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Differences in the Perception of Wine Packaging Attributes Based on Tactile-Visual and Visual-Only Texture Evaluation

ABSTRACT

Texture represents an important element of multisensory packaging design, which can be experienced not only through visual perception but also through tactile interaction with the packaging. Through touching and observing the packaging, texture can convey certain expectations, as well as aesthetic, emotional, and functional values to consumers. However, with the development of online sales, the formation of these expectations and values during purchasing is largely limited to the visual perception of the texture of packaging and products. For this reason, a study was conducted with the aim of identifying differences in perception that arise solely from the visual perception of texture and from texture that, in addition to visual perception, can also be touched. A total of 237 participants aged between 20 and 27 years took part in the study. The participants were divided into two groups depending on the conditions of interaction with the packaging. For the purposes of the study, physical wine packaging stimuli were created, on the surfaces of which texture was formed using glass, wax, paper, textile, twine, and stone. The results of the study showed that tactile interaction with the texture of wine packaging was generally associated with higher ratings of perceived packaging attributes. However, it was also observed that visual perception of certain textures and examined attributes may result in higher ratings compared with interaction that also includes tactile perception.

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1. Introduction

Packaging represents a formed or unformed material into which a product is placed, that is, packaged, in order to ensure its safe protection and transportation. It represents a complex technical and commercial system aimed at protecting the packaged contents from the final stage of production until use by end consumers, while at the same time facilitating transportation, handling, recognition, promotion, and marketing of the product (Đurđević, 2023; Sastre, de Paula & Echeveste, 2022). Over time, the functions of packaging, in addition to its primary role of protecting the packaged contents, have become numerous and important for the success of a product. Nowadays, packaging has become an integral part of the marketing mix, with the success of a product in a competitive market largely depending on its functional and aesthetic attributes.

The perception of these attributes is influenced by packaging elements that can be perceived visually, such as color, as well as elements that can be perceived through both sight and touch, such as the shape and texture of packaging (Spence, 2016). Although shape and texture can be experienced through touch, the mechanisms involved in obtaining information about

their characteristics through the sense of touch differ. To obtain information about shape, people use more active touch, which involves the participation of skin receptors, kinesthetic mechanisms, and mechanisms responsible for sensing the position and movement of the body. Such free exploration of a surface is referred to as haptic perception, whereas obtaining information about texture involves the activation of skin receptors resulting from changes in the skin, which is associated with passive touch (Fernandes & Albuquerque, 2012; Simões-Franklin, Whitaker & Newell, 2011).

Texture can be described as a set of visual and tactile characteristics of a surface, for describing and experiencing which people use a rich vocabulary. Visual texture can evoke associations in people that connect it with tactile experiences of that texture, while tactile experience can evoke memories of its visual appearance. These two modes of perception complement each other in forming a clear representation of the surface properties of a particular surface (Alerby & Opstad, 2022). In the context of packaging, texture largely depends on the packaging material used for its production.

Packaging texture represents a means of communication through which designers and companies seek to evoke certain emotions and sensations in consumers, while its experience as pleasant or unpleasant to the touch depends on previous experiences and associations related to that experience (Tangeland, Schulte & Boks, 2008; Alerby & Opstad, 2022). Considering the importance of sight and touch in the perception of packaging texture, a study was conducted with the aim of determining differences in the perception of packaging attributes under conditions of tactile and visual perception of texture on the surface of wine packaging and under conditions of exclusively visual perception of texture.

The examined packaging attributes included the suitability of the texture for wine packaging, as well as the influence of texture on the perception of innovativeness, authenticity, and luxury of wine packaging.

2. Methods

The experimental part of the study was conducted with the aim of examining differences in the perception of wine packaging attributes depending on the conditions of interaction with its texture. A total of 237 participants took part in the study, including 177 women and 60 men. All participants were students of the Graphic Engineering and Design study program, aged between 20 and 27 years.

