DO TASTE AND ATTENTION AFFECT CONSUMER PREFERENCES FOR MULTIPLE NUTRITIONAL AND HEALTH CLAIMS ON A HEALTHY FOOD PRODUCT? AN EMPIRICAL INVESTIGATION ON SPANISH CONSUMERS

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Abstract

The purpose of the current research is to assess consumer evaluation for multiple nutritional claims (NCs) versus health claims (HCs) on a healthy food product (yogurt), examine whether and how taste influences consumer preferences for these labels through a discrete choice experiment, and explore the visual attention that consumers give to NCs and HCs on yogurt package through the eye tracking technique. Results from logistic regression models suggest that there is a relationship between the most highly valued NCs and/or HCs from the stated preferences and the most viewed claims in terms of visual attention (fixation count). This relationship affirms that final product selection is not only based on the type of labeling on the package but also the visual attention that consumers pay to it. Tasting a healthy food product resulted in higher values and higher visual attention attached to NCs and HCs, however, preferences between the two treatments (taste and no-taste) were homogeneous.

Keywords: Nutritional and health claims, eye-tracking, discrete choice experiment, yogurt, consumer

1. Introduction

The obesity epidemic constitutes an important threat to national and global public health in terms of prevalence, incidence, and economic burden (Tremmel et al., 2017). To prevent this phenomenon, the European Union (EU) has introduced nutritional claims (NCs) and health claims (HCs) (Regulation (EC) Nº 1924/2006 and 432/2012), reported on the front of pack (FOP) of pre-packaged food products. Evidence from previous studies shows that food products bearing NCs and HCs are seen as healthier alternatives and that consumers are willing to pay premium prices for them (Ballco & de-Magistris, 2018; de-Magistris & Lopéz-Galán, 2016). However, consumers typically make choice decisions within a few seconds; thus, they may not attend to all the information available on the FOP (Milosavljevic and Cerf, 2008). For this reason, studying consumers' attention to food labels is becoming a key aspect in the design of food labels. In this research we focus in this latter aspect and assess consumer choices through a discrete choice experiment, explore attention by using the eye-tracking technology, and examine whether taste influences the final choice decision for different yogurts with NCs and HCs.

2. Materials and methods

2.1 Discrete choice experiment: product and attribute selection

For the selection of the product and the attributes to be included in the experiment, we created a database that collected information regarding food products available in different hypermarkets and supermarkets. We chose yogurt for further analysis because it was the product that carried the most NCs and HCs. In total there were 251 yogurts with NCs and 67 yogurts with HCs on the FOP that corresponded to the official EU definitions. To summarize, the attributes and levels included in the experiment are shown in table 1. In addition to those present in the local market HCs (e.g., HCs number 3, 5 and 7 as reported in table1) we used five additional HCs in the experiment which were extracted from the EU Regulations (e.g., HCs number 1, 2,4, 6 and 8 as reported in table 1) and a focus group of 20 "average consumers" of different ages and education levels. Thus, our final design had 6 levels of NCs and 8 levels of HCs. Each participant completed 11 choice tasks with three options (A, B or no-buy).

Table 1: Levels of nutritional and health claims and variable names used

N°	NC levels	Variable name[a]	Presence[b] (%)	N°	HC levels	Variable name[c]	Presence (%)
1°	Fat-free	Nc_fat	(42.78)	1°	Reducing consumption of saturated fat contributes to the maintenance of normal blood cholesterol levels (A)*	Hca[d]_fat	-
2°	Low sugars	Nc_sug	(11.99)	2°	Consumption of food containing sweeteners instead of sugar induces a lower blood glucose (A)	Hca_sug	-
3°	High fiber	Nc_fib	(1.09)	3°	Fiber contributes to an acceleration of intestinal transit	Hcp[a]_fib	3.80
				4°	Fiber contributes to an increase in fecal bulk (A)	Hca_fib	-
4°	Source of vitamin B_6	Nc_vit	(10.63)	5°	With vitamin B_6 that helps your defenses and reduces fatigue	Hcp_vit	10.33
				6°	Vitamin B_6 contributes to the normal functioning of nervous system (A)	Hca_vit	-
5°	Source of calcium	Nc_cal	(21.25)	7°	Calcium is necessary for maintaining bones under normal conditions	Hcp_cal	2.17
				8°	Calcium contributes to normal muscle function (A)	Hca_cal	-
6°	Plain (Baseline)	Nc_nat	(12.26)	9°	-	-	-

Notes: * Defines that a HC has not yet being introduced to the local market - absent (A). [a]Indicates variable names for the nutritional claims used in the model estimations. [b]Indicates the presence of that NC and HC found in the local market on yogurts and is expressed in percentage. [c]Indicates the variable names for nutritional and health claims. [d]Hca represents the health claims that are not present in the market (absent). [e]Hcp represents the health claims that are present in the market.

