

STATISTICAL STUDIES ON THE CROSSMODAL CORESPONDENCES BETWEEN THE COLOUR OF PACK AND SENSORIAL PERCEPTION OF LOCAL FRUIT JUICES

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Abstract

The purpose of this paper is to determine the effect of a product package, in this case, a local fruit juice, on consumer's sensorial expectations. Therefore, our study focused on the connection between the package's colour of local fruit juice and different sensorial characteristics of the juice that the consumer expects to have. The objectives of this study are related to the following aspects: types of packages preferred by local fruit juices consumers, the association of package's colour with the type of juice from different fruit, the association between the body mass index and the consumption of juices. For this purpose, we selected a sample of 100 people aged between 17 and 27 years and we determined the most appreciated characteristics of the juice by consumers (such as natural and healthy taste and low price). We also proposed 10 figures which represent types of packages like tetra-pak with different colours and we analyzed the correspondence that exists between the package's colour and the type of juice which the consumer expects to find in that package.

Key words: package's colour, fruit juice, consumer's expectations, crossmodal analysis

INTRODUCTION

The term of *crossmodal correspondence* is one of a series of terms which have been used over the years by researchers to refer to our brain tendency to associate, in a systematic manner, certain features or dimensions of stimuli with senses. A crossmodal correspondence between sensory attributes of a product and product use experience is being created. If after consumption, the product sensory attributes satisfy the consumer's expectations, then this fact will obviously lead to the consumption increase of the product in question. There are many studies which point out the influence of package shape, design and colour on consumer's sensory expectations (Ares G., Deliza R., 2010; Becker L., et al., 2011)

The functions of a product's package, such as handling, storage and protecting of contents storage, can be completed with shapes and colours which can influence potential consumers in order to increase the acceptance of the product (Rebollar R. et al., 2012)

Many researchers point out that a product's advantage over its competition on the food product market is its ability to catch the consumer's

attention and package is a key element in the decision to purchase a product (Fenko A. et al, 2010), either by incorporating images (Underwood R.L. et al., 2001) or by implementing redesigns that differ greatly from the original packaging (Schoormans J.P.L., Robben H.S.J, 1997).

In this paper we have studied the effect of a product package (such as that of a local fruit juice) on consumer's sensorial expectations, focusing on the connection between the package's colour and different sensorial characteristics that the consumer expects to have.

MATERIALS AND METHODS

Statistical analysis was carried out on a sample of 100 persons aged between 18 and 27 years, students of the Faculty of Food Engineering, Stefan cel Mare University of Suceava, Romania, in June 2014. Sample segmentation was done taking into account gender, age, height, weight, usual residence. These participants were chosen because young adults are the most frequent consumers of fruit juices. The data were collected through direct interview method. The average age of the group is of 19.28 years old, with a standard deviation of 1.99 years (14 males, 86 females) and the average height is of 166.5 cm, with a standard deviation of 7.75 cm.

Body mass index is defined as the ratio of body weight, expressed in kilograms, divided by height square, expressed in meters. This formula results in a certain quantity expressed in kg/m^2 (7). The average mass of the sample is of 59.7 kg, with a standard deviation of 9.92 kg and the average of body mass index (BMI) is of 21.5, with standard deviation of 2.67. Table 1 provides the demographic characteristics of sample based on the weight status using BMI.

Table 1.

Sample structure as a function of BMI

Body mass index (BMI)	Frequency	Increasingly cumulated relative frequency (%)	Body mass index (BMI) categories
IMC <18.49	10	10%	Underweight
18.50 - 24.99	83	93%	Normal weight
25.00 -29.99	5	98%	Overweight
More than 30.00	2	100%	Obesity

Questionnaire used in the research contains the following information: age (years), height (cm), weight (kg), gender (male /female), permanent residence (urban/rural areas) and 8 questions regarding consumption of fruit juice. Also, we used in our study 10 models of packages of different colours that can be used for tetra pak-type packages, presented in the fig. 1.

