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Original article

Exploring the effects of packaging on consumer experience and purchase behaviour: insights from eye tracking and facial expressions on orange juice

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Summary Packaging is crucial in attracting consumer attention, conveying product identity, influencing product perception and affecting approach-based consumer behaviours. The present exploratory study aimed to gain insights into the effects of packaging on consumer experiences and the factors driving willingness to buy different orange juice products based on packaging. Eye tracking and facial expressions were used to capture the consumer perception journey, from the initial interaction to the final product evaluation. The study also examined hedonic liking, explicit emotions and different label attributes in the evaluation stage, and the importance of texture, price and the New Zealand (NZ)-made logo in the validation stage. Results showed that the packaging's physical features significantly affected consumer's attention during the initial interaction stage. Implicit emotions provided deeper insights into consumers' preferences in the orientation stage. Nutritional information gained maximum visual attention (fixation counts = 0.40) in the evaluation stage, while the NZ-made logo (odds ratio = 15.62) drove purchase intention. The study revealed that the packaging that attracted the maximum attention was not necessarily the one with the highest liking score. Moreover, consumers may not pay much visual attention to attributes (price, $r = -0.22$) that they reported to be important. By advancing our knowledge in this field, marketers and product designers can refine their strategies and create packaging that captures visual attention and evokes positive emotional responses, ultimately influencing consumer behaviours.

Keywords Emotions, facial expressions, hedonic liking, packaging type, visual attention, willingness to buy.

Introduction

Packaging is more than a product-carrying medium; it is a powerful marketing tool that attracts consumers' attention with its aesthetic qualities. When consumers engage in everyday grocery shopping, their attention and choices are often influenced by the product's visual appearance (Clement *et al.*, 2013; Husić-Mehmedović *et al.*, 2017). Packaging can steer consumer approach-based behaviour with its visual and aesthetic abilities (Mehta *et al.*, 2022), especially for low-involvement products. Consumers rely heavily on visual cues to make quick, effortless decisions regarding low-involvement products (Silayoi & Speece, 2004), such as the case of fruit juices. Given the competitive nature of the beverage market, it is crucial for juice packaging to stand out on the supermarket shelf and capture consumers' interest, especially considering the limited time consumers have to make decisions (Bahrainizad & Rajabi, 2018). Attractive and well-designed packaging can capture consumers' attention and induce a positive product evaluation. On the other hand, poorly designed packaging can have an adverse effect on consumer choices (Young & Ciummo, 2009).

In supermarket shopping behaviours, consumer decisions are often driven by elicited emotions rather than rational choices. Therefore, it is essential to understand the emotional responses of consumers to different product's design factors such as colour, texture and labels to assess their effect on approach-based consumer behaviours (Merlo *et al.*, 2019; Clark *et al.*, 2021; Mehta *et al.*, 2022). Emotions are typically categorised into explicit or consciously expressed and implicit or unconscious or automatic emotions, which impact perception, attention and subsequent behaviours

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(Lagast *et al.*, 2017). Emotions (explicit and implicit) evoked by different milk packaging can significantly influence consumer purchasing behaviours (Clark *et al.*, 2021). Negative explicit emotions evoked by packaging can create a negative impression of the product, deterring consumers' purchase intentions (Mehta *et al.*, 2022). Emotions also play a significant role in decision-making processes, such as perception, attention, evaluation and post-purchase satisfaction (de Wijk & Noldus, 2021). Combining implicit and explicit emotional measurements allows researchers to gain a more comprehensive understanding of the emotional drivers behind consumer purchase intentions. Notably, the studies mentioned so far have not integrated emotions (both explicit and implicit) alongside functional and cognitive effects to comprehensively understand consumers' overall experiences in a supermarket scenario.

Eye tracking, a novel biometric technique, measures consumers' physical gaze inputs to visual stimuli, capturing attention-fixation points and potentially affecting the approach-based behaviours of consumers (Ares *et al.*, 2014; Rebollar *et al.*, 2015; Husić-Mehmedović *et al.*, 2017; Merdian *et al.*, 2021; Liu *et al.*, 2022). In consumer behaviour studies (Simmonds & Spence, 2017; Huang *et al.*, 2021), gaze patterns quantify visual attention, impacting decision-making and food choices (Torrico *et al.*, 2022). Visual attention in the supermarket can be divided into orientation and evaluation stages (Clement *et al.*, 2013), with the former being fast, non-selective and pre-attentive, providing a quick product overview. The latter is slow, selective and requires knowledge inputs, with consumers deciphering exogenous factors to make a final decision. The present study focused on exogenous factors related to packaging, which are under managerial control.

Exogenous factors can be physical, semantic or context-related features. Clement *et al.* (2013) stated that the physical attributes (colour, texture and shape) draw initial attention, while semantic features (picture, brand, logo and text) need more focused evaluation. Bialkova *et al.* (2020) stated that brand strength and shelf placements drove consumer attention and choice. While Husić-Mehmedović *et al.* (2017) emphasise the impact of physical features on initial visual attention, semantic factors become prominent during the evaluation stage. Piqueras-Fiszman *et al.* (2013) found that different textures of jam jars, such as ridged surfaces, attract visual attention. Torrico *et al.* (2018) explored baby formula labels, indicating that consumers preferred figures that garner a higher value of fixation points, and a longer fixation duration, particularly with colour transitions.

Label elements such as logos, country-of-origin seals and price information significantly affected consumer attention and food choices in previous studies (Bogomolova *et al.*, 2020; Rödiger & Hamm, 2020; Liu *et al.*, 2022). Helmert *et al.* (2017) demonstrated that using different coloured price tags for suboptimal fresh produce impacted visual attention and willingness to purchase from consumers. Similarly, other studies highlighted the role of price as a determinant factor of product quality and purchase intention (Petrescu *et al.*, 2020; Kovacs & Keresztes, 2022; Boccia *et al.*, 2023). Amid the pandemic, country-of-origin labels (COOL) gained importance as an assurance of product quality based on the product's origin. Recent studies underscored the significance of COOL in various products such as Italian olive oil (Bimbo *et al.*, 2020; Carzedda *et al.*, 2021), French wine (Valentin *et al.*, 2021), speciality coffee (Teuber & Herrmann, 2012) and meat (Holdershaw & Konopka, 2023).

The present research covered this gap by combining emotions (explicit and implicit) with visual attention measurements to gain a more comprehensive understanding of the consumer experiences throughout the product journey, which spans from the initial interaction with the product to the point of purchase. Specifically, this research focussed on various attributes of different orange juice packaging. The study hypothesised that packaging attributes affect consumers' gaze behaviours, and explored whether these correlate with emotions (both implicit and explicit) elicited during the orientation and evaluation stages within the packaging interaction. Additionally, the study aimed to determine whether consumers have higher fixation points to specific attributes, which can imply higher perceived values of those elements.

Material and methods

Participants

Eighty-four participants (50 women and 34 men), 64% in the age group of 18–34 and 36% above 35 years volunteered for the study. The participants were staff and students at Lincoln University recruited through email. The inclusion criteria were that participants had a normal or corrected-to-normal full-colour vision. Also, the participants reported that they were involved in everyday grocery shopping. The study was conducted as per the ethical requirement (HEC2021-08) of Lincoln University, New Zealand (NZ). The participants were awarded chocolates for their contribution.