Depending on the conditions of interaction with the packaging, the participants were divided into two groups. The first group consisted of 137 participants who evaluated the influence of texture on the examined wine packaging attributes based on tactile and visual perception of the texture. The second group consisted of 100 participants who evaluated the influence of texture on the examined attributes exclusively based on photographs presented as part of the data collection instrument, with one representative stimulus shown for each material used in the study.

2.1. Experimental stimuli

A total of 16 physical wine packaging stimuli were used for the purposes of the study. Fifteen stimuli were covered with different materials: wax, paper, textile, twine, and stone, while one stimulus represented uncoated glass wine packaging. Each material used to cover the wine packaging was represented through three variations of the texture of the applied material, achieved through different application techniques, degrees of crumpling, weave structures, thicknesses, or grain sizes of the material (Figure 1).

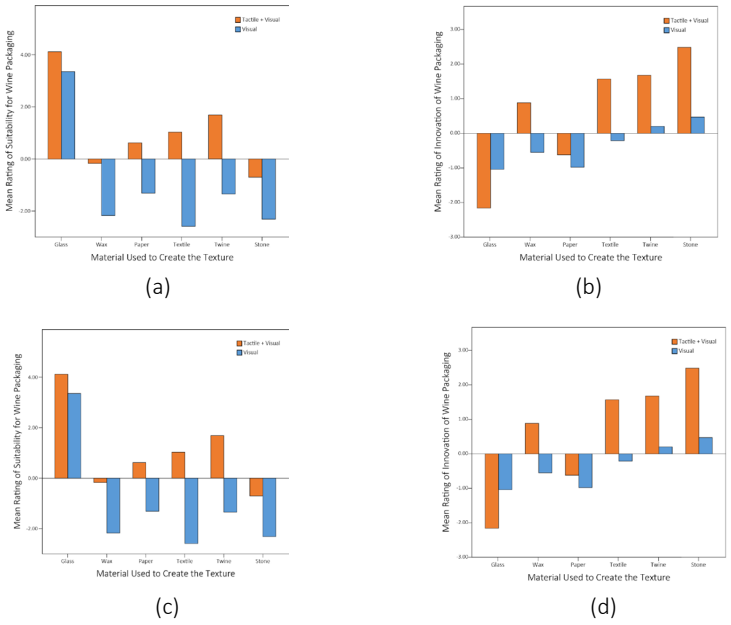


» **Figure 1:** *Overview of the stimuli used in the study: a) uncoated glass packaging, b) wax-covered packaging, c) paper-covered packaging, d) textile-covered packaging, e) twine-covered packaging, and f) stone-covered packaging*

Wax was applied using three different techniques: dipping the bottle in wax, applying wax with a brush, and allowing wax to drip onto the surface of the packaging. Paper was applied in three degrees of crumpling: smooth, moderately crumpled, and heavily crumpled. Textile was applied in three weave structures: fine, medium, and coarse. Twine was applied in three thicknesses: 1 mm, 2 mm, and 4 mm. Stone was applied in three grain sizes: fine sand, medium-grained stone particles, and coarse-grained stone particles with a diameter of approximately 5 mm.

2.2. Experimental procedure and survey instrument

The participants in the first group were presented with physical wine packaging stimuli that enabled them



» **Figure 2:** *Graphical presentation of the results: a) perceived suitability of the texture for wine packaging, b) perceived innovativeness, c) perceived authenticity, and d) perceived luxury*

to interact with the textures through the senses of touch and sight. This group was able to interact with each of the materials used in the study, as well as with different texture variations within each material. Before the evaluation began, the participants were introduced to the materials and texture variations used to create the stimuli. No additional information was provided about the properties of the materials that could potentially influence their perception.

The materials were presented to the participants in a random order, with all three texture variations of one material being evaluated before moving on to the next material. The second group evaluated the packaging attributes exclusively based on the visual perception of the textures, which is why photographs of the stimuli were presented to them. The order of presentation of the stimuli was the same for each examined attribute. For each material used in the study, one representative texture variation of the stimulus was selected and presented to this group.

