency (n = 23)**
ButteryAroma	95.65%	SweetAroma	34.78%
SaltyTaste	95.65%	Brittle	34.78%
LightColor	91.30%	Hard	26.09%
Crispy	78.26%	MilkyTaste	26.09%
ButteryTaste	78.26%	Crumbly	21.74%
SweetTaste	60.87%	GreasyTexture	21.74%
Dry	52.17%	UmamiTaste	21.74%
SweetAF	52.17%	GreasyAF	17.39%
MilkyAroma	43.48%	Cardboard	13.04%
SaltyAF	43.48%	Soft	13.04%
Toasted	39.13%	DarkColor	8.70%
StarchyAF	39.13%	AiryTexture	0.00%
PaleColor	34.78%	BitterAF	0.00%

Table 5 shows that the most dominant sensory attribute on the group 4 sample was buttery aroma (95.65%), followed by the salty taste, light color, crispy, buttery taste, sweet taste, dry, and sweet aftertaste, all of which were chosen by more than 50% of the panelists. However, there was no bitter aftertaste and airy texture. According to the results, double layer packaging offers a greater variety of sensory attributes such as sweet taste, sweet aftertaste, dry texture, starchy aftertaste, and toasted aroma.

3.2. Different sensory attributes compared to control

The sensory attributes were determined using CATA and the final list of lexicons used and measured is provided below (Table 6).

Table 6. The list of sensory attributes for CATA

Sensory Attribute			
Aroma	Sweet	Appearance	Light color
	Toasted		Pale color
	Buttery		Dark Color
	Cardboard	Taste	Sweet
	Milky		Salty
	Dry		Umami
	Brittle		Buttery
	Crispy		Milky
	Crumbly		Bitter
	Airy Texture		Salty
	Greasy		Sweet
	Soft		Starchy
	Hard		Greasy

The CATA results were first determined using the Cochran Q test, and the results show that all of the sample distributions are significant, implying that a post hoc McNemar test can be performed. McNemar tests were used to see if there were any significant differences within the sample, however there were no differences when each treatment group was compared to the control (Appendix 5.1-4). It denotes that there is no statistically significant difference in sensory attributes between the control and treatment groups.

3.3. Different sensory attributes compared within group

The methods used to compare sensory attributes within a group are the same as described above. The result shows (Appendix 5.5-7) that Group 1 compared with group 2, 3, and 4 has significant differences in salty taste (p value<0.05). Group 2 and 3 have significant differences in sweet taste (Appendix 5.8.). Group 2 and 4 have significant differences in milky aroma and sweet taste (Appendix 5.9.).

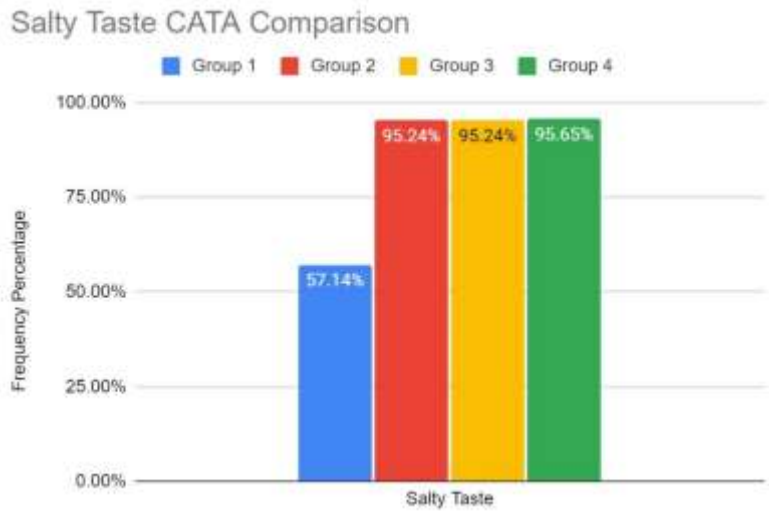

Figure 3. Salty Taste CATA Comparison Histogram

The frequency of the salty taste difference indicates that opaque packaging was believed to be saltier than transparent packaging (Figure 3). The double layer packaging also contributes to a small increase in the salty flavor.