Stimuli and apparatus

Four kinds of packaging (glass, plastic bottle, pouch and tetra pack™) were selected for the experiment based on the market survey and previous study (Mehta *et al.*, 2022). The label on the packaging consisted of the brand name, product picture, nutritional information [which was taken from a previous study

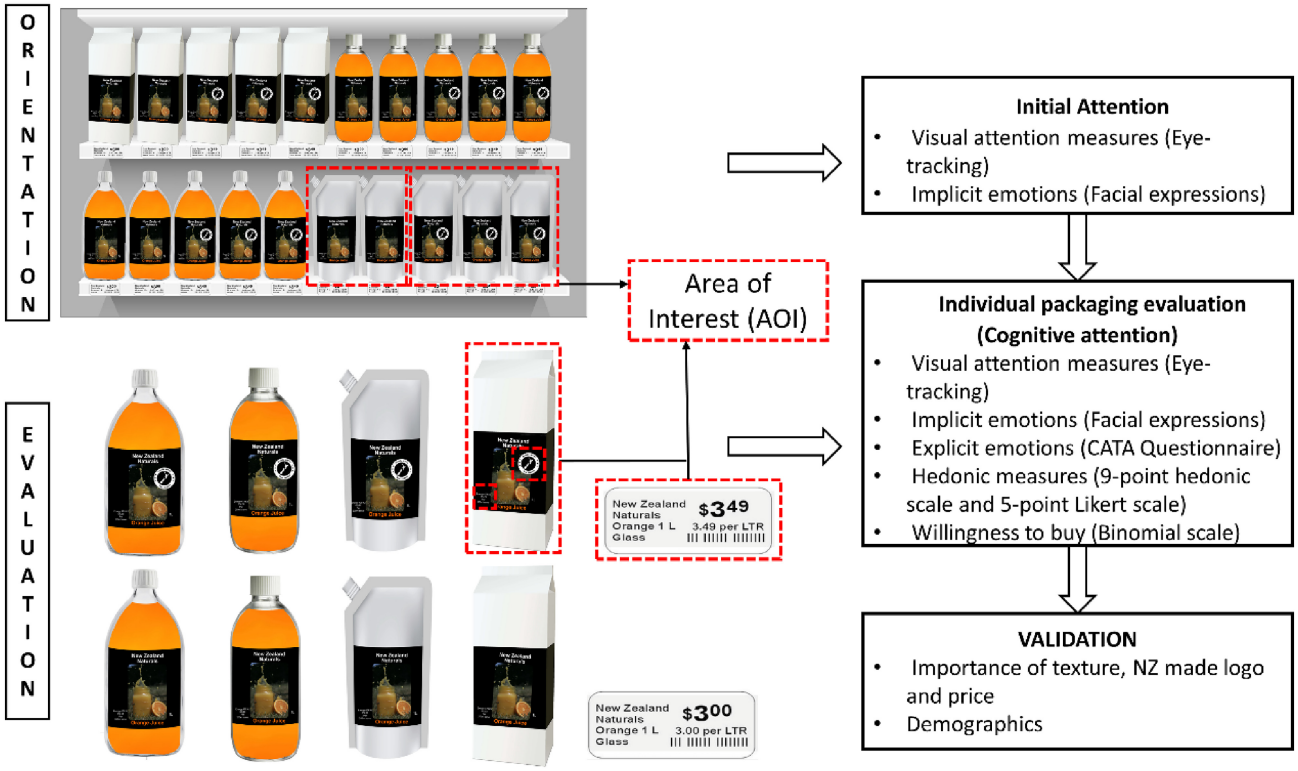

Figure 1 Experimental layout of the study.

conducted by Mehta *et al.*, 2022] and a country-of-origin logo, which was designed as a picture with the country map and the 'Proudly Made in New Zealand' statement written around it (logo commonly found in New Zealand products). The packaging with the NZ-made logo had a price tag of 3.49$, and the packaging without the NZ-made logo had a price tag of 3.00$ based on the market survey and studies related to the price tag of organic and locally made products (Feldmann & Hamm, 2015; Van Loo *et al.*, 2015). The supermarket layout and eight packaging types, a combination of four textures (glass, plastic bottle, pouch and tetra pack) x two labels (with and without the NZ-made logo) (Fig. 1), were edited using Adobe Premier CS4 (Adobe®, Melbourne, Victoria, Australia).

Equipment

GP3 eye-tracker (Gazepoint, Vancouver, BC, Canada) (www.gazept.com) and iMotions software (iMotions, 2022) were used to collect and process the eye-tracking data. The data were viewed from a 60 cm distance at 0.5–1.0° visual accuracy. The refresh rate of the eye tracker was 60 Hz. In addition, individual calibrations were done using the 9-point calibration method to minimise tracking errors. The stimuli were displayed on a full-screen 24″ monitor (Samsung, Suwon-Si, South Korea) with a viewing angle of 178° vertically and horizontally. The screen's resolution was 1920 by 1080 pixels with a refresh rate of 60 Hz.

Facial expressions were recorded with a full HD webcam on the Samsung monitor (Samsung, Suwon-Si, South Korea) for an integrated facial recognition measurement. The stimuli presentation, eye-tracking measurements and camera recordings were controlled by the iMotions 8.1 software (iMotions, Inc., Copenhagen, Denmark). The automated facial coding module AFFDEX (Affectiva Inc., Boston, MA, USA) was used to post-process the recorded videos, measuring seven core emotions (happy, angry, sad, contempt, surprise, fear and disgust) and two involvement markers (engagement and valence). In addition, the AFFDEX module creates the numeric scores for the 20 action units (specific facial muscle movement) and core emotions on a scale from 0 (no expression) to 100 (expression detected).

Procedure

The research was designed into three stages: orientation, evaluation and validation, as shown in Fig. 1. In the natural environment of supermarkets, there are

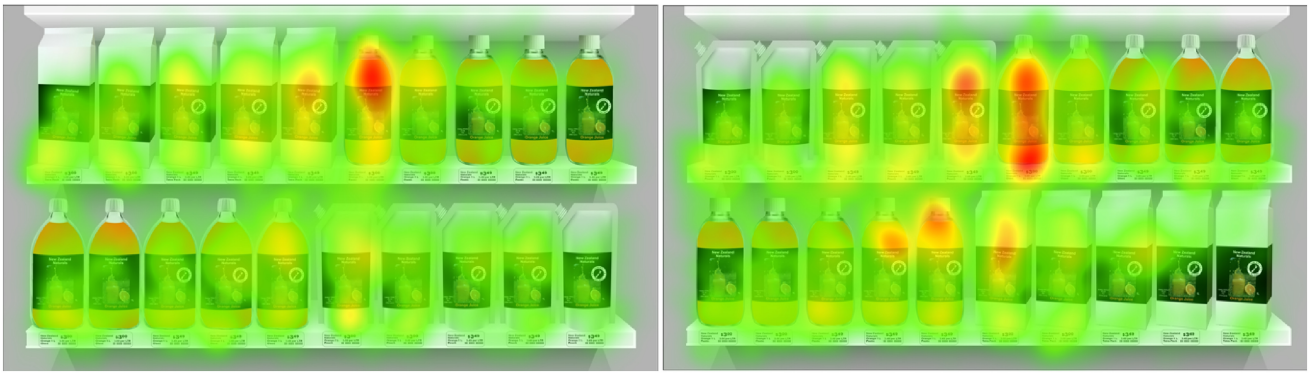

Figure 2 A heatmap representation of the supermarket juice shelves 1 and 2 with four kinds of packaging (glass, plastic bottle, pouch and tetra pack). Red and orange indicate the most viewed area, while green shows the least viewed area.

many confounding factors, such as shelf position, noise, posters or advertisements and other people shopping, which might distract the consumer's attention and perception (Reimann *et al*., 2010; Clement *et al*., 2013). Therefore, the present study was conducted in controlled laboratory conditions to understand the effect of the packaging texture, NZ-made logo, nutritional information and price on the consumer's visual attention and perception. In addition, the participants' facial expressions were also recorded to understand the elicited implicit emotions in the orientation and evaluation stages.

In the orientation stage, the eight-juice packaging was displayed on simulated supermarket shelves (Fig. 2). The samples were randomly placed in the collage to replicate the shelf context in supermarkets. The two collages were randomly shown to the participants to overcome the packaging position effect, and the results were measured as the average of both collages. The price tags of the samples were also incorporated in the design set up of the shelves (Van Loo *et al*., 2015). Based on previous research (Orquin & Scholderer, 2011), the collage was shown for 10 s in the orientation stage. The time considered was adequate to evaluate consumers' attention in a free viewing situation (Orquin & Scholderer, 2011; Husić-Mehmedović *et al*., 2017).

