Società Italiana Marketing

Il Marketing per una società migliore

XVII^ SIM Conference

Castellanza, 29-30 ottobre 2020

PROCEEDINGS

ISBN 978-88-943918-4-8

EYE ON PACK. Visual search strategies in food choice

ALESSIA AMATO[1*] ANDREA BAZZANI[2·] UGO FARAGUNA[3ª]
LEOPOLDO TRIESTE[4**] GIUSEPPE TURCHETTI[5··]

Abstract

A growing number of authors apply neuroscientific techniques to design the packaging of products and test the efficacy of their positioning on a shelf. Food products and nutritional labels received great attention since their health implications. This study aims at investigating whether consumers adopt specific visual search strategies to choose a food product, such as a sweet snack. We also explore which personal characteristics are correlated to these strategies. We recruited 36 participants who underwent a lab experiment with an eye-tracker. They had to choose among different ice-creams projected on a screen. Participants showed to prefer products in specific positions, according to a front or top view of the stimuli. We distinguished four basic visual strategies for decision-making grounded on the number of fixations and the fixation duration on areas of interest (AOIs), corresponding to product alternatives. The 91% of products chosen fell into one of the principal AOIs (PAOIs), corresponding to products with the maximum of minimum value of each of the two gaze metrics considered. Moreover, the visual search strategies adopted changed based on age, sex, BMI, the level of food literacy and the importance attributed to specific purchase aspects. Taken together, these findings suggest that exploiting eye-tracking techniques it is possible to predict which positions of a product consumers tend to choose based on their personal characteristics and purchase habits acquired throughout traditional self-reported measures. Within the realm of consumer neuroscience, the acquisition of personal data is entirely addressed to improve consumers' satisfaction and wellbeing.

Keywords: Food choice, food literacy, consumer behaviour, consumer neuroscience, eye-tracking

---

1

* M.Sc in Human Nutritional Science, Department of Pharmacy - University of Pisa e-mail: a.amato17@studenti.unipi.it

2· PhD Candidate in Management, Institute of Management, Scuola Superiore Sant'Anna; andrea.bazzani@santannapisa.it

3♠ Associate Professor of Physiology, Department of Translational Research and New Technologies in Medicine and Surgery - University of Pisa; ugo.faraguna@unipi.it

4** Assistant Professor of Management, Institute of Management, Scuola Superiore Sant'Anna; leopoldo.trieste@santannapisa.it

5·· Professor of Management, Institute of Management, Scuola Superiore Sant'Anna; giuseppe.turchetti@santannapisa.it

Objective - The present study aims at investigating whether consumers apply specific visual search strategies to choose a food product, such as a sweet snack (ice-cream). Moreover, we intend to explore whether personal variables (e.g. age, sex, BMI, etc.), food literacy and food purchase habits correlate with eventual differences in attentional levels and visual search strategies.

Literature Background - Consumers are often told to pay more attention to the quality of what they eat (Cowburn and Stockley, 2004). Indeed, food products absolve nutritional needs in addition to be tasty and satisfying. For this reason, a growing attention has been directed to a correct and engaging use of nutritional labels (Bo Rundh, 2016). Scholars already tried to describe the modalities through which consumers approach the consultation of food nutritional properties and quality, and attempted to define the profile of a responsible consumer (Drichoutis et al., 2006; Grunert and Wills, 2007). The concept of food literacy became the focal point of any behavioural intervention aimed at improving the resort to nutritional labels and the adoption of healthy eating habits in general (Cullen et al., 2015; Perry et al., 2017). Some authors highlighted that among the possible different dimensions of food literacy, the possession of good procedural skills is what impacts the most on consumers' purchase and consumption behaviours (Benne, J., 2014; Palumbo et al., 2018; Poelman et al., 2018). However, limited evidence is reported with respect to the success rate of engaging low food literate consumers to choose a food product grounded on nutritional information (Visschers et al., 2010; Cavaliere et al., 2017). Several experiments have been conducted to explore the behavioural strategies adopted in food choice (Van Loo et al. 2018: García-Madariaga et al., 2019). While some authors concentrated their efforts on testing directly the ease in reading nutritional labels when positioned in the front of the packaging (van Camp et al., 2010; Campos et al., 2011), other authors investigated more in depth the visual search strategies adopted by consumers. Among these, Reutskaja and colleagues (2011) demonstrated the search dynamics of consumers' gaze for a food product when subjected to time constraints using eye-tracking technique. In a similar vein, many authors applied neuroscientific techniques to test the best design of a product and its positioning on a shelf, and of nutritional labels on a packaging (Stasi et al., 2018; Tórtora et al., 2018).