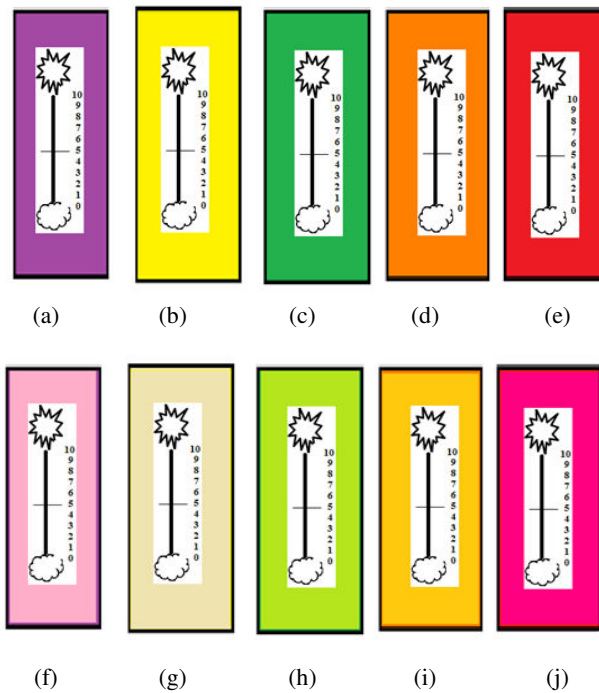


Fig. 1. Proposed figures colour for natural fruit juice packages

RESULTS AND DISCUSSION

When respondents are asked about their local fruit juices consumption habits, 9% responded that they did so almost daily, another 33% said that they consumed a few times a week and 58% replied that they consumed it occasionally (fig.2), (with the variants V1 - almost daily , V2 - a few times a week, V3 - occasionally, V4 - never).

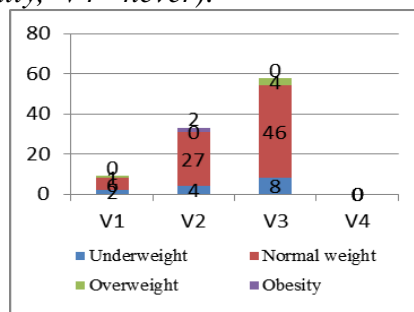


Fig. 2. The frequency of fruit juiceconsumption

When respondents are asked about “What colour do you generally associate with fruit juices with?” a certain percentage of 52% of respondents mentioned yellow colour and 36% orange colour. Also, they referred to red, green or black colour, as can be seen in fig. 3 (a).

The responses to the question “*What kind of package do you prefer to buy fruit juice in?*” are presented in fig. 3 (b). The people surveyed chose plastic in a percentage of 48 %, followed by glass with a percentage of 37% and Tetra Pak at a rate of 15 %.

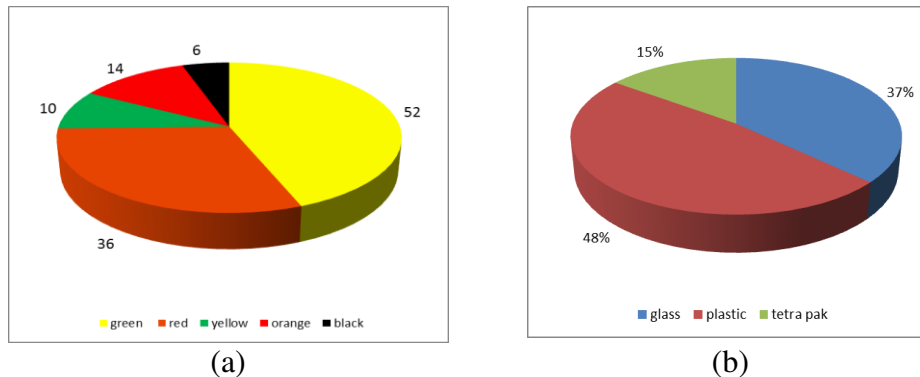


Fig. 3. (a) Juice fruit association with different colours; (b) Preferred juice fruit packages

The question “*When choosing a juice, which of the following characteristics mostly influences you: taste, smell, color, be sweet, be energizing, be refreshing, be cool, be acidified, be cheap, be healthy, be natural ?*” has the results given in fig. 4 (a).