In the evaluation stage, participants were randomly shown the individual packaging and price tag on the monitor screen (one sample at a time). The individual displayed packaging had predefined areas of interest (AOIs), such as the NZ-made logo, packaging texture, nutritional information (NI) and price tag (Fig. 1). AOIs are the predefined rectangular shapes superimposed on the interested area of the image. Based on previous research, the participants were shown each sample for a duration of 10 s (Chandon *et al*., 2009). The final measurement was the average of how many participants fixed their gaze at least once inside the AOI. The visual attention measurements reported in the study were the fixation counts (per cm^2), time to first fixation (TTFF, s), total fixation duration (ms) and first fixation duration (ms). Due to the difference in the size of the different AOIs in the study, the fixation count result was expressed as per square centimetre of the label.

The participants also reported explicit emotions, purchase intention and packaging liking in the evaluation stage. The check-all-that-apply (CATA) questionnaire measured participants' explicit emotions while recalling the packaging, using $n = 25$ selected emotions were included from a previous study (Mehta *et al*., 2022) and focus group. Emotional terms such as 'active', 'adventurous', 'aggressive', 'bored', 'calm', 'disgusted', 'enthusiastic', 'energetic', 'free', 'glad', 'good', 'guilty', 'happy', 'interested', 'joyful', 'merry', 'mild', 'peaceful', 'pleased', 'pleasant', 'sad', 'satisfied', 'surprise', 'wild' and 'worried' were selected from a focus group ($N = 15$) discussion. The emotional terms were selected on consensus within the focus group and were based on the frequency of use (>20%) categorisation. The dichotomous criterion (0 = 'will not buy the product' and 1 = 'will buy the product') was used to assess the willingness to buy (WTB) the juice packaging by asking, 'If you are given $5 to buy a juice of your choice, Will you buy this product?'. The overall packaging liking was measured using the 9-point hedonic scale, and the appeal of the packaging was measured using the question 'How appealing is the packaging?' on a 5-point Likert scale (Westerman *et al*., 2013).

In the validation stage, participants were asked to answer attitudinal questions related to the importance of packaging attributes (price, NZ-made logo and texture) on a 5-point Likert scale, ranging from 0 (not at all important) to 5 (extremely important) (Van Loo

Table 1 Mean and standard deviation values of visual attention measurements concerning packaging displayed on supermarket shelves 1 and 2

Stimuli	Fixation Count (per cm^2)	TTFF (s)	First fixation duration (ms)	Total fixation duration (ms)
Glass	0.05 ± 0.04^{a}	5.23 ± 3.44^{ab}	99.18 ± 39.64^{a}	106.29 ± 29.40^{a}
Glass L	0.02 ± 0.02^{c}	6.02 ± 3.17^{a}	101.51 ± 39.02^{a}	97.63 ± 21.05^{a}
Plastic	0.04 ± 0.05^{ab}	4.15 ± 3.03^{bc}	103.63 ± 36.37^{a}	109.89 ± 28.0^{a}
Plastic L	0.03 ± 0.03^{c}	5.63 ± 3.03^{ab}	98.31 ± 38.88^{a}	103.71 ± 33.42^{a}
Pouch	0.03 ± 0.02^{c}	4.91 ± 3.52^{abc}	102.08 ± 47.44^{a}	104.28 ± 35.18^{a}
Pouch L	0.03 ± 0.02^{c}	4.72 ± 3.75^{abc}	98.68 ± 45.25^{a}	101.06 ± 25.97^{a}
Tetra pack	0.03 ± 0.01^{bc}	3.53 ± 3.22^{c}	100.57 ± 36.19^{a}	103.08 ± 21.61^{a}
Tetra pack L	0.02 ± 0.02^{c}	5.91 ± 3.32^{a}	99.43 ± 31.66^{a}	105.27 ± 26.03^{a}

Different superscripts depict significant differences ($P < 0.05$) between packaging. L signifies packaging with NZ-made logo and TTFF signifies time to first fixation.

et al., 2010). At the end of the questionnaire, demographic (age, gender and ethnicity) information was obtained. All questions in the survey and the data collection were administered using the Redjade® Sensory Software (Redjade® software, CA, USA) (RedJade, 2022).

Statistical and data analysis

The visual attention measurements, attitudinal questions and overall liking were analysed using the Minitab® Statistical Software (ver. 19.2020.2, Pennsylvania, USA) (Minitab, 2021). One-way analysis of variance ($P < 0.05$) was used to find the significant difference in mean values of samples using the Tukey honest significant difference (HSD) *post-hoc* test. The correlation between the visual attention measurements and implicit emotional responses was analysed in the orientation stage using the principal component analysis (PCA). Furthermore, the facial expression graph was plotted by averaging all the participant's emotional responses for 10 s. TTFF values of all the packaging were presented on the facial expression graph to correlate the measurements. The effect of visual attention, emotions (explicit and implicit) and hedonic measurements on the willingness to buy response were analysed using a logistic regression model, assuming the willingness to buy as an independent variable and the other factors as predictors.

In the evaluation stage, Cochran's Q and multiple pairwise comparison tests (*Sheskin*) were used to analyse the significant difference between the samples based on the frequency of selecting explicit emotions in the CATA questionnaire. XLSTAT® Statistical Analysis Software 2022.3.1 (Addinsoft, New York, USA) (Addinsoft, 2023) was used for multivariate data analysis (Vidal *et al.*, 2020). The correlation among emotions (explicit and implicit), overall liking, appeal, visual attention measurements and purchase intention was analysed using the multiple factor analysis (MFA). The correlation between visual attention measurements in the evaluation stage and attitudinal measurements in the validation stage was tested with Spearman's correlation coefficient.

Results and discussion

Orientation stage

Visual attention measurements

The number of times participants looked at a particular object and the total fixation durations were plotted in the supermarket collages' heatmap (Fig. 2), showing consumers' attention towards each packaging in the initial orientation stage. The heatmaps showed that the maximum fixation was located towards the centre of the shelves compared to the periphery. The heatmaps also revealed that the top shelf obtained the maximum fixation counts compared to the bottom shelf.

The visual attention measurements were reported as fixation durations (100 ms or above) in the orientation stage because fixation is related to visual attention in psychophysical studies (Ladeira *et al.*, 2021). In addition (Fig. 2), the packaging on the shelf was divided into separate areas of interest (AOIs) for each packaging to understand the participant's interest in the type of packaging texture, while exploring the supermarket shelf. Table 1 presents the results obtained from different AOIs (glass, glass L, plastic, plastic L, pouch, pouch L, tetra pack and tetra pack L) from supermarket collage, where 'L' refers to packaging with NZ-made logo. No significant difference ($P > 0.05$) was obtained for the first and total fixation duration. However, the fixation counts and TTFF varied significantly ($P < 0.05$) between the packaging on the shelf. Glass (0.05/cm^2) and plastic (0.04/cm^2) packaging had the highest fixation counts compared to other packaging (ranging from 0.02 to 0.03/cm^2). On the other hand, regarding the TTFF, the participants first looked at

the tetra pack (3.53 ms) and then the glass (5.23 ms), tetra pack L (5.91 ms) and glass L (6.02 ms).

Correlation between implicit emotions and visual attention measurements

Time to first fixation indicates the time the participant took to examine the attribute of interest. A significant difference in TTFF was reported among AOIs. For example, tetra pack (3.53 s) had the lowest TTFF compared to glass (5.23 s), glass L (6.02 s), plastic L (5.63 s) and tetra pack L (5.91 s). The implicit emotions reported from facial expressions were plotted along with TTFF to understand the implicit behaviour of participants when they first looked at the packaging (Fig. 3a). The figure shows that the participants first looked at the tetra pack with a high intensity of fear and engagement. On the other hand, the participants had high intensity of joy when they first looked at the glass bottle.