Positioning and contribution of this paper – With respect to the current literature, on the one hand, our research project was designed to test the possible correlation between the level of food literacy and the propensity to pay attention to, and then buy, products with a nutritional label on the front of the packaging. Within the framework of behavioural interventions to improve healthy food habits, we think that nutritional labels can be considered a marketing claim for those consumers with a high nutritional education, especially for those who have good practical skills. On the other hand, this work is preliminarily intended to explore the importance attributed to the position of a product on a shelf or in a fridge counter as in this case, since the type of products we selected are ice-creams. This choice is in line with most of the studies using eye-tracking technique to investigate the visual search dynamics of consumers. Indeed, they usually adopt sweet snacks as stimuli, with clear and immediate

implications for companies, and policy makers involved in fighting against unhealthy lifestyles. Compared to these studies, the novelty of our research activity consists in having added a profiling survey, whose results give us the possibility to go beyond a simple description of the visual search strategies adopted, inferring which personal variables might influence the discrepancies observed between the trends of attentional gaze metrics and the choice actually made by participants. In this paper we focus on this second part of our research project, postponing to a dedicated study the results and discussions on the correlation between food literacy and the visual salience of nutritional labels.

Methodology

Study design

The study consisted of two parts. First a large sample of participants was profiled through a survey, and then a subsample of participants was recruited to undergo a lab experiment with eye-tracking.

Participants

The larger sample was composed of 194 Italian participants (avg. age 33.52 years, SD: 9. 761, median: 26 years; 29% male, 71% female). Inclusion criteria foresaw fluency in Italian language and age >18 years old. The subsample of participants who underwent the experimental part was instead composed of 36 subjects (avg. age 30.39 years, SD: 10.196, median: 26 years; 33% male, 67% female), excluding subjects with the following characteristics: assumption of any drug or substance influencing the regulation of appetite; presence of metabolic or hypothalamic disorders; presence of allergy or intolerance to any of the ingredients of a common ice-cream.
This study received the approval of the Ethical Committee of the University of Pisa.

Procedure of the lab experiment

Participants were asked to comfortably seat in front of a screen at 60 cm. The monitor was equipped with an eye-tracker that recorded participants' gaze during the vision of 12 trails, each given by two pictures of ice-creams. Some products were customized presenting a nutritional label on the front of the packaging. The first trail consisted of a frontal view of four products (front view packaging) and the second of a top view of six products (caps). The participant was free to move on by pressing the space key. After, a black screen appeared for 3s and then the participant was asked to choose from a list one of the products previously displayed. The position of products in each trial was randomized (Rebollar et al., 2015). The experiment lasted around 10min.

Tools

The self-report profiling survey was composed by several validated questionnaires for the assessment of personal and demographic data, eating and purchase habits (D'Addezio et al., 2006; Leclercq et al., 2009), food literacy, and other psychometric variables, i.e. chronotype and trust. Food literacy was explored through two different questionnaires: The Self-Perceived Food Literacy Scale (SPFL) (Poelman et al., 2018) and the Short Food Literacy Questionnaire (SFLQ) (Krause et al., 2018). The

latter is more focused on declarative knowledge, while the former is oriented to evaluate procedural skills.
The gaze of participants was recorded by an eye-tracker (Tobii X2-30) with a sampling rate of 30Hz. The data collected were pre-processed using the dedicated software TobbiProLab®, and then exported for a customized analysis with R, considering two different gaze metrics, i.e. the number of fixations and the fixation duration on a product for each participant.

Statistics

Given the different number of possible positions for products' display, i.e. four in the front view and six in the top view, we considered such positions as Areas of Interest (AOIs) according to eye-tracking data collection.
We used two different gaze metrics, i.e. "fixation duration" and "number of fixations".
AOIs with extreme (max-min) values of each of the two gaze metrics were called "Principal AOIs (PAOIs)".
After comparing the distributions of products chosen (C) and products in the PAOIs (F), to test the differences C-F, we estimated a measure of standardized difference between positions (C-F), as follows:

> C-F = number of positions of products we should pass through moving from C to F.