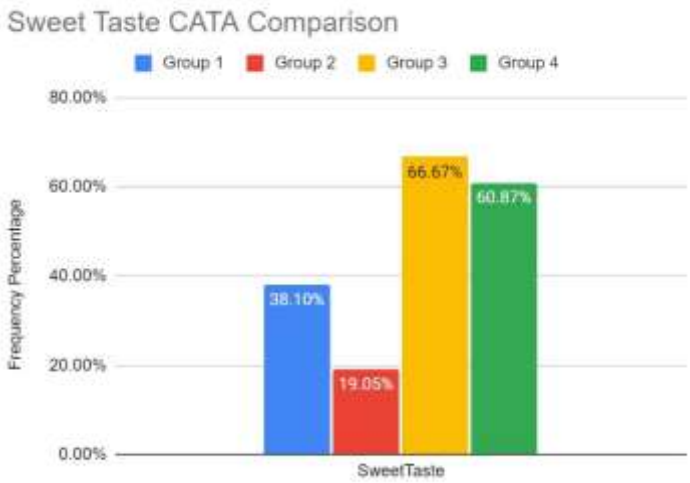

Figure 4. Sweet Taste CATA Comparison Histogram

The frequency of the sweet taste difference indicates that transparent packaging was believed to be sweeter than opaque packaging (Figure 4). The double layer packaging also contributes to an increase in the sweet flavor.

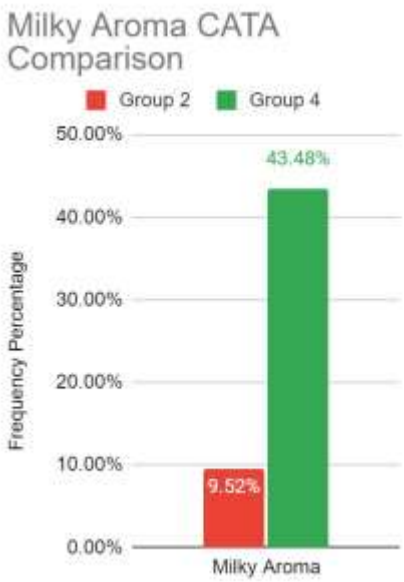

Figure 5. Milky Aroma CATA Comparison Histogram

Figure 5 shows that the sensory attribute milky aroma was more prevalent in sample group 4. It could be due to opaque packaging, the inner layer of the double layer packaging can keep the milky aroma, allowing more people to detect the aroma.

3.4. Different intensity sensory attributes within samples

The line scaling test was used to determine the intensity of the sensory attributes, and the data was processed using the Mann-Whitney test to determine whether there were any significant differences between groups.

Table 7. Mean and standard deviation of control and treatment group on appearance

	Light Color (cm)	Pale Color (cm)	Dark Color (cm)
Control	$9.32 \pm 2.52^{a, b}$	$8.97 \pm 3.31^{a, b}$	9.55 ± 1.56
Group 1	7.38 ± 3.00^{a}	10.22 ± 0.52^{a}	6.66 ± 5.16
Group 2	8.69 ± 2.75^{a}	$7.94 \pm 3.21^{a, b}$	9.45 ± 0
Group 3	10.56 ± 3.05^{b}	9.57 ± 3.43^{a}	4.40 ± 3.75
Group 4	8.97 ± 2.69^{a}	5.86 ± 2.13^{b}	6.50 ± 4.74

Note: different superscript letters within each sensory attribute (column) indicate significant difference at $p < 0.05$.

Table 7 shows that there were significant differences in light color intensity between all groups and group 3. The intensity of light on group 3 was the highest, which could be attributed to the transparent outer packaging and translucent inner packaging, as transparent materials have the ability to transmit light while translucent materials not only transmit but also diffuse light, making the sample seem lighter than the other groups (Guzman-Puyol et al., 2022). While group 4 differs significantly from groups 1 and 3 in terms of pale color, this could be due to the translucent inner packaging, which diffuses light.

Table 8. Mean and standard deviation of control and treatment group on aroma

	Sweet (cm)	**Toasted (cm)**	**Buttery (cm)**	**Cardboard (cm)**	**Milky (cm)**
Control	8.16 ± 3.51	7.74 ± 3.55	10.70 ± 2.30$^{a, b}$	9.13 ± 6.61	7.18 ± 3.10$^{a, b}$
Group 1	5.80 ± 1.17	6.97 ± 3.28	9.56 ± 2.42^{a}	13.40 ± 0	8.43 ± 1.32^{a}
Group 2	6.40 ± 2.72	8.76 ± 2.75	10.52 ± 2.65^{a,b}	12.35 ± 3.75	11.95 ± 1.76$^{a, b}$
Group 3	7.75 ± 3.83	8.94 ± 3.79	11.57 ± 2.82^{b}	8.73 ± 4.11	11.22 ± 1.81^{b}
Group 4	6.76 ± 3.61	7.50 ± 3.66	9.72 ± 3.07^{a,b}	4.60 ± 1.80	7.60 ± 3.53^{a,b}