The PCA obtained for the implicit emotions and visual attention measurements from the eye tracking against different AOIs are shown in Fig. 3b. The PCA explained 60.15% of data variability, with PC1 showing 37.22% and PC2 showing 22.92%. Based on the PCA result, TTFF, engagement and implicit negative emotions (fear, disgust, anger and sadness) were associated with the tetra pack, tetra pack L and pouch L. In contrast, the positive implicit emotion of joy was associated with glass L.

Evaluation stage

Visual attention measurements

In the evaluation stage, participants evaluated individual packaging briefly. Each packaging was divided into four AOIs (logo, price, texture and nutritional information). Table 2a shows the significant difference among AOIs across all the samples collectively. Relatively higher fixations were obtained for the nutritional information ($0.40/cm^2$), followed by the logo ($0.18/cm^2$), while texture ($0.03/cm^2$) had the least number of fixations. A similar trend was also observed in the first fixation duration, which was significantly higher for nutritional information (106.54 ms) than for texture (93.62 ms). However, the TTFF was low for texture (1.57 s) compared to logo (3.90 s), price (3.99 s) and nutritional information (3.82 s). The total fixation duration for nutritional information (110.46 ms) and logo (105.69 ms) was significantly higher than that of price (97.31 ms) and texture (100.19 ms).

The mean values and significant differences between the four AOIs (logo, price, texture and nutritional information) within each sample and across all the samples are shown in Table 2b. Within each sample, the fixation count was significantly higher on nutritional information AOI than other AOIs for all samples. At the same time, participants took longer to have the first fixation on the nutritional information than other AOIs for all samples. No significant difference was observed for the first and total fixation duration within the AOIs of all samples, except for nutritional information and texture in the case of plastic L and pouch L. Nutritional information had a significantly higher first and total fixation duration than other attributes in the plastic L sample. An almost similar trend was observed in the case of pouch L for texture. However, no significant difference was found in the first and total fixation duration across the packaging treatments (glass, glass L, plastic, plastic L, pouch, pouch L, tetra pack and tetra pack L) for any of the four AOIs. A significantly high fixation count on nutritional information was reported for pouch L ($0.63/cm^2$) compared to tetra pack L ($0.28/cm^2$) and glass L ($0.25/cm^2$). The TTFF on texture was significantly lower for glass L (0.84 s) than for plastic (1.88 s).

Explicit emotions, overall liking, appealing packaging and willingness to buy (WTB)

The frequencies of self-reported emotions, mean values of overall liking and appealing packaging ratings and the percentage of WTB are shown in Table 3. The frequency of using emotional terms 'pleasant', 'happy', 'good' and 'merry' were significantly high in the case of glass L compared to pouch. The selection frequency of the high arousal emotion term 'enthusiastic' was 19% for glass L compared to 1% for pouch L, 6% for tetra pack L and 4% for both pouch and tetra pack. However, the frequency of selecting the negative emotion 'bored' was significantly higher in the case of the pouch (33%), pouch L (32%), tetra pack (37%) and tetra pack L (43%) compared to glass (8%), glass L (8%) and plastic L (10%). No significant differences were found in other reported emotions for packaging in the evaluation stage.

A significant difference in the overall liking, appeal of the sample and willingness to buy is shown in Table 3b. The overall liking of the glass (6.48 ± 1.73), glass L (6.70 ± 1.71) and plastic L (6.06 ± 1.91) were significantly higher than the liking of the pouch (5.02 ± 1.86), tetra pack (5.04 ± 1.84) and tetra pack L (4.98 ± 1.88). Similarly, participants felt glass (3.45 ± 0.87) and glass L (3.52 ± 0.93) to be more appealing than pouch (2.63 ± 0.94), tetra pack (2.64 ± 0.89) and tetra pack L (2.71 ± 0.99). Consumers were more willing to buy glass (73.8%) and glass L (77.4%) compared to pouch (34.5%), pouch L (36.9%), tetra pack (40.5%) and tetra pack L (36.9%).

Figure 4 shows the principal coordinate analysis (PCoA) results that combine explicit emotions, overall liking and packaging. The PCoA result explained 79.18% of the variability in the data, where the

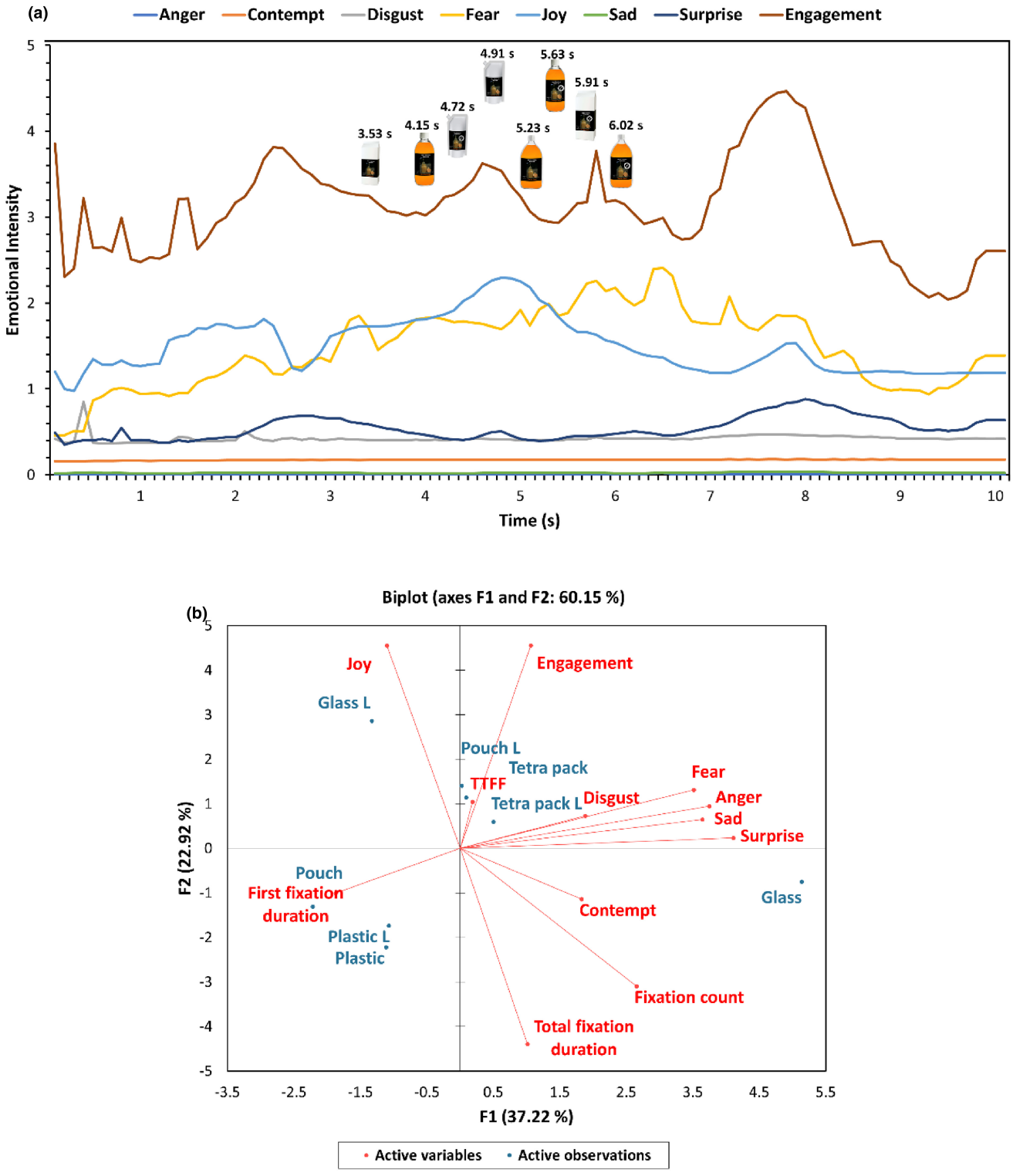

Figure 3 (a) Graph plotted with implicit emotional intensities at different time stamps and TTFF packaging values in the orientation stage. (b) Results of principal component analysis (PCA) of implicit facial emotions and visual attention measurements in the orientation stage. L signifies packaging with NZ-made logo and TTFF signifies time to first fixation.