C-F was hence calculated for each possible condition for F for each trail (choice): DF_dmax, DF_dmin, DF_fmax, DF_fmin (see **Table 1**).
If C was to the left of F, C-F assumed a negative sign; otherwise, a positive sign.
The difference C-F was also adjusted according to the number of items displayed, i.e. six in the trails with a top view and four in the trails with a front view:

> C-F (front) = difference / 3
> C-F (top) = sign(C-F)*mod(difference, 3) / 2. When the difference was 3, we prior transformed it into 1, since mod(3,3) = 0.

To individuate the visual search strategies, C-F patterns were calculated on 864 observations (24 trails x 36 participants).

In order to select the gaze metrics that better predict the choice, i.e. the F which minimize the difference C-F, we compared DF_dmax, DF_dimin, DF_fmax and DF_fmin according to their cumulative distribution functions (CDFs). Let F(X) be the CDF of C-F=*X*. For negative values *(C-F=x < 0)*, the best metric is that minimizes *F(X)*. For positive values (*C-F=x > 0*), the best metric is that maximizes *F(X)*.

To assess the influence of personal variables, food literacy and self-reported purchase habits on visual search strategies, linear regression models with stepwise methods were run on 36 observations, considering as dependent variables the four possible mean values per participant of |C-F|, i.e. DF_dmax, DF_dmin, DF_fmax, DF_fmin.

For each participant, we eventually considered the average time passed on a trail (out of 24) (Dur_sess), i.e. the mean time spent to choose.

Table 1. Variables considered in the analysis.

Name	Definition
DF_fmax	difference between the position of the product chosen (C) and the PAOI with the maximum number of fixations (fmax)
DF_fmin	Difference between the position of the product chosen (C) and the PAOI of the minimum number of fixations (fmin)
DF_dmax	Difference between the position of the product chosen (C) and the PAOI of the minimum number of fixations (dmax)
DF_dmin	Difference between the position of the product chosen (C) and the PAOI of the minimum number of fixations (dmin)
DUR_SES	sum of duration fixations i.e., it is the time necessary to take decision)
Age	years
Gender	1: female; 2: male
BMI	Body Max Index (weight[Kg]/heigh^2[m]): 1: normal weight [18.5-24,99); 2: overweight [25, 29.99); 3: obese >=30.
MEQ	1: evening type; (rMEQ score <11) 2: neutral type (rMEQ score; [12-17]; 3: morning type (rMEQ score >17). rMEQ consists of 5 questions
SPFL	Mean of the 8 different domains
Purchase habits	Degree of importance (from 1 to 5) attributed to price, nutritional properties, brand reputation, product availability, packaging and advertising

Empirical Evidence

Visual search strategies

The AOIs with the maximum number of fixations (fmax) (per participant, on average) are those in the upper left in top view and central in both top (upper and lower central positions) and front (central left and central right positions) views (see **Figure 1**). Upper left and left AOIs also reported the highest duration of fixation (damx), respectively in top and front view.

With respect to choices, we observed that in case of top view the most selected products (C) are those on the upper left (21%), while in front view products on the left side (first position from left) are the less selected ones (18%).

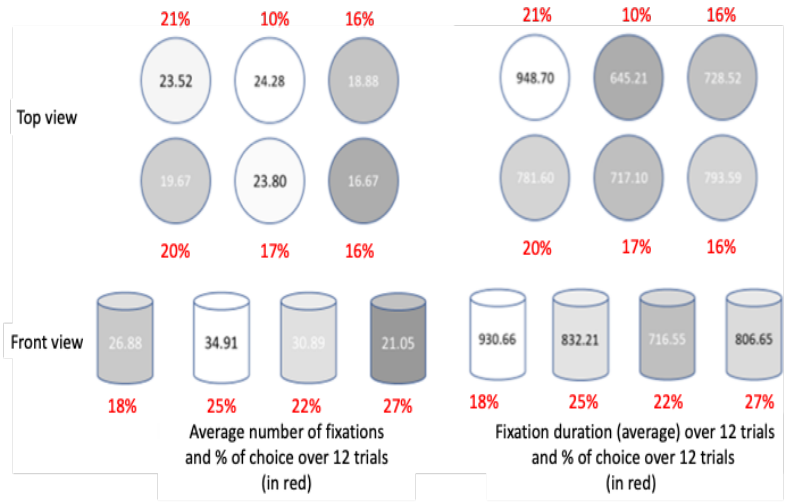


Figure 1. Average values per participant of number of fixations (left) and fixation duration (right) in top and front view. In red the average of individual choices for each AOI.