Likert scale variants are used in a few of the survey questions. In quality management, Likert scale is used to measure customers’ satisfaction with regards to the services or products provided by a certain company. This scale is made up of a typical five-level Likert item, as follows: -2 = *strongly disagree*, -1 = *disagree*, 0 = *neutral (neither agree nor disagree)*, +1 = *agree*, +2 = *strongly agree*.

Different features of the juice considered important or not by consumers intending to purchase the product are shown in figure 4 (b), where the variants are: (V1 - *taste*, V2 - *smell*, V3 - *colour*, V4 - *to be sweet*, V5 - *to be energizing*, V6 - *to be refreshing*, V7 - *to be cool*, V8 - *to be acidified*, V9 - *to be cheap*, V10 - *to be healthy*, V11 - *to be natural*).

Thus, in people’s opinion surveyed, the most important characteristics of the juice are: taste with an average of 1.56, “to be natural” and “be healthy” with an average of 1.31. As regards acidity, consumers prefer non carbonated juices, and the price does not constitute an important feature. The first principal component (F1) provides the greatest amount of information, about 89.97%, and the second (F2) contributes by 3.09% of the data distribution.

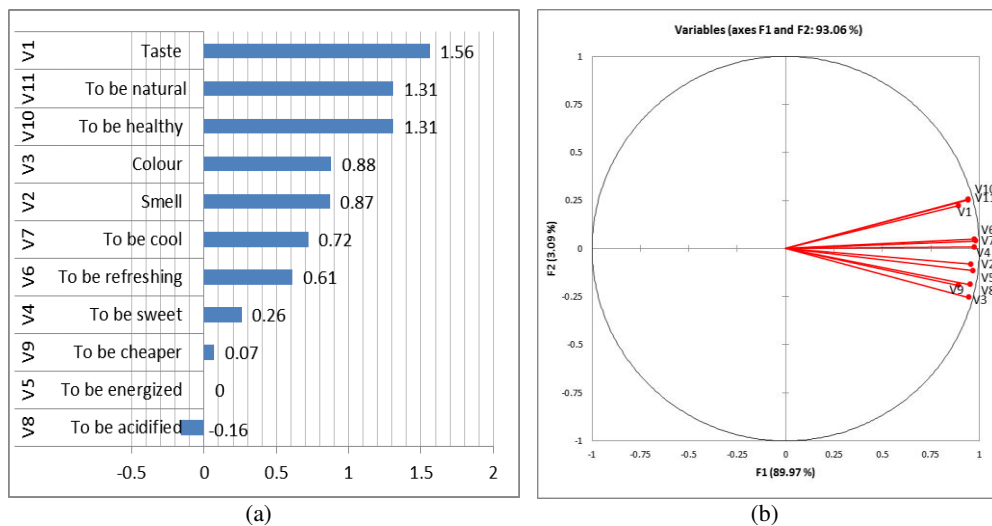


Fig.4. (a) The importance attributed by respondents to juice features (b) Principal components analysis (PCA)

Some similar features are: the first group is formed by $V1 = \text{taste}$, $V10 = \text{to be healthy}$, $V11 = \text{to be natural}$; the second is formed by $V3 = \text{colour}$, $V8 = \text{to be acidified}$, $V9 = \text{to be cheap}$; the third is formed by $V4 = \text{to be sweet}$, $V6 = \text{to be refreshing}$, $V7 = \text{to be cool}$ and the last one consists of $V2 = \text{smell}$ and $V5 = \text{to be energizing}$.

Table 2.