Table 2 Mean and standard deviation values of (a) average AOIs (logo, price, texture and nutritional information) for all the packaging and (b) average AOIs within and across all the packaging in the evaluation stage

Stimuli	Attributes (AOI)	Fixation count (per cm^2)	TTFF (s)	First fixation duration (ms)	Total fixation duration (ms)
(A)					
Logo		0.18 ± 0.16^{b}	3.90 ± 3.02^{a}	104.04 ± 51.39^{ab}	105.69 ± 42.06^{ab}
Price		0.06 ± 0.06^{c}	3.99 ± 2.84^{a}	96.41 ± 40.72^{ab}	97.31 ± 26.90^{c}
Texture		0.03 ± 0.02^{d}	1.57 ± 2.11^{b}	93.62 ± 46.22^{b}	100.19 ± 25.29^{bc}
Nutritional Info		0.40 ± 0.43^{a}	3.82 ± 2.59^{a}	106.54 ± 59.71^{a}	110.46 ± 53.05^{a}
(B)					
Glass	Logo	NA	NA	NA	NA
	Price	0.07 ± 0.06^{bA}	4.25 ± 2.91^{aA}	98.8 ± 39.6^{aA}	101.2 ± 26.8^{aA}
	Texture	0.02 ± 0.02^{bA}	1.54 ± 2.03^{bAB}	89.5 ± 36.5^{aA}	96.8 ± 20.9^{aA}
	Nutritional Info	0.31 ± 0.30^{aBC}	3.34 ± 2.16^{aA}	94.0 ± 36.5^{aA}	97.7 ± 36.5^{aA}
Glass L	Logo	0.18 ± 0.18^{aA}	4.07 ± 3.17^{aA}	89.2 ± 34.4^{aA}	97.1 ± 31.7^{aA}
	Price	0.06 ± 0.06^{bA}	3.79 ± 3.09^{aA}	90.0 ± 34.0^{aA}	95.8 ± 25.2^{aA}
	Texture	0.03 ± 0.02^{bA}	0.84 ± 1.35^{bB}	97.5 ± 52.3^{aA}	99.2 ± 21.6^{aA}
	Nutritional Info	0.25 ± 0.11^{aC}	2.78 ± 2.08^{aA}	110.6 ± 50.2^{aA}	108.2 ± 40.2^{aA}
Plastic	Logo	NA	NA	NA	NA
	Price	0.07 ± 0.06^{bA}	4.33 ± 2.97^{aA}	90.4 ± 32.0^{aA}	94.21 ± 25.29^{aA}
	Texture	0.03 ± 0.02^{bA}	1.88 ± 2.28^{bA}	90.0 ± 35.4^{aA}	97.32 ± 20.81^{aA}
	Nutritional Info	0.56 ± 0.58^{aAB}	4.21 ± 2.64^{aA}	98.1 ± 42.9^{aA}	97.5 ± 33.6^{aA}
Plastic L	Logo	0.15 ± 0.10^{bA}	3.75 ± 2.96^{aA}	101.2 ± 43.2^{abA}	100.6 ± 33.9^{bA}
	Price	0.07 ± 0.07^{bcA}	3.79 ± 2.75^{aA}	108.4 ± 50.2^{aA}	102.6 ± 27.7^{bA}
	Texture	0.03 ± 0.02^{cA}	1.66 ± 2.53^{bAB}	86.5 ± 35.9^{bA}	97.3 ± 24.67^{bA}
	Nutritional Info	0.56 ± 0.49^{aAB}	3.40 ± 2.17^{abA}	118.3 ± 62.1^{aA}	127.7 ± 58.5^{aA}
Pouch	Logo	NA	NA	NA	NA
	Price	0.06 ± 0.06^{bA}	3.74 ± 2.66^{aA}	91.5 ± 42.2^{aA}	94.7 ± 27.1^{aA}
	Texture	0.03 ± 0.02^{bA}	1.76 ± 2.11^{aAB}	98.6 ± 48.3^{aA}	100.7 ± 21.7^{aA}
	Nutritional Info	0.34 ± 0.27^{aBC}	4.47 ± 2.82^{bA}	109.6 ± 83.3^{aA}	109.3 ± 61.3^{aA}
Pouch L	Logo	0.17 ± 0.19^{bA}	3.95 ± 3.26^{aA}	117.6 ± 60.0^{aA}	113.2 ± 45.4^{abA}
	Price	0.06 ± 0.05^{bcA}	3.66 ± 2.83^{aA}	104.6 ± 51.0^{abA}	102.2 ± 32.8^{bA}
	Texture	0.03 ± 0.02^{cA}	1.68 ± 2.25^{bAB}	91.6 ± 45.0^{bA}	105.1 ± 31.2^{bA}
	Nutritional Info	0.63 ± 0.71^{aA}	3.68 ± 2.45^{aA}	129.0 ± 54.8^{aA}	133.1 ± 51.2^{aA}
Tetra pack	Logo	NA	NA	NA	NA
	Price	0.07 ± 0.06^{bA}	3.63 ± 2.43^{aA}	95.8 ± 39.4^{aA}	96.1 ± 23.3^{aA}
	Texture	0.03 ± 0.02^{bA}	1.47 ± 1.98^{bAB}	96.3 ± 55.3^{aA}	103.5 ± 32.7^{aA}
	Nutritional Info	0.39 ± 0.42^{aABC}	3.62 ± 3.12^{aA}	92.7 ± 52.3^{aA}	108.1 ± 53.0^{aA}
Tetra pack L	Logo	0.21 ± 0.16^{aA}	3.80 ± 2.74^{aA}	106.8 ± 60.3^{aA}	111.4 ± 53.3^{aA}
	Price	0.06 ± 0.05^{bA}	4.74 ± 3.04^{aA}	92.9 ± 31.9^{aA}	92.2 ± 26.2^{aA}
	Texture	0.03 ± 0.02^{bA}	1.71 ± 2.02^{bAB}	99.2 ± 56.1^{aA}	101.9 ± 25.5^{aA}
	Nutritional Info	0.28 ± 0.18^{aC}	4.58 ± 2.73^{aA}	105.8 ± 69.1^{aA}	105.1 ± 67.3^{aA}

The different superscript indicates a significant difference ($P < 0.05$). (A) a, b and c superscripts indicate the significant difference among stimuli at a 5% significant level. (B) a, b and c indicate significant differences within attributes of glass, glass L, plastic, plastic L, pouch, pouch L, tetra pack and tetra pack L, where L signifies packaging with NZ-made logo and TTFF signifies time to first fixation. A and B indicate significant differences among packaging for logo, price, texture and nutritional information.

principal component (F1) described 69.85% and the principal component (F2) explained 9.33% of the data variability. The positive emotions ('happy', 'interested', 'merry', 'good', 'joyful', 'pleased' and 'pleasant') and high arousal emotions ('active', 'energetic' and 'enthusiastic') were associated with the glass and plastic (both with and without logo). In comparison, negative emotions ('bored', 'disgusted', 'sad', 'worried' and 'guilty') were associated with pouch and tetra pack. The overall liking was also linked with explicit positive emotions compared to explicit negative emotions.

Although no correlation analysis was done, the MFA (Fig. 5) shows few associations of explicit responses with facial behavioural data. MFA shows that overall liking and explicit emotions 'active' and 'wild' were negatively associated with FE disgust. On the other hand, the explicit emotion 'adventurous' was negatively associated with FE surprise and sadness.