Strategies based on gaze metrics

Comparing out the 24 trials the distributions of products chosen (C) and of products in the PAOIs (F), the 91% of (C) fell in a PAOI. Specifically, in the fmin-PAOIs (18%), fmax-PAOIs (30%), dmin-PAOIs (17%), and dmax-PAOIs (26%).

Figure 2. Heatmaps of gaze data for the top view (upper) and front view (lower) of a stimulus projected (ice-creams). Colour code: red colour corresponds to areas with a higher density of fixations compared to green colour.

Considering also C and F distributions and the type of view:

- In the front view, C tends to coincide with F more in left (F = fmin) and central (F = fmax) positions; instead, C on the right side tends to correspond to F = dmax (see **Table 2**). To note that distributions of C among different PAOIs with dmin and dmax are not independent (p-value: 0.864).
- In the top view, C in the upper left position tends to correspond to F = fmax. Instead, C on the upper right and on the lower line tends to correspond to F = dmax. Distributions of C among different PAOIs with dmin and dmax are not independent (p-value: 0.738).

Therefore, we should expect that participants, who adopt the number of fixations as a visual search strategy for decision-making, will prefer products on the left. On the contrary, participants who adopt fixation duration as visual strategy tend to choose products on the right side.

To note, in general, that the distribution of choices on different PAOIs per position are independent of each other, with the exception of F=dmin and F=dmax (see **Table 2**).

Table 2. Distribution of the number of choices corresponding to PAOIs.

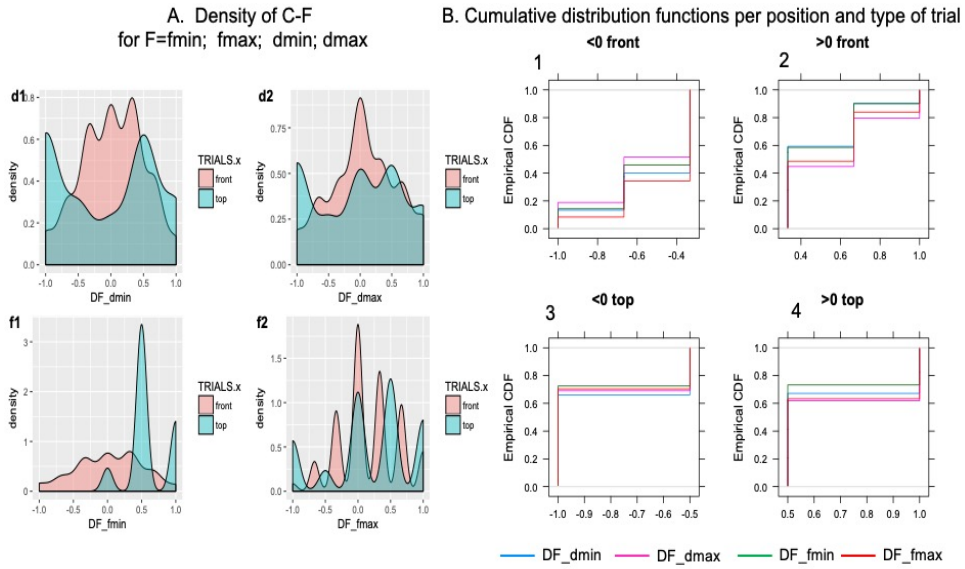
view	Position	A. fmin	B. fmax	C. dmin	D. dmax	Tot.
front	L	49	42	27	34	**152**
	CL	8	46	22	29	**105**
	CR	12	35	27	28	**102**
	R	30	12	24	34	**100**
top	UL	21	51	8	30	**110**
	UC	7	19	4	6	**36**
	UR	9	14	8	15	**46**
	LL	12	13	9	23	**57**
	LC	2	16	7	16	**41**
	LR	2	7	7	11	**27**
	Tot.	**152**	**255**	**143**	**226**	**776**
		20%	33%	18%	29%	100%

Front. χ^2 test p.values: (A,B): 0.000***; (A,C): 0.000***; (A,D): 0.000***; (B,C): 0.008***; (C,D): 0.864. **Front.** χ^2 test p.values: (A,B): 0.14; (A,C): 0.036*; (A,D): 0.073.; (B,C): 0.011*; (C,D): 0.738. Where the number of observations was not sufficient, p-values have been estimated through Monte Carlo techniques.