Pearson correlation matrix of the characteristics that influence the purchase of a juice

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11
V1	1										
V2	0.880	1									
V3	0.803	0.896	1								
V4	0.862	0.925	0.850	1							
V5	0.814	0.905	0.831	0.950	1						
V6	0.884	0.937	0.850	0.938	0.935	1					
V7	0.881	0.916	0.860	0.926	0.940	0.969	1				
V8	0.760	0.896	0.826	0.933	0.962	0.938	0.912	1			
V9	0.783	0.906	0.844	0.931	0.952	0.917	0.913	0.955	1		
V10	0.831	0.860	0.782	0.934	0.896	0.926	0.929	0.871	0.834	1	
V11	0.835	0.859	0.783	0.929	0.891	0.930	0.923	0.876	0.831	0.984	1

We notice a strong positive correlation of 0.884 between V6 and V1, of 0.937 between V2 and V6, of 0.860 between V7 and V3, of 0.950 between V5 and V4, of 0.962 between V8 and V5, of 0.952 between V9 and V5, of 0.969 between V7 and V6, of 0.929 between V7 and V10, of 0.955 between V8 and V9 and for 0.834 between V10 and V9.

When asked "Which of the following words come into your mind when you look at the package fig. 1 (a), ..., (j)? with variants sweet, sour, healthy, refreshing, tasty, something else ", the distribution of responses is specified in Fig.5 .

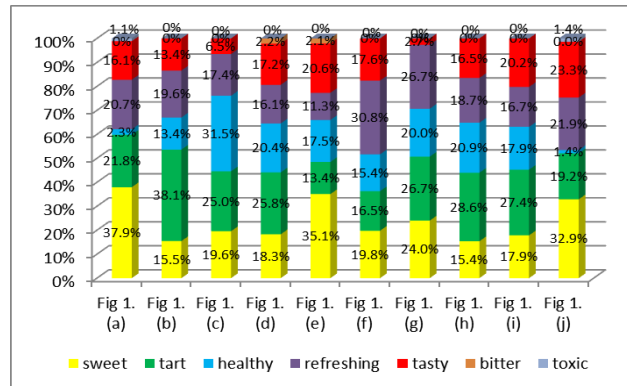


Fig. 5. The combination of figures 1 (a) to (j) with different attributes:

According to Fig. 5, Fig. 1 (a) suggests a sweet-sour juice, Fig. 1 (b) is suitable for sour and refreshing juices, Fig. 1 (c) makes people think of a healthy juice, Fig. 1 (d) is suitable for sour juices and healthy, Fig. 1 (e) suggests a sweet and tasty juice, Fig. 1 (f) is suitable for refreshing juices, Fig. 1 (g) suggests a sour and refreshing juice while Fig. 1 (i) suggests a sour juice and healthy and Figure 1 (j) is suitable for a sweet and tasty juice. The respondents assigned each figure (Fig. 1(a) to 1(j)) the corresponding fruits: apples, pears, cherries, apricots, sour cherries, peaches, grapes, strawberries, cantaloupe, watermelon, as can be seen in figure 6.

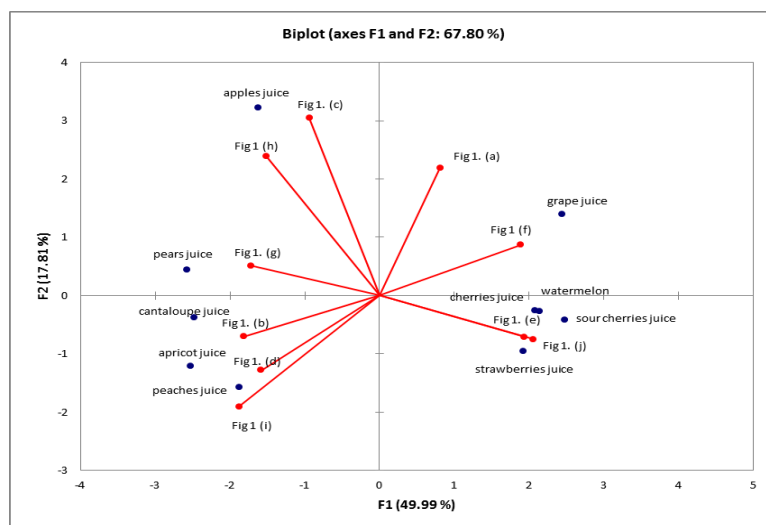


Fig. 6. PCA for association of figures 1 (a) to 1 (j) with various types of fruits