Table 3 (A) Frequency of explicit emotions elicited. (B) Mean values of overall liking and appealing packaging ratings, and the percentage of willingness to buy in the evaluation stage

Emotions	Glass	Glass L	Plastic	Plastic L	Pouch	Pouch L	Tetra pack	Tetra pack L
(A)								
Pleased	0.29^{ab}	0.35^{a}	0.24^{abc}	0.21^{abc}	0.12^{bc}	0.11^{c}	0.11^{c}	0.16^{bc}
Pleasant	0.25^{a}	0.24^{ab}	0.21^{ab}	0.16^{ab}	0.07^{b}	0.12^{ab}	0.12^{ab}	0.13^{ab}
Happy	0.35^{a}	0.20^{abc}	0.26^{ab}	0.25^{abc}	0.08^{c}	0.17^{bc}	0.10^{bc}	0.12^{bc}
Good	0.42^{a}	0.43^{a}	0.32^{ab}	0.27^{ab}	0.21^{b}	0.16^{b}	0.30^{ab}	0.16^{b}
Energetic	0.18^{ab}	0.21^{a}	0.17^{abc}	0.20^{ab}	0.02^{c}	0.06^{bc}	0.08^{abc}	0.07^{abc}
Bored	0.08^{c}	0.08^{c}	0.18^{bc}	0.10^{c}	0.33^{ab}	0.32^{ab}	0.37^{ab}	0.43^{a}
Enthusiastic	0.06^{b}	0.19^{a}	0.12^{ab}	0.13^{ab}	0.04^{b}	0.01^{b}	0.04^{b}	0.06^{b}
Merry	0.11^{a}	0.08^{ab}	0.05^{ab}	0.07^{ab}	0.01^{ab}	0.01^{ab}	0^{b}	0.02^{ab}
(B)								
Overall liking	6.48 ± 1.73^{a}	6.70 ± 1.71^{a}	5.96 ± 1.96^{ab}	6.06 ± 1.91^{a}	5.02 ± 1.86^{c}	5.12 ± 1.94^{bc}	5.04 ± 1.84^{c}	4.98 ± 1.88^{c}
Appealing	3.45 ± 0.87^{a}	3.52 ± 0.93^{a}	3.16 ± 0.95^{ab}	3.19 ± 0.96^{ab}	2.63 ± 0.94^{c}	2.80 ± 0.99^{bc}	2.64 ± 0.89^{c}	2.71 ± 0.99^{c}
WTB (%)	73.8^{a}	77.4^{a}	61.9^{ab}	63.1^{ab}	34.5^{c}	36.9^{c}	40.5^{bc}	36.9^{c}

A check-all-that-apply (CATA) questionnaire was used to select emotions related to the sample. Cochran's Q was used for emotions and WTB to find the significant difference ($P < 0.05$) between the packaging. 9-point hedonic scale, 5-point Likert scale and binomial scale were used for overall liking, most appealing packaging and willingness to buy respectively. Means with different superscripts in each row indicate significant differences ($P < 0.05$). L signifies packaging with an NZ-made logo.

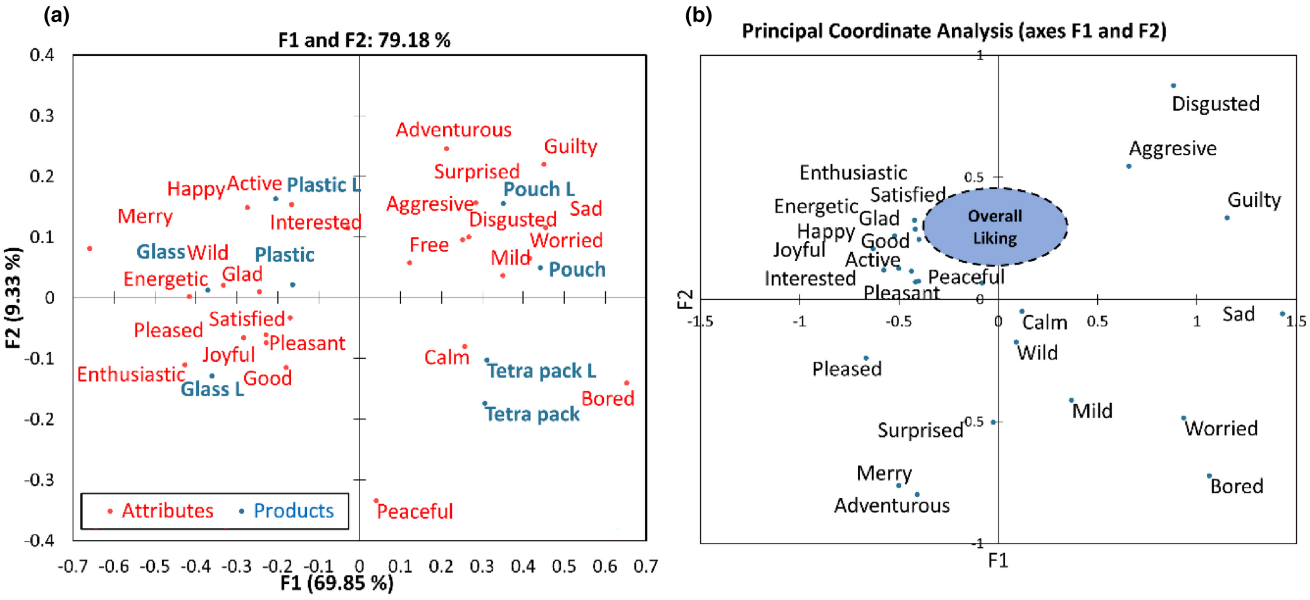

Figure 4 (a) Correspondence analysis and (b) principal coordinate analysis of explicit emotional terms used for different packaging with respect to overall liking in the evaluation stage. L signifies packaging with an NZ-made logo.

Table 4 shows the visual attention measurements, explicit emotions and hedonic responses that influenced the juice packaging willingness to buy in the evaluation stage. Visual attention measurements significantly affected the willingness to buy the product. For example, participants with a high fixation count on the logo (odd ratio = 15.62) were more willing to buy the product. However, the first fixation duration on the texture (odd ratio = 0.99) had a negative impact on the willingness to buy. The explicit emotions 'satisfied' (odd ratio = 4.50) and 'adventurous' (odd ratio = 10.31) had a positive effect on the willingness to buy, while 'worried' (0.27) and 'satisfied' (0.31) had a negative impact on the willingness to buy. Participants who

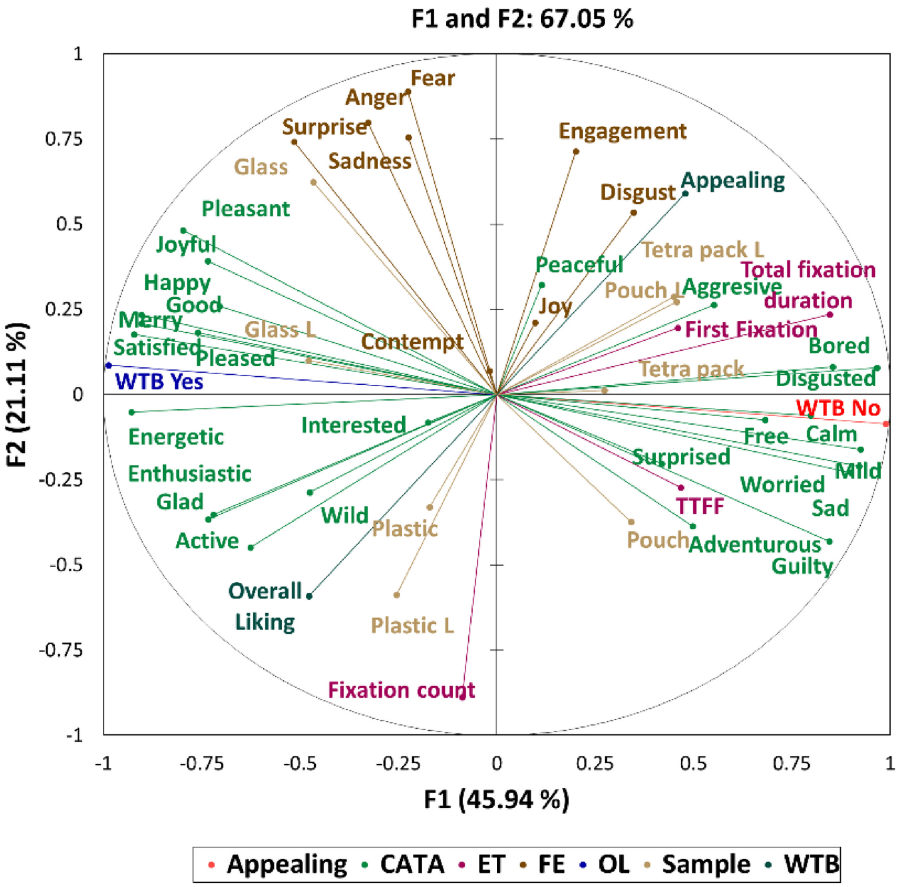

Figure 5 Multiple-factor analysis of emotions (implicit and explicit), overall liking, appeal, visual attention and willingness to buy. L signifies packaging with NZ-made logo and TTFF signifies time to first fixation.