Note: different superscript letters within each sensory attribute (column) indicate significant difference at $p < 0.05$

Table 8 shows that there was a significant difference in intensity in buttery and milky aroma between group 1 and group 3, this might happen because group 3 have an inner packaging which can keep the aroma intensity in the inner packaging. As discovered by Winotapun et al. (2019) the aroma barrier performance of multilayer LDPE films containing PLA was significantly improved, with optimum gas permeability desirable for modified atmosphere packaging to retain the quality of fresh-cut durian

throughout the storage period. It is also known that LDPE films can absorb ethylene; ethanol, ethyl acetate, ammonia, and hydrogen sulfide are used in the food industry to keep food fresher for longer and eliminate odors (Awulachew, 2022).

Table 9. Mean and standard deviation of control and treatment group on texture

	Dry (cm)	Brittle (cm)	Crispy (cm)	Crumbl y (cm)	Airy Texture (cm)	Greasy (cm)	Soft (cm)	Hard (cm)
Control	10.67 ± 3.18	10.25 ± 3.14^{a,b}	11.02 ± 2.88	9.69 ± 3.04	8.49 ± 3.46	9.39 ± 3.26^{a}	4.72 ± 1.47	9.68 ± 3.03
Group 1	9.39 ± 3.07	7.16 ± 2.69^{a,b}	9.63 ± 2.74	7.50 ± 3.92	7.77 ± 1.25	7.99 ± 3.70^{a,b}	5.82 ± 0.04	10.29 ± 2.27
Group 2	9.28 ± 3.73	5.99 ± 3.14^{a}	10.39 ± 2.30	7.69 ± 4.06	-	11.20 ± 1.00^{a}	1.45 ± 0	7.80 ± 4.67
Group 3	9.93 ± 2.61	9.82 ± 3.06^{a,b}	10.60 ± 3.09	9.43 ± 2.85	8.57 ± 4.36	6.78 ± 4.18^{a,b}	9.02 ± 2.23	9.50 ± 4.46
Group 4	8.85 ± 4.10	9.92 ± 2.13^{b}	10.43 ± 2.56	6.09 ± 3.99	-	7.13 ± 2.31^{b}	7.77 ± 0.61	7.93 ± 3.65

Note: different superscript letters within each sensory attribute (column) indicate significant difference at $p < 0.05$

Table 9 shows a significant difference in brittle and greasy texture intensity between groups 2 and 4, also greasy texture between control and group 4. From group 2 to group 4, the brittle texture increased (5.99 to 9.92 cm) while the greasy texture decreased (11.20 to 7.13 cm). It could be due to the inner packaging as mentioned above, which can keep the food fresher for longer. It is also known that an LDPE-based functional film is coated on the surface of wrapping paper to create a paper-based functional food packaging material that is resistant to water and grease (Shankar et al., 2019).

Table 10. Mean and standard deviation of control and treatment group on taste

	Sweet (cm)	Salty (cm)	Umami (cm)	Buttery (cm)	Milky (cm)
Control	7.90 ± 3.47	9.46 ± 2.92	9.11 ± 2.46	10.18 ± 2.52	$9.30 \pm 3.06^{a,b}$
Group 1	7.42 ± 3.11	9.95 ± 3.67	8.44 ± 3.94	9.07 ± 2.79	7.28 ± 2.39^{a}
Group 2	6.38 ± 4.06	9.58 ± 3.47	8.66 ± 3.15	8.84 ± 3.15	$6.85 \pm 4.20^{a,b}$
Group 3	7.88 ± 4.31	9.58 ± 3.84	11.46 ± 1.52	9.84 ± 3.16	11.16 ± 2.62^{b}
Group 4	7.44 ± 2.98	8.46 ± 3.11	8.54 ± 3.12	10.12 ± 2.86	10.76 ± 2.47^{b}

Note: different superscript letters within each sensory attribute (column) indicate significant difference at $p < 0.05$

Table 10 shows that there were significant differences in milky taste intensity between group 1 with group 3 & group 4. Cadwallader et al. (2022) discovered that LDPE, HDPE, and PET packaging can keep milk flavor.