Visual strategies as choice predictor

If C does not correspond to F, the gaze metric (i.e. fmin, fmax, dmin, dmax) which minimizes the difference C-F can be considered the best predictor of choice. **Figure 3** shows that in the front view when the C is on the left side, it is closer to F= fmax;

when it is on the right side, it is closer to F=dmin (see **Figure 3 B 1,2**). In the top view, when C is on the left side, it is closer to F=dmin; when it is on the right side, it is closer to F=fmin. We can conclude that the two gaze metrics analyzed provide four different visual search strategies for decision-making, on the basis of which we can identify four basic profiles of consumers.



Df_dmin: distance between C and F, F=dmin. **Df_dmax**: distance between C and F, F=dmax. **Df_fmin**: distance between C and F, F= fmin. **Df_fmax**: distance between C and F, F=fmax.

Figure 3. Comparison of densities (A) and empirical cumulative distributions of specific difference between C and F, where F is a PAOI (A d1, d2, f1, f2) per type of trial (B).

Visual search strategies, personal characteristics and purchasing behavior

We hence tried to define the associations between individual profiles grounded on gaze metrics (fmax, fmin, dmax, dmin) and the personal characteristics investigated through self-reported questionnaires.

We first considered the correlations among the variables listed in **Table 1**, also adding the time spent to make a decision (i.e., the total time spent on AOIs in each trail). As shown in **Figure 4**, only SPFL and SFLQ scores are highly and positively correlated between each other (0.94). Also, some significant correlations emerged among purchase habits. The degree of importance attributed to product availability correlates

with the importance assigned to packaging (0.37), to nutritional properties (0.43) and to BMI (0.37). To note also an interesting negative correlation (not significant though) between the level of food literacy (SPFL) and the importance of advertising.

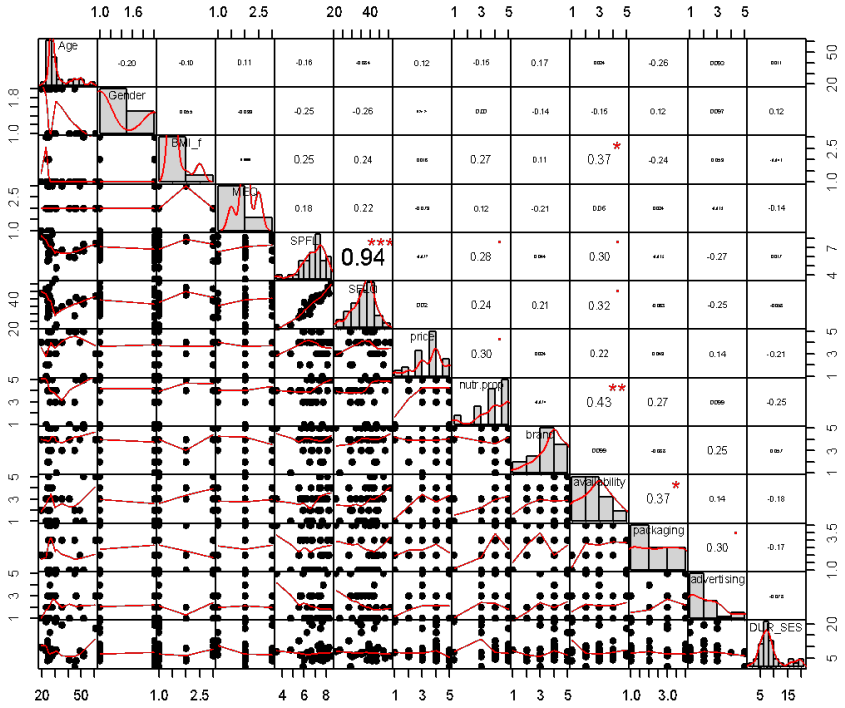


Figure 4. Personal and self-reported purchasing habits: correlations and distribution plot.