Table 4 Parameter estimates, probability and odds ratio estimates for predicting willingness to buy in the evaluation stage with the help of visual attention measurements, explicit emotions and hedonic liking

Attributes	Predictor	β	SEβ	Wald's χ^2	*P*-value	Eβ (odds ratio)
Visual attention measurements	FC logo	2.75	1.30	4.46	0.04	15.62
	FFD texture	−0.01	0.00	4.99	0.02	0.99
Explicit emotions	Peaceful	−1.16	0.50	5.35	0.02	0.31
	Worried	−1.30	0.50	6.75	0.01	0.27
	Satisfied	1.50	0.40	13.86	0.00	4.50
	Adventurous	2.33	0.75	9.64	0.00	10.31
Hedonic responses	Overall liking	0.73	0.12	27.52	<0.0001	2.08
	Appealing	0.94	0.22	17.55	<0.0001	2.55

Based on the logistic regression analysis, using the full model with visual attention measurements, explicit emotions and hedonic measurements. The study 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 $P < 0.05$.
FC, fixation count; FFD, first fixation duration.

liked the product (odd ratio = 2.08) and found the product appealing (odd ratio = 2.55) were more willing to buy the product. No significant effect of implicit emotions was found on the WTB.

To confirm this trend, a general logistic model was run including all predictive factors. Table S1 shows the effects of all measurement parameters (eye tracking, emotions and hedonic responses) on the willingness to

Table 5 Spearman's correlation coefficients between the importance of attributes to the visual attention measurements

Importance of attributes	Mean and SD[†]	Total fixation count			Total fixation duration (ms)		
		Logo	Price	Texture	Logo	Price	Texture
Logo	3.32 ± 1.09	−0.11	−0.01	0.04	0.03	0.01	0.13
Price	4.04 ± 0.94	−0.10	−0.22[‡]	0.15	−0.08	−0.23[‡]	−0.02
Texture	4.13 ± 0.89	−0.03	−0.04	−0.15	−0.04	−0.08	−0.13

[†]Measured on a 5-point scale from 0 = Not at all important to 5 = Extremely important.
[‡]Correlation is significant at the alpha = 0.05 level (2-tailed).

buy. The largest effect size in the model was imparted by the fixation count on the logo (odd ratio = 15.62), highlighting the importance of attention in purchase intention.

Multivariate data analysis

Multiple factor analysis (MFA) explaining a correlation among emotions (implicit and explicit), overall liking, the appeal of packaging, willingness to buy and visual attention measurements is shown in Fig. 5. Dimension 1 of MFA accounted for 45.94% of the data variability, while dimension 2 (F2) represented 21.11%, totalling 67.05%. The factor loading for dimension 1 was characterised by the explicit negative emotions ['worried' (FL = 0.40), 'sad' (FL = 0.44), 'guilty' (FL = 0.46), 'disgusted' (FL = 0.28) and 'bored' (FL = 0.65)] on the right side, and was associated with pouch, pouch L, tetra pack and tetra pack L packaging. While the positive emotions ['glad' (FL = -0.24), 'happy' (FL = −0.26), 'interested' (FL = −0.03), 'good' (FL = −0.20) and 'satisfied' (FL = −0.18)] and high arousal emotions ['energetic' (FL = −0.40), 'enthusiastic' (FL = −0.42) and 'wild' (FL = −0.28)] were associated with willingness to buy and plastic, glass and glass L packaging. The factor loading of dimension 2 was categorised by the implicit negative emotions like 'fear' (FL = 0.89), 'anger' (FL = 0.76) and 'sadness' (FL = 0.74) on the upper side. In contrast, fixation count (FL = −0.89) and plastic L (FL = -0.59) were grouped on the lower side of the biplot.

Validation stage

Table 5 shows the relationship between the total fixation count and fixation duration within the AOIs (logo, price and texture) and participants' attitudinal variables (importance ratings). A significant negative relationship was reported between the stated importance of price reported by the participants and the fixation counts with the total fixation duration values in the AOIs. The result confirms that the participants who gave higher importance to price had fewer counts and fixation durations on the price tag of the packaging.

Discussion

Orientation stage

Visual attention measurements

In the orientation stage, the heatmaps (Fig. 2) showed that the maximum attention of participants was focused on the centre rather than the periphery. Moreover, the heatmaps indicated that the top shelf received the maximum attention compared to the bottom shelf. Chandon *et al.* (2009) also inferred similar results, stating that top and centre-positioned products gained more attention than a shelf's right- or left-hand side, directly affecting the consumer's evaluation and choice behaviour. Generally, consumers tend to look in the centre due to its strategic position (Juravle *et al.*, 2015), which reduces the distance to the periphery, thus, gaining more information from the stimuli (Tatler, 2007; Peacock *et al.*, 2020).

The AOIs separation provided a more detailed and quantitative understanding of the participant's visual attention behaviour towards each packaging material (glass, plastic, pouch and tetra pack). In the initial overview of the displayed products, the tetra pack was first viewed but had low visual fixations compared to the glass and plastic packaging (Table 1). Viewing food from transparent packaging (glass and plastic) had higher fixation counts than opaque or translucent packaging. Transparent packaging helps participants locate products quickly and evaluate product quality (Simmonds *et al.*, 2018). Moreover, seeing the food through the transparent window of the packaging can induce a 'salient effect' (Deng & Srinivasan, 2013), which results in visual hunger and, hence, induces closer attention than opaque packaging (Ma *et al.*, 2020). Transparent packaging (glass and plastic bottles) affects the consumer's behaviour towards the product based on the food-reward theory of psychology (Simmonds & Spence, 2017; Morales & Berridge, 2020).

Correlation between implicit emotions and visual attention measurements

Based on the PCA and Fig. 3a,b, visual attention measurements and implicit facial emotions showed that the

packaging was divided into different groups in the orientation stage. Participants were highly engaged with the packaging on the shelf in the initial 8 s, and then, the engagement dropped to a minimum (Fig. 3a). Previous studies have reported that the autonomous nervous system (ANS) responses are expressed immediately after exposing participants to the stimuli (Danner *et al*., 2014; Crist *et al*., 2016; Mehta *et al*., 2021), which can also be observed in this study. Glass L was associated with the positive emotion 'joy', while tetra pack, tetra pack L and pouch L were associated with the first-time fixation duration and implicit negative emotions 'disgusted', 'anger', 'fear' and 'sad'. Transparent packaging is easier to understand and increases perceptual fluency, resulting in a fast, intuitive and effortless heuristic processing approach (Du *et al*., 2021) during product selection. As observed in the present study, the positive implicit emotion 'joy' was elicited while evaluating glass L (transparent packaging) instead of tetra pack, tetra pack L, pouch and pouch L.