Table 11. Mean and standard deviation of control and treatment group on aftertaste

	Bitter (cm)	Salty (cm)	Sweet (cm)	Starchy (cm)	Greasy (cm)
Control	4.38 ± 2.24	7.60 ± 4.00	7.68 ± 3.64	$8.33 \pm 3.45^{a,b}$	8.64 ± 2.88
Group 1	2.28 ± 0.25	7.32 ± 3.90	7.78 ± 3.05	7.24 ± 2.40^{a}	10.06 ± 2.48
Group 2	5.50 ± 0	7.86 ± 3.76	8.72 ± 3.67	$9.11 \pm 3.36^{a,b}$	11.82 ± 1.37
Group 3	-	6.70 ± 4.31	8.57 ± 3.40	$8.81 \pm 3.84^{a,b}$	9.65 ± 4.15
Group 4	-	7.22 ± 3.51	7.93 ± 3.40	10.17 ± 3.45^{b}	4.88 ± 3.31

Note: different superscript letters within each sensory attribute (column) indicate significant difference at $p < 0.05$

Table 11 shows that there were significant differences in starchy aftertaste between groups 1 and 4. It could be because of the inner packaging, as mentioned above, which keeps the food fresh, resulting in a less starchy aftertaste in group 4.

Transparent windows on food packaging can successfully highlight the actual food inside, attracting consumers' attention and increasing their proclivity to purchase. According to Simmonds et al. (2018), when compared to packaging that used food imagery and plain opaque packaging, transparent packaging increased purchase willingness, expected freshness, and expected quality.

People also expected the products to be tastier, more innovative, and more liked overall. Study by Ma et al. (2020) also found that transparent and food-graphic windows packaging of nuts, preserved fruits, and instant cereals showed greater salience effects than the regular opaque packaging. But even so, there was no significant difference between the transparent and graphic window conditions. However, from this experiment, it can be concluded that there was no significant difference between control, transparent and opaque packaging. But there are some attributes that differ in intensity between single layer and double layer packaging.

4.0 Conclusion and Discussion

The frequency of sensory attributes chosen suggests that double-layer packaging offers a wider range of sensory characteristics, such as sweet flavor, sweet aftertaste, dry texture, starchy aftertaste, and toasted scent. However, there were no noticeable differences in sensory attributes and intensity between control samples and different packaging designs, except when comparing different groups. Significant variations were found in salty flavor, sweet flavor, and milky scent.

In terms of attribute intensity, it can be inferred that transparent double-layer packaging produces the highest light color intensity. This is due to the transparent and translucent material used in the packaging's inner layer. The inner layer of the double-layer packaging also helps prolong food freshness, prevent odors from escaping, and enhance buttery scent, milky scent, brittle texture, and milky flavor. It also reduces greasy texture and starchy aftertaste. The results show significant differences between single-layer and double-layer packaging but not between transparent and opaque packaging. Future research should explore how packaging affects consumer perceptions of value, quality, and hygiene. The experimental design could be improved by having each panelist evaluate all packaging designs to account for individual differences in taste perception. Additionally, using commercially available samples that maintain consistent taste across production batches would enhance the robustness of the study.

Furthermore, this study presents a framework for understanding how personal brand orientation impacts digital business performance in SMEs. The findings show that personal brand orientation positively supports owner

education and vision for company success. Interestingly, the study also reveals that owner narcissism does not contribute to personal brand orientation for company success. This provides management with new insights on maximizing the owner's personal brand within the business context, as well as expanding networking opportunities and enhancing digital learning in SMEs. However, it is important to note that the study's findings may not apply to other countries and industries, as it focused only on Indonesian SMEs. Therefore, further research on personal brand orientation across different companies and industries is recommended.

About the authors:

Eddy Yansen is a highly accomplished researcher and educator with a Doctorate in Research Management from Universitas Pelita Harapan. Eddy has been actively teaching since 2017 and specializes in marketing research, particularly in the field of Neuromarketing. He is a member of The Neuromarketing Science and Business Association (NMSBA) and is dedicated to advancing knowledge in research management and the application of neuroscience in marketing.

Elizabeth Furio Perez holds a degree in Doctor in Business Administration and is currently the Dean of Indonesia International Institute for Life Science (i3L) School of Business in Jakarta, Indonesia. She has taught various business subjects and led the academic teams in different universities in the Philippines, Vietnam, UAE, Myanmar, and Indonesia.

Kelly Anviola holds a degree in Bachelor of Biomedicine and is currently pursuing her Master of BioManagement in Indonesia International Institute for Life Science (i3L) School of Life Science in Jakarta, Indonesia.

Andamar Pradipta is a PhD Candidate, and holds a degree in Master in Sociology and Social Anthropology and is currently working in the School of Business of Indonesia International Institute for Life Sciences as Lecturer and Student Affairs Coordinator.

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