Then we explored the possible correlations between the time spent to decide and the personal characteristics, pointing out some positive correlations (although not significant) with age, gender (male), food literacy (SPFL) and brand reputation. On the contrary, the time spent to decide is negatively correlated with the importance attributed to advertising, packaging, product availability, nutritional properties, price; with food literacy (SFLQ); and with morning chronotypes. Therefore, the time spent to make decisions could discriminate between declarative (SFLQ) and procedural (SPFL) food literacy.

Interesting findings emerged about the correlations between personal characteristics, purchase habits, and the time spent to decide, and the four independent conditions of F (i.e. dmin, dmax, fmin, fmax), considered as the visual search strategies adopted to choose. For instance, we showed that an increase in age and BMI predicts a tendency towards the correspondence between C and F=fmax. In other words, participants with these characteristics tend to choose the products they fixate more frequently (see **Table 3**).

Instead, participants who spend more time on decision-making tend to choose those products they fixated the minimum number of times possible (see **Table 4**).

Male elder participants with a morning chronotype, or with a higher BMI, are those who probably choose products they fixate for a longer time (see **Table 5**).

Finally, participants who give importance to price and packaging of products tend to choose products they fixate for the shortest time possible (see **Table 6**).

Table 3. Determinants of fmax as a visual strategy.

DF_fmax (scaled)

	Est.	S.E.	t val.	p	
(Intercept)	-2.5	1.2	-2.07	0.05	*
DUR_SES	0.07	0.03	2.29	0.03	*
Age	-0.04	0.01	-2.54	0.02	*
BMI	-0.34	0.2	-1.71	0.1	.
SPFL	0.42	0.14	2.99	0.01	**
advertising	0.24	0.12	1.89	0.07	.
Signif. code: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' '		max vif coeff.=1.137			
R-squared = 0.46	Shapiro-Wilk test = resid normality, p = 0.983				
Adj. R-squared = 0.37	t.test resid mean = 0, p=1				
F(5,28) = 4.82, p = 0.000	Breush-Pagan test = homoscedasticity, p= 0.701				

Table 4. Determinants of fmin as visual strategy.

DF_fmin

	Est.	S.E.	t val.	p	
(Intercept)	0.38	0.03	13.14	0.00	***
DUR_SES	-0.003	0.002	-1.98	0.06	.
Gender	0.08	0.02	4.59	0.00	***
BMI	0.03	0.01	2.37	0.02	*
Signif. code: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' '			max vif coeff.=1.043		
R-squared = 0.5	Shapiro-Wilk test = resid normality, p = 0.955				
Adj. R-squared = 0.45	t.test resid mean = 0, p=1				
F(3,30) = 10.17, p = 0	Breush-Pagan test = homoscedasticity, p= 0.656				

Table 5. Determinants of dmax as a visual search strategy.

Df_dmax

	Est.	S.E.	t val.	p	
(Intercept)	0.495	0.123	4.018	0.00	***
Age	-0.003	0.001	-2.077	0.047	*
Gender	-0.063	0.027	-2.34	0.027	*
BMI	-0.032	0.016	-1.934	0.064	.
SPFL	0.030	0.013	2.346	0.027	*
MEQ	-0.034	0.02	-1.705	0.10	.
advertising	0.034	0.01	3.255	0.003	**
Signif. code: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' '			max vif coeff.= 1.327		
R-squared = 0.532	Shapiro-Wilk test = resid normality, p =0.966				
Adj. R-squared = 0.428	t.test resid mean, p=1				
F(6,27) = 5.115, p = 0.001	Breush-Pagan test = homoscedasticity, p= 0.277				

Table 6. Determinants of dmin as a visual search strategy.