Evaluation stage

Visual attention measurements

In the evaluation stage, the consumers first observed the packaging (texture) during the individual packaging evaluation, and then, consumers paid attention to other packaging elements. Thus, the packaging predominance was higher than the other attributes (logo, price and nutritional information) (Rebollar *et al*., 2015). Moreover, the visual attention measurements varied significantly based on shape, size and location (Peschel & Orquin, 2013; Hessels *et al*., 2016). In general, fixation count, first and total fixation duration were higher for the nutritional information than other label elements (Table 2a). The nutritional information was a salient factor at the bottom left corner of the packaging. Fixation counts are concurrent with information processing. The denser the area with information or complex visual processing, the higher the fixation count when using eye tracking (Ares *et al*., 2014). Consumers paid more attention to the packaging' salient (unexpected) features (Bialkova *et al*., 2014), such as nutritional information, followed by the logo. However, the price and the texture had the lowest fixation counts and duration times; hence, these elements gained the least visual attention from the consumers. The position where different attributes were located also affected the fixation and attention of consumers (Rebollar *et al*., 2015). As with other elements in the packaging, the price tag AOI had lower fixation counts and total fixation duration than the logo. The top-to-bottom viewing pattern could be the reason for the low visual attention of the price AOI (Rebollar *et al*., 2015).

Explicit emotions, overall liking and appealing packaging

Emotions are essential in understanding consumer behaviour and choices. Marketers often use these emotions as leverage to design the labels, which helps promote and upsell the product. Emotions are explained in terms of valence (positive/negative) and degree of arousal (Russell, 2009). In the present study, explicit emotions have provided clear packaging segregation. Consumers elicited positive and high arousal emotions towards glass, glass L, plastic and plastic L. In contrast, negative emotions were evoked towards tetra pack, tetra pack L, pouch and pouch L. Du *et al*. (2021) also reported that transparency strengthened the effect of emotions on food choices and the decision-making process due to perceptual fluency. Moreover, consumers presume glass and plastic to be innocuous to the environment compared to pouch and tetra pack and are willing to pay more for recycling (Klaiman *et al*., 2016).

Explicit positive emotions elicited from glass and glass L also increased overall liking (Fig. 4) and willingness to buy response. Based on the logistic regression model, the fixation counts on the NZ-made logo and the explicit emotion 'adventurous' have significantly affected the willingness to buy (Table 4). Juice is a refreshing drink and consumer perceives it to be fresh, natural and high quality if the product is local rather than imported (Mohebalian *et al*., 2013). Thus, the NZ-made logo (country of origin logo) influenced the affective (emotions) and normative aspects (moral consideration) of consumers, which in turn affected the willingness to buy the product. The impact of the country-of-origin logo on the consumer's purchase behaviour was also reported in wine (Veale & Quester, 2009; Liu *et al*., 2022), meats (Furnols *et al*., 2011), coffee (Teuber, 2010), seafood (Lim *et al*., 2018) and retail foods (Berry *et al*., 2015). The term 'adventurous' is a positive emotion (Nestrud *et al*., 2016) associated with high purchase intention. Previous studies have proved that pleasure significantly influences consumer satisfaction with a product. Furthermore, according to the emotion–congruency effect (So *et al*., 2015), instances where emotional appraisals align with the product's appeal led consumers to anticipate that the product will meet their expectations.

Multivariate data analysis

Multiple factor analysis (MFA) is the most powerful tool in integrating and interpreting the diverse data set of this study. MFA helped to understand the factors affecting the overall liking and willingness to buy the packaging with the help of different measurements (visual attention, explicit and implicit emotions). The results indicated that different packaging types played a significant role in driving consumers' attention. Consumers had a higher level of visual attention (first

fixation and total fixation durations) towards the tetra pack and pouch than the glass and plastic because the former packaging was opaque. Hence, consumers relied on heuristic (indirect) clues to evaluate the product's sensory properties (Ma *et al.*, 2020). Suppose the product evaluation based on the heuristic signals is unsatisfactory, it can lead to negative emotions and reluctance to purchase the product, which explains the importance of packaging design and its influence on consumer perception and purchasing behaviour.

Emotions play a significant role in the decision-making (Pfister & Böhm, 2008). Implicit emotions (unconscious or automatic emotional responses) were negatively associated with the study's overall liking and fixation counts. The negative association between implicit emotions and fixation count suggests that consumers may not spend as much time examining the packaging when they have implicit negative emotions towards a product, possibly due to a lack of interest or a subconscious aversion (Hamelin *et al.*, 2021). Previous studies from consumer science also reported the inverse association between implicit emotions and overall liking of the product (Danner *et al.*, 2014; Mehta *et al.*, 2021). On the other hand, explicit emotions (consciously experienced and expressed responses) were related to consumer purchasing behaviour (Mehta *et al.*, 2021, 2022). In a similar study, Merdian *et al.* (2021) also reported the difference in conscious and unconscious perception towards overall liking in the case of wine bottles.

Validation stage

The findings reveal a significant negative relationship between the stated importance of price and the fixation counts or average fixation duration on the price AOI. The results indicated that while consumers consider price a vital attribute when making a purchase decision, they tend to pay less visual attention to the price displayed on the packaging or in the purchasing environment. Hence, consumers rely more on cues such as prior knowledge, familiarity or other packaging attributes for decision-making (Hamelin *et al.*, 2021). Therefore, this study highlights the pivotal role of packaging and its attributes in capturing visual attention and its subsequent impact on purchase intention. The empirical linkage established among packaging attributes, visual attention, emotions elicited and buying inclination emphasises packaging's primary function as the initial conduit between products and consumers. By leveraging these insights, product developers can strategically optimise packaging designs to enhance product visibility and foster positive purchasing decisions.

Conclusion

The study suggests that the positioning of products on the shelf and the type of packaging material used can significantly impact the consumer's attention and evaluation of products. Transparent packaging has advantages in attracting visual attention and influencing consumer behaviour. Moreover, the implicit emotional responses elicited from packaging were linked with participants' visual attention and engagement. In the evaluation stage, the consumer paid more attention to packaging texture and salient features such as nutritional information. The different attributes within the packaging design also significantly affected consumers' fixation and attention patterns. The emotional cues conveyed through the packaging also affected consumers' perception and engagement with the product. Understanding the attributes which attract visual attention and elicit emotional responses can be beneficial to marketers in promoting and upselling their products. Further investigation using more specific 3D stimuli in ecologically valid contexts can expand understanding of how different packaging attributes drive consumers' choices and preferences.

Conflict of interest

The authors declare no conflict of interest.

Ethical approval

The study was approved by the Human Ethics Committee of Lincoln University (Approval: HEC2021-08).

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Author contributions

Annu Mehta: Conceptualization; investigation; writing – original draft; methodology; formal analysis. **Luca Serventi:** Writing – review and editing; supervision. **Lokesh Kumar:** Writing – review and editing; supervision. **Damir D. Torrico:** Conceptualization; writing – review and editing; funding acquisition; project administration; supervision.

Data availability statement

Research data are not shared.

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The study utilises eye-tracking methodology in a lab and a real supermarket environment to investigate the key parameters influencing the attention and choices at a point of sale. The study underscores the potential of eye tracking in consumer research, offering insights for effective marketing strategies in both controlled and real-world environments.

Bimbo, F., Roselli, L., Carlucci, D. & de Gennaro, B.C. (2020). Consumer misuse of country-of-origin label: insights from the Italian extra-virgin olive oil market. *Nutrients*, **12**, 2150.

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The study underscores the pivotal role of packaging and labelling in conveying product information and value to consumers. It investigates consumer behaviour, focusing on willingness to pay (WTP) for cherry jam with varying attributes, including brand, production method and price. The findings, particularly the influence of price on WTP, align with my topic, highlighting the importance of consumers' attention to specific product attributes. This research contributes valuable insights into factors impacting purchasing decisions, complementing my topic's focus on consumer attention and behaviour.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Table S1. Parameter estimates, probability and odds ratio estimates for predicting willingness to buy in the evaluation stage with the combined effect of visual attention measurements, explicit and implicit emotions, and hedonic liking.