No additional information about the materials or the textures of the wine packaging was provided to the participants. After evaluating the stimuli, the participants recorded their responses in the data collection instrument, which was created using the Google Forms platform. Both groups evaluated the same wine packaging attributes: suitability, innovativeness, authenticity, and luxury. A Likert-type scale ranging from −5 to +5 was used in the instrument. A rating of 5 represented the highest level of the examined attribute, while a rating of −5 represented the lowest level. The collected data were analyzed using appropriate statistical methods with IBM SPSS Statistics 22.

3. Results

The results of the study were analyzed using independent-samples t-tests to determine whether there were statistically significant differences in the ratings of the influence of texture on the perception of the examined wine packaging attributes depending on the conditions of interaction. Results with p-values lower than .05 were considered statistically significant.

For each examined packaging attribute, the mean ratings are graphically presented in Figure 2, while a detailed overview of the descriptive statistics and t-test results is provided in the following subsections.

3.1. Differences in the influence of texture on the perception of suitability for wine packaging

Table 1 presents the descriptive statistics of the ratings of the perceived suitability of textures for wine packaging for different materials and experimental conditions. The highest mean rating was recorded for glass in the tactile-visual group (M = 4.12, SD = 1.79). In contrast, the lowest mean rating was recorded for textile in the visual group (M = −2.60, SD = 2.47). The largest difference between the groups was observed for textile, with the tactile-visual group giving a significantly higher mean rating of the perceived suitability of the texture for wine packaging (M = 1.03) compared with the visual group (M = −2.60).

Table 1

Descriptive statistics of perceived suitability of texture for wine packaging for both groups

Stimulus	Condition	N	Mean	SD	Std. Error Mean
Glass	Visual + Tactile	137	4.12	1.79	0.15
	Visual	100	3.37	2.96	0.29
Wax	Visual + Tactile	137	-0.17	2.95	0.25
	Visual	100	-2.12	2.94	0.29
Paper	Visual + Tactile	137	0.62	2.48	0.21
	Visual	100	-1.28	3.22	0.32
Textile	Visual + Tactile	137	1.03	2.29	0.19
	Visual	100	-2.60	2.47	0.25
Twine	Visual + Tactile	137	1.69	2.53	0.22
	Visual	100	-1.35	2.91	0.29
Stone	Visual + Tactile	137	-0.70	3.04	0.26
	Visual	100	-2.33	2.73	0.27

Independent t-tests revealed statistically significant differences in the mean ratings of the suitability of the textures for wine packaging between the tactile-visual and visual groups for textures formed using glass, $t(151.12) = 2.24$, $p < .05$; wax, $t(235) = 5.04$, $p < .05$; paper, $t(178.76) = 4.93$, $p < .05$; textile, $t(203.64) = 11.50$, $p < .05$; twine, $t(195.18) = 8.37$, $p < .05$; and stone, $t(235) = 4.25$, $p < .05$. The tactile-visual group gave higher mean ratings of the suitability of the textures for wine packaging for all examined materials compared with the visual group.

3.2. Differences in the influence of texture on the perception of innovativeness of wine packaging

Table 2 presents the descriptive statistics of the ratings of the perceived innovativeness of wine packaging for different materials and experimental conditions. The highest mean rating was recorded for stone in the tactile-visual group (M = 2.48, SD = 2.65). In contrast, the lowest mean rating was recorded for glass in the tactile-visual group (M = −2.16, SD = 2.77). The largest difference between the groups was observed for stone, with the tactile-visual group giving a significantly higher mean rating of the perceived innovativeness of wine packaging (M = 2.48) compared with the visual group (M = 0.47).