2.2 Eye-tracking and its measures

For the analysis of the eye movement data, we defined a set of areas of interest (AOIs) to capture the eye fixations on the NCs and HCs corresponding to each attribute. Visual attention was measured for each attribute (AOI) in terms of fixation count. Fixation count is the number of times a participant focused her/his gaze on the AOI. More fixation counts mean that the area is more noticeable with respect to the rest of the AOIs present in that choice task (Poole et al., 2005). The combination images were presented one by one in a computer. Before the display, participants were familiarized with the process using an example.

2.3 Model specification

In this study, a logistic regression model was estimated allowing for multiple observations from individuals. The first model (Model I) is the baseline model takes into account the choice preferences and assumes random preferences and correlation patterns across parameters. Data are divided into the taste and no-taste treatments meaning we estimated two separate equations. In these models, "*Choice*" was a function of NC and HC attributes. Hence, the preference of individual *n* derived from alternative *j* in task *t* can be expressed as follows:

$$Choice_{njt} = \beta_0 + \beta_1 nc\_fat_{njt} + \beta_2 hc\_fat_{njt} + \beta_3\, nc\_sug_{njt} + \beta_4 hc\_sug_{njt} + \beta_5 nc\_fib_{njt} + \beta_6 hcp\_fib_{njt} + \beta_7 hca\_fib_{njt} + \beta_8 nc\_vit_{njt} + \beta_9 hcp\_vit_{njt} + \beta_{10} hca\_vit_{njt} + \beta_{11} nc\_cal_{njt} + \beta_{12} hcp\_cal_{njt} + \beta_{13} hca\_cal_{njt} + \varepsilon_{njt} \quad (1)$$

In equation (1) $Choice_{njt}$ is the n^{th} consumer's preference for choosing alternative *j* in task *t*. The constant β_0 represents the no-buy option, while the coefficients β_1 *to* β_{13} are the rest of attributes (NCs and HCs) and enter the model as dummy variables (1 if the product displays them on the FOP and 0 otherwise). Lastly, ε_{njt} is the idiosyncratic error and is independently and identically distributed (IID). The second model (Model II) incorporates the data from visual attention (fixation count). In this model, we create interaction terms between the variables from the choice experiment decisions and visual attention and estimate a logistic regression model for each treatment (taste – no-taste) to capture the marginal effects.

3. Results

3.1. Sample characteristics

The experiment was conducted in 2016 in Zaragoza (Spain). Table 2 shows the characteristics of the final sample of respondents.

Table 2 - Descriptive analysis of the sample and demographic characteristics (n=218).

	Sample	Population Spain
Gender		
Male	47.25%	49.00%
Female	52.75%	51.00%
Age[a]		
Age of respondents	48.8 (15.26)[c]	42.90
From 18 to 34 years	19.72%	22.24%
From 35 to 44 years	20.64%	19.55%
From 45 to 54 years	18.35%	18.28%
More than 55 years	41.28%	39.93%
Education Level[b]		
Primary studies	26.61%	24.88%
Secondary studies	41.74%	47.64%
University studies	31.65%	27.48%

Note: [a] Provisional data obtained (INE) at 1st of January 2017 (INE, 2017). [b] (OECD, 2014). [c]Average, standard deviation.

3.2. Estimates from the visual attention and sensorial analysis

Table 3 presents the results from the logistic regression models and their treatments.