The first principal component (F1) offers the greatest amount of information, 49.99%, and the second one (F2) contributes 17.81% of the data distribution. Also, one may notice that apple juice is associated with the Fig 1. (c) and 1 (h), pears juice is associated with the Fig 1. (g), cantaloupe juice is associated with the Fig 1. (b), apricot juice and peaches juice are associated with the Fig 1. (d) and 1(i), grape juice is associated with the Fig 1. (a) and 1(f), cherries juice and watermelon juice are considered suitable similarly for fig. 1 (e) and 1(j). Also, sour cherry juice and strawberry juice are considered suitable similarly for fig. 1 (e) and 1 (j).

As results from the combination made by respondents among Figure 1 (a) to 1 (j) with various types of natural fruits, we obtained: Figure 1 (a) was associated by 69% of respondents with grape juice; Fig. 1 (b) was associated by 42% of respondents with melon juice; Fig. 1 (c) was associated by 47% of respondents with apple juice; as regards Fig.1 (d), 34% of respondents associated it with peach juice and 32% of respondents associated it with apricot juice, for Fig.1 (e), 30% of the respondents chose sour cherry juice; grape juice is indicated by 35% of respondents suitable for Fig.1 (f); Fig. 1 (g) is compatible with pear juice, chosen by 44% of respondents; Fig.1 (h) is suitable for apple juice, chosen by 39% of respondents; Fig. 1 (i) is associated by 33% of respondents with apricot juice; Fig.1 (j) is associated by 28% of respondents with strawberry juice and 26% of respondents with watermelon juice.

In terms of assigning a score from 0 (for non-carbonated) to 10 (extremely carbonated), arithmetic means and standard deviations of scores for every figures from 1 (a) to 1 (j) are shown in fig. 7, where means with the same assigned letter are not significantly different from one another (*Tukey's HSD, p-value < 0.05*).

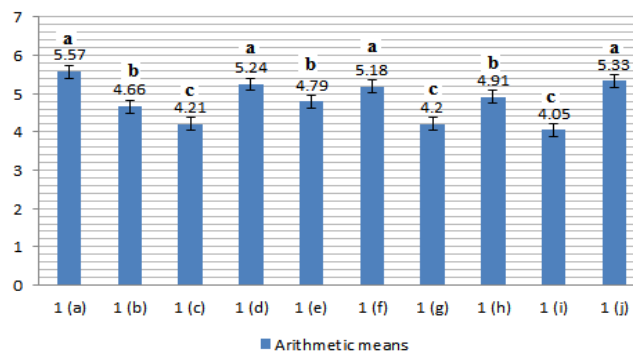


Fig. 7 Means of scores assigning for every figure from 1 (a) to 1 (j)

Means of scores were compared by using one - way analysis of variance (ANOVA), in order to assess significant differences among figures 1(a) to 1 (j).

We remark that there are 3 groups of figures formed (from the point of view of the scores obtained): group (I), formed by figures 1(a), 1(j), 1(d) and 1(f) having the means of score more than 5 points, suitable for carbonated fruit juice; group (II), formed by figures 1(h), 1(e) and 1(b) having the means of score between 4.91 and 4.66 points, suitable for slightly carbonated fruit juices; and group (III), formed by figures 1(c), 1(g) and 1(i) having the means of score between 4.21 and 4.05 points, suitable for very slightly carbonated fruit juices.

CONCLUSION

Package material and design are important elements in sale process still colour is that which combines all its aspects, being one of the most outstanding means of rendering package a real instrument of communication. Consumer's expectations on sensorial attributes of a product may be influenced by the impact of the package colour.

After processing the questionnaire results we have noticed that taste, natural and healthy composition are the most appreciated features of juice by respondents; juice box colour matches the colour of the fruit the juice is made from. Most of the respondents associated the term *natural juice of local fruit* with yellow colour (52%) or orange colour (36%), being obvious that respondents prefer moderately carbonated juices of fruits.

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