Independent t-tests revealed statistically significant differences in the mean ratings of innovativeness between the tactile-visual and visual groups for textures formed using glass, $t(171.76) = -2.51$, $p < .05$; wax, $t(195.46) = 4.00$, $p < .05$; textile, $t(183.25) = 5.14$, $p < .05$; twine, $t(188.08) = 3.93$, $p < .05$; and stone, $t(187.22) = 5.10$, $p < .05$. No statistically significant differences in the mean ratings between the groups were observed for the texture formed using paper. The tactile-visual group gave higher mean ratings of innovativeness for wine packaging covered with wax, textile, twine, and stone,

Table 2

Descriptive statistics of perceived innovativeness for both groups

Stimulus	Condition	N	Mean	SD	Std. Error Mean
Glass	Visual + Tactile	137	-2.16	2.77	0.24
	Visual	100	-1.04	3.80	0.38
Wax	Visual + Tactile	137	0.88	2.51	0.21
	Visual	100	-0.55	2.88	0.29
Paper	Visual + Tactile	137	-0.62	2.18	0.19
	Visual	100	-0.98	2.71	0.27
Textile	Visual + Tactile	137	1.57	2.28	0.19
	Visual	100	-0.21	2.86	0.29
Twine	Visual + Tactile	137	1.68	2.54	0.22
	Visual	100	0.20	3.07	0.31
Stone	Visual + Tactile	137	2.48	2.65	0.23
	Visual	100	0.47	3.23	0.32

Table 3

Descriptive statistics of perceived authenticity for both groups

Stimulus	Condition	N	Mean	SD	Std. Error Mean
Glass	Visual + Tactile	137	0.03	2.60	0.22
	Visual	100	0.92	3.13	0.31
Wax	Visual + Tactile	137	1.31	2.54	0.22
	Visual	100	0.78	2.76	0.28
Paper	Visual + Tactile	137	-0.09	2.37	0.20
	Visual	100	-0.04	2.88	0.29
Textile	Visual + Tactile	137	1.15	2.53	0.22
	Visual	100	0.07	2.88	0.29
Twine	Visual + Tactile	137	2.42	2.33	0.20
	Visual	100	1.04	2.78	0.28
Stone	Visual + Tactile	137	1.61	3.10	0.26
	Visual	100	1.04	3.37	0.34

while the visual group gave a higher mean rating of innovativeness for uncoated glass wine packaging.

3.3. Differences in the influence of texture on the perception of authenticity of wine packaging

Table 3 presents the descriptive statistics of the ratings of the perceived authenticity of wine packaging for different materials and experimental conditions. The highest mean rating was recorded for twine in the tactile-visual group (M = 2.42, SD = 2.33). In contrast, the lowest mean rating was recorded for paper in the tactile-visual group (M = −0.09, SD = 2.37). The largest difference between the groups was observed for twine, with the tactile-visual group giving a significantly higher mean rating of the perceived authenticity of wine packaging (M = 2.42) compared with the visual group (M = 1.04).

Independent t-tests revealed statistically significant differences in the mean ratings of authenticity between the tactile-visual and visual groups for textures formed using glass, $t(189.02) = -2.32$, $p < .05$; textile, $t(235) = 3.05$, $p < .05$; and twine, $t(235) = 4.13$, $p < .05$. No statistically significant differences in the mean ratings between the groups were observed for the textures formed using wax, paper, and stone. The tactile-visual group gave higher mean ratings of authenticity for wine packaging covered with textile and twine, while the visual group gave a higher mean rating of authenticity for uncoated glass wine packaging.

3.4. Differences in the influence of texture on the perception of luxury of wine packaging

Table 4 presents the descriptive statistics of the ratings of the perceived luxury of wine packaging for

Table 4

Descriptive statistics of perceived luxury for both groups

Stimulus	Condition	N	Mean	SD	Std. Error Mean
Glass	Visual + Tactile	137	1.44	2.56	0.22
	Visual	100	2.38	2.62	0.26
Wax	Visual + Tactile	137	0.02	2.90	0.25
	Visual	100	-0.94	3.33	0.33
Paper	Visual + Tactile	137	-0.47	2.42	0.21
	Visual	100	-1.54	2.71	0.27
Textile	Visual + Tactile	137	1.18	2.55	0.22
	Visual	100	-0.98	2.94	0.29
Twine	Visual + Tactile	137	1.31	2.57	0.22
	Visual	100	-0.36	3.05	0.30
Stone	Visual + Tactile	137	1.02	3.25	0.28
	Visual	100	-0.07	3.27	0.33

different materials and experimental conditions. The highest mean rating was recorded for glass in the visual group (M = 2.38, SD = 2.62). In contrast, the lowest mean rating was recorded for paper in the visual group (M = −1.54, SD = 2.71). The largest difference between the groups was observed for textile, with the tactile-visual group giving a significantly higher mean rating of the perceived luxury of wine packaging (M = 1.18) compared with the visual group (M = −0.98).