DF_dmin

	Est.	S.E.	t val.	p	
(Intercept)	0.44	0.05	9.55	0.00	***
Gender	0.07	0.02	4.25	0.00	***
MEQ	0.02	0.01	1.82	0.08	.
Price	-0.02	0.01	-2.79	0.01	**
nutritional_properties	0.02	0.01	3.17	0.00	**
Packaging	-0.02	0.01	-2.7	0.01	*
Signif. code: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' '			max vif coeff.=1.283		
R-squared = 0.59	Shapiro-Wilk test = resid normality, p = 0.754				
Adj. R-squared = 0.52	t.test resid mean = 0, p=1				
F(5,28) = 8.13, p = 0	Breush-Pagan test = homoscedasticity, p= 0.814				

Conclusion

Taken together, the findings presented in the previous paragraph show that it is possible to identify different unconscious gaze patterns in food product choice. Consumers can adopt specific visual search strategies to decide based on their personal characteristics. For instance, gender, age, the level of food literacy, as well as the importance attributed to specific purchase habits, emerged to be crucial in defining which visual search strategy is adopted to move across alternative products of the same type (ice-creams in this case). We distinguished four types of basic visual search strategies grounded on two gaze metrics analysed, i.e. number of fixations and fixation duration. Considering the maximum and minimum values of each metric, we individuated four clusters of participants.

(i) those participants who tended to choose the products they fixated more frequently were older participants or participants with a high BMI.

(ii) participants who spent more time making decisions tended to choose those products they observed the least number of times possible.

(iii) male or elder participants, with a morning chronotype or with a higher BMI, are those who tended to choose products they fixated for a longer time.

(iv) participants who attributed importance to packaging and price tended to choose products they fixated for the shortest time.

Moreover, participants showed to prefer some positions in food product choice according to the type of display view (front or top). The analysis of the AOIs with the highest or lowest values of the two gaze metrics considered, named PAOIs, confirmed that the 91% of choices fell into one of the PAOIs.

Therefore, we concluded that exploiting eye-tracking techniques it is possible to predict which products, depending on their spatial position, consumers tend to choose on the basis of their personal characteristics and purchase habits acquired throughout traditional self-reported measures. This information may be extremely valuable to companies in increasing the effectiveness of their marketing strategies with respect to the specific segments of consumers they are targeting.

Limitations and areas for future research

We are fully aware of the limitations of this study, starting from the number of subjects recruited. However, we believe that by enlarging the sample size we will be able to confirm these promising results and conduct further refined analysis. Other gaze metrics, e.g. the fixation path, might provide useful information about consumer behavior. We suggest that marketing campaigns should take into account objective biometric correlates of decision-making to design personalized and efficient ads, essential to convey messages of social promotion, such as those related to proper nutritional habits.

Research and social marketing implications

At the intersection among marketing, decision science, neuroscience and economics, a valuable conceptual framework and a rigorous experimental paradigm are necessary to improve our knowledge on human behavior without ignoring those noble aims we must pursue. Healthy lifestyles, responsible and conscious consumption, and the awareness of the unconscious processes that govern our decisions are feasible goals thanks to the application of neuroscience to marketing and economics. Within the realm of consumer neuroscience, the acquisition of personal data is entirely addressed to improve consumers satisfaction and wellbeing.

References

Benne, J. (2014) "Food, nutrition or cooking literacy - a review of concepts and competencies regarding food education", Internationa Journal of Home Economics, Vol 7 No 1, pp. 13-35

Bo Rundh (2016) "The role of packaging within marketing and value creation', British Food Journal, Vol 118 No 10, pp. 2491-2511 doi: doi.org/10.1108/BFJ-10-2015-0390.

van Camp, D. J., Hooker, N. H. and Souza-Monteiro, D. M. (2010) "Adoption of voluntary front of package nutrition schemes in UK food innovations", British Food Journal, Vol 112 No 6, pp. 580–591. doi: 10.1108/00070701011052673.

Campos, S., Doxey, J. and Hammond, D. (2011) "Nutrition labels on pre-packaged foods: A systematic review", Public Health Nutrition, Vol 14 No 8, pp. 1496–1506. doi: 10.1017/S1368980010003290.

Cavaliere, A., De Marchi, E. and Banterle, A. (2017) "Investigation on the role of consumer health orientation in the use of food labels", Public Health, Vol 147, pp. 119–127. doi: 10.1016/j.puhe.2017.02.011.

Cowburn, G. and Stockley, L. (2004) "Consumer understanding and use of nutrition labelling: a systematic review", Public Health Nutrition, Vol 8 No 1, pp. 21–28. doi: 10.1079/phn2005666.

Cullen T, Hatch J, Martin W, Higgins JW, Sheppard R. Food Literacy: Definition and Framework for Action. Can J Diet Pract Res. 2015;76(3):140-145. doi:10.3148/cjdpr-2015-010

D'Addezio, L., Capriotti, M., Pettinelli, A. and Turrini, A. (2006) "L'indagine Nazionale sui consumi alimentari in Italia: INRAN-SCAI 2005-06; parte C: i risultati dei questionari sulle abitudini alimentari".