Table 3 – Results from the logistic regression models (n=218)

Parameters	Model I		Model II-FC	
	Taste	No taste	Taste	No-Taste
	Coef. (z-ratio)	Coef. (z-ratio)	Coef. (z-ratio)	Coef. (z-ratio)
Constant	-1.83 (-71.48)***	-1.65 (-47.14)***	-1.34 (-74.53)***	-1.12 (-45.87)***
Nc[a]_fat	-0.13 (-1.03)	-0.03 (-0.19)	0.56 (12.11)***	0.27 (4.04)***
Nc_sug	-0.57 (-4.58)***	-0.61 (-3.43)***	0.24 (5.51)***	0.10 (1.75)
Nc_fib	0.73 (13.43)***	0.65 (8.38)***	0.46 (11.20)***	0.25 (4.16)***
Nc_vit	-0.48 (-6.12)***	-0.33 (-2.99)***	0.32 (10.51)***	0.28 (6.44)***
Nc_cal	-0.20 (-2.59)***	-0.18 (-1.71)	0.38 (11.79)***	0.22 (4.82)***
Hc[b]_fat	2.68 (21.89)***	2.15 (12.94)***	0.79 (22.20)***	0.71 (13.32)***
Hc_sug	2.07 (17.05)***	1.81 (10.44)***	0.43 (12.57)***	0.32 (6.12)***
Hcp[c]_fib	1.10 (17.33)***	0.93 (10.14)***	0.58 (16.78)***	0.47 (9.10)***
Hca[d]_fib	0.37 (6.71)***	0.43 (5.52)***	-0.02 (-0.20)	-0.20 (-1.25)
Hcp_vit	2.48 (28.74)***	2.14 (17.67)***	0.69 (18.27)***	0.56 (9.98)***
Hca_vit	2.18 (27.51)***	1.81 (16.26)***	0.61 (17.95)***	0.39 (7.68)***
Hcp_cal	2.23 (26.73)***	1.90 (15.99)***	0.63 (19.09)***	0.48 (9.78)***
Hca_cal	1.82 (23.70)***	1.56 (14.22)***	0.55 (16.05)***	0.37 (7.14)***
Number of observations	28.776	13.596	28.776	13.596
R^2	0.15	0.11	0.16	0.11
Log likelihood	-15603.38	-7677.09	-13296.99	-6123.00

Notes: ** and *** denotes statistical significance at 5% and 1% levels, respectively. [a]Nc means nutritional claim. [b]Hc means health claim. [c]Hcp means health claims present in the local market. [d]Hca means health claims absent from the local market. [e]SD stands for standard deviation and *z–ratio*.

Results indicate that the constant coefficient is negative and statistically significant in both models (I and II) and treatments, indicating that consumers value any NC and HC more than the no-buy option. In model I, the coefficients of four NCs (i.e., *fat-free*, *low sugar*, *source of vitamin* B_6, and *source of calcium*) are negative and statistically significant in both treatments, indicating a negative effect when these claims are reported on yogurt packages. Out of five, only one NC (i.e., *high fiber*), generated positive effects compared to the baseline full-fat plain yogurt. In comparison to NCs, all HCs are positive and statistically significant in both treatments (Model I) indicating a positive contribution to respondent

preferences compared to the full-fat plain yogurt. The marginal change in a HC that was most important to respondents (i.e., had the coefficient of greatest magnitude) was the *"Reducing consumption of saturated fat contributes to the maintenance of normal blood cholesterol levels"* present in the market claim, followed by *"With vitamin B_6 that helps your defenses and reduces fatigue"* health claim.

Results from model II, where the interaction effects between choices and attention are incorporated shows that most attributes are positive and statistically significant. Similar to model I, participants in model II attached a greater value to HCs in comparison to NCs in both treatments. Compared to model I, in model II NCs are positive and statistically significant, however, generating lower preferences compared to the HCs when the NCs is accompanied by its HC. Findings between the taste and no-taste treatment show that when participants experience the taste of the product they attach higher values to NCs and HCs (i.e., coefficients receive greater magnitude) compared to when the taste is missing in both models. However, there is a consistency in the evaluation of NCs and HCs for both models (Model I and II) between the taste and no-taste treatment. This result indicates that there is heterogeneity in preferences between types of information labels and that experiencing the taste of yogurts does not affect preferences for NCs and HCs.

4. Conclusion

Results suggest that there is, a relationship between the highly valued NCs and HCs and the visual attention data in terms of fixation count. Hence, the more we visualize an attribute the higher the probability to purchase it. Even though we found consistency between the taste and no-taste treatments on yogurts with NCs and HCs, this does not necessarily mean that healthy products have less taste compared to the un-healthy ones. Therefore, whilst we maintain that taste is one of the highest influential factors that consumers consider when purchasing food products, we argue that further research is needed, perhaps in yogurts with NCs and HCs that contain fruits and flavors rather than plain ones.

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