Independent t-tests revealed statistically significant differences in the mean ratings of luxury between the tactile-visual and visual groups for textures formed using glass, $t(235) = -2.77$, $p < .05$; wax, $t(235) = 2.37$, $p < .05$; paper, $t(198.93) = 3.13$, $p < .05$; textile, $t(194.65) = 5.91$, $p < .05$; twine, $t(190.94) = 4.43$, $p < .05$; and stone, $t(235) = 2.55$, $p < .05$. The tactile-visual group gave higher mean ratings of luxury for wine packaging covered with wax, paper, textile, twine, and stone, while the visual group gave a higher mean rating of luxury for uncoated glass wine packaging.

4. Discussion

The results presented in the previous chapter indicate that tactile interaction with the texture of wine packaging was generally associated with a more positive perception of innovativeness, authenticity, and luxury, and particularly with the perception of the suitability of the texture for making packaging. Participants who had the opportunity to touch the stimuli made from each material included in the study consistently rated the texture as more suitable compared with evaluations based exclusively on the visual perception of texture. The difference between the groups was also significant for glass, which, as a material, is recognizable due to its properties and suitable for packaging products in this category.

Regarding innovativeness, the tactile group generally gave higher mean ratings of the innovativeness of wine packaging, but not as consistently as was the case with the suitability of the texture for making wine packaging. Regarding glass, which is traditionally used for this purpose, participants who made their evaluations solely on the basis of visual texture could have obtained less information about the texture and its surface characteristics compared with the tactile group. The recognizable cold and smooth surface of glass may have influenced participants to recognize with greater certainty that it is a traditional and commonly used material for this purpose, which may have contributed to them perceiving the texture of this material as less innovative compared with the visual group.

The least consistent pattern of higher ratings by the tactile group was observed in the perception of the authenticity of wine packaging, with ratings being statistically significantly higher only for textile and twine compared with the visual group. These results may be explained by the fact that participants who had the opportunity to touch the textures formed using these materials received additional information that could have triggered memories and associations with some traditional ways of decorating wine packaging, as well as with products from the broader cultural context.

Regarding the influence of wine packaging texture on the perception of luxury, the tactile group gave higher ratings of luxury for wax, paper, textile, twine, and stone, possibly due to the rich tactile experience that the textures formed using these materials could provide. On the other hand, the visual group gave a higher mean rating for glass, which can be associated with the gloss of the glass surface. Since glass was the only material whose gloss was clearly visible in the photographs presented, this visual characteristic may have contributed to the formation of a more pronounced perception of luxury among the visual group.

5. Conclusion

The results of this study indicated the importance of consumers' tactile interaction with packaging texture when evaluating the attributes of wine packaging. The possibility of touching the texture of wine packaging was generally associated with higher ratings of the suitability of the texture for making wine packaging, as well as the innovativeness, authenticity, and luxury of wine packaging. The significance of this study lies in highlighting the importance of enabling consumers to engage in tactile interaction with packaging during the purchasing process. When such an opportunity exists and consumers are sufficiently motivated to further examine the packaging texture through the sense of touch, such interaction should be enabled because it can positively influence their evaluations of packaging attributes. Considering that consumers often cannot separate what they think and feel while handling packaging from what they think and feel about the product, such interaction can also influence their perception of product attributes. Future research could examine how different textures, during tactile interaction with the surface of wine packaging, contribute to the formation of perceptions of different wine packaging attributes. The limitations of this study relate to the relatively narrow age range of the participants, with the majority of the sample consisting of students between 20 and 27 years of age. Therefore, future research could include participants from a broader age range.

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