Drichoutis, A., Lazaridis, P. and Nayga Jr, R. (2006) "Consumers' use of nutritional labels: a review of research studies and issues", Academy of marketing science review, Vol 2006 No 9

García-Madariaga, J., Blasco López, M. F, Burgos, I. M, Virto, N.R. (2019) "Do isolated packaging variables influence consumers' attention and preferences?", Physiology and Behavior. Vol 200, pp. 96–103. doi: 10.1016/j.physbeh.2018.04.030.

Gréa Krause, C., Beer-Borst, S., Sommerhalder, K., Hayoz, S. and Abel, T. (2018) "A short food literacy questionnaire (SFLQ) for adults: Findings from a Swiss validation study", Appetite, Vol 120, pp. 275–280. doi: 10.1016/j.appet.2017.08.039.

Leclercq, C., Arcella, D., Piccinelli, S., Sette, S. (2009) "The Italian National Food Consumption Survey INRAN-SCAI 2005-06: Main Results: In terms of food

consumption", Public Health Nutrition, Vol 12 No 12, pp. 2504–2532. doi: 10.1017/S1368980009005035.

Van Loo, E. J., Grebitus, C., Nayga, R. M., Verbeke, W., Roosen, J. (2018) "On the Measurement of Consumer Preferences and Food Choice Behavior: The Relation Between Visual Attention and Choices", Applied Economic Perspectives and Policy, Vol 40 No 4, pp. 538-562 doi: 10.1093/aepp/ppy022.

Palumbo, R., Adinolfi, P., Annarumma, C., Catinello, G., Tonelli, M., Troiano, E., Vezzosi, S. and Manna, R. (2018) "Unravelling the food literacy puzzle: Evidence from Italy", Food Policy, Vol 83, pp. 104–115. doi: 10.1016/j.foodpol.2018.12.004.

Piqueras-Fiszman, B., Velasco, C., Salgado-Montejo, A., & Spence, C. (2013). Using combined eye tracking and word association in order to assess novel packaging solutions: A case study involving jam jars. Food Quality and Preference, 28, 328–338.

Perry Azevedo, E., Thomas, H., Samra, H.R. et al. (2017) "Identifying attributes of food literacy: a scoping review", Public Health Nutrition, Vol 20 No 13, pp. 2406–2415. doi: 10.1017/S1368980017001276.

Poelman, M. P., Dijkstra, S. C., Sponselee, H. et al. (2018) "Towards the measurement of food literacy with respect to healthy eating: the development and validation of the self-perceived food literacy scale among an adult sample in the Netherlands", International Journal of Behavioral Nutrition and Physical Activity. Vol 15 No 1, pp. 1–12. doi: 10.1186/s12966-018-0687-z.

Rebollar, R., Lidón, I., Martín, J., & Puebla, M. (2015). The identification of viewing patterns of chocolate snack packages using eye-tracking techniques. Food Quality and Preference, 39, 251–258. https://doi.org/10.1016/j.foodqual.2014.08.002

Reutskaja, E., Nagel, R., Camerer, C., and Rangel, A. (2011). Search Dynamics in Consumer Choice under Time Pressure: An Eye-Tracking Study. American Economic Review. 101. 900-926. 10.1257/aer.101.2.900.

Stasi, A. Song, G., Mauri, M., Ciceri, A., Diotavelli, F., Nardone, G., Russo, V. (2018) "Neuromarketing empirical approaches and food choice: A systematic review", Food Research International, Vol 108, pp. 650–664. doi: 10.1016/j.foodres.2017.11.049.

Tórtora, G., Machín, L. and Ares, G. (2018) "Influence of nutritional warnings and other label features on consumers' choice: Results from an eye-tracking study", Food Research International, Vol 119(September), pp. 605–611. doi: 10.1016/j.foodres.2018.10.038.

Visschers, V. H., Hess, R. and Siegrist, M. (2010) "Health motivation and product design determine consumers visual attention to nutrition information on food

products", Public Health Nutrition, Vol 13 No 7, pp. 1099–1106. doi: 10.1017/S1368980009993235.