Neuromarketing: Analysis of Packaging Using Gsr, Eye-Tracking and Facial Expression

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Abstract
Neuromarketing techniques (use of psychophysiological responses as variables in decision making processes) are being used successfully in the area of marketing. However, there is no academic research that enables us to explore the degree of effectiveness of these techniques, as well as the cognitive and affective mechanisms underlying. This data will allow the construction of theoretical models. The objective of the research was to analyze the mechanisms of action of 3 psychophysiological variables widely used in this field: eye-tracking, GSR (galvanic skin response) and facial emotion. Thirty five randomly selected subjects (men and women, ages from 22 to 65 years), carried out the experiment in the NeurolabCenter at the Complutense University of Madrid. Each participant received 30 euros as an incentive. Method: subjects viewed four different types of packaging. Each image was presented randomly for 10 seconds, while their GSR, eye-tracking and facial emotions responses were recorded. Next, subjects completed a questionnaire. The following variables were analyzed: the areas of interest within the "heat map" (AI), the "total time spent" in every (AI), the "peaks" of GSR, the facial emotions "joy, surprise, contempt, disgust", as well as the motives of "choice and rejection." All the variables were interpreted within the framework of persuasive communication theories and neuromarketing. The results indicated a consistent pattern of relationship between all of the variables that allow a better understanding of the underlying mechanism. Some important gender differences were also found and interpreted.

Keywords: Neuromarketing, GSR, Eye-tracking, Facial Emotions, Packaging, Advertising, Cognition, Emotion, Processing

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Introduction

The way consumers make decisions

When consumers need to acquire information about choice, they need to direct their attention toward the plethora of flashy packages and pay attention to the stimulus features that are relevant for their choice. A clear example of this concentrated attention is showed in the '*invisible gorilla*' test, where people are told to count how many times a ball is thrown between people, and as a result, they fail to notice a person in a gorilla suit passing the stage (Chabris and Simons, 2010). This perceptual phenomenon is called 'change blindness': the reason why we fail to notice changes in visual scenes is because the visual system only perceives the information that is necessary for the immediate task.

The main purpose for our eye movements is to accumulate sensory evidence to efficiently carry out actions. One way we do this is by using fixations to lower the demands on working memory (Kahnemen and Egan, 2011). When standing in front of a supermarket shelf, we do not learn and remember all the information about all the products, but instead carry out fixations to make multiple comparisons, and mentally organize suitable options into consideration sets. Due to carrying out more fixations, working memory demands decrease and attention increases using fixations as external memory space.

About the correlation between the way people look at the products and their preferences, The Gaze Cascade model (Shimojo, Simion, Shimojo, and Scheier, 2003; Simion and Shimojo, 2006, 2007) and the Attentional Drift Diffusion model (Ratcliff, 1978, 2002; Busemeyer and Rapoport, 1988; Leite and Ratcliff, 2010) suggest that the gaze allocation has a causal effect on choice. However, other authors have shown that the gaze bias effect occurs also in decisions that are not preference-based. Therefore the causal link between looking and choosing is at least more complex than previous models have suggested.

Regarding product appearance, Bottom-up assume that the product packaging surface, size, position, etc, impact consumer´s visual attention and choice improving the likelihood of purchase. Different studies show the tendency to look more at the options placed near the center and that salient packages are more likely to capture visual attention having impact on choice (Theeuwes, 2010). Bottom-up attention capture is important since it acts a gatekeeper mechanism of the mere exposure effect, package not attended are excluded from the consideration set. However, about the product appearance, other studies suggest that the Top-down control is higher than the effect of saliency (Bettman and Sujan, 1987; Orquin, Bagger and Mueller, 2013; Kowler, 2010). Task instructions, object representations, and semantic cues override the saliency. Longer dwell (TTS) durations may indicate that the decision-maker is encoding stimuli according to their relevance to the goal, whereas higher dwell frequency (VP) may be reflective of an active comparison across alternatives. These two process offer information about the way consumers make their consideration set, by the accumulation of evidence about the product and the comparison of alternatives, during their purchase decision. In this field, Neuromarketing techniques (use of psychophysiological responses as variables in

decision making processes) are being used successfully in the area of marketing (Cuesta, Martinez-Martinez and Niño, 2018). However, there is no academic research that enables us to explore the degree of effectiveness of these techniques, as well as the cognitive and affective mechanisms underlying.

The objective of the research was to analyze the mechanisms of action of 3 psychophysiological variables widely used in this field: eye-tracking, GSR (galvanic skin response) and facial emotion. This data will allow the construction of theoretical models to understand the role of vision, attention and product appearance in the consumer choice process and as well as help companies to make marketing decisions deciding the best option for their packages.

RQ1: Which package will be chosen one?

RQ2: What's the role play by visual paths (VS), total time spent (TTS), emotions and arousal in the final choice?

RQ3: Is a top-down or a bottom-up process which plays the most important role in the choice?

RQ4: Is there any gender difference?

Method

Thirty five randomly selected subjects (men and women, ages from 22 to 65 years), viewed four different types of packaging, each image was presented randomly for 10 seconds, while the variables GSR, eye-tracking and facial emotions responses were recorded in the laboratory of neuromarketing "NeuroLabCenter" (www.neurolabcenter.com) at the Complutense University of Madrid. After the exposition to the stimuli subjects completed a questionnaire about their preferences and emotions (buy intentions). The following variables were analyzed: the areas of interest within the "heat map" (AI), the "total time spent" in every (AI), the "peaks" of GSR, the facial emotions "joy, surprise, contempt, disgust", as well as the motives of "choice and rejection". Galvanic Skin Response (GSR) allows to analyses the sympaticus autonomic nervous system throughout the changes in individual skin conductance giving information about the arousal or emotion. With the Facial emotion technic emotional states of the individuals can be analyses by recording gestures or micro-muscular changes associated to certain reactions and it is an indicator of the positive or negative emotional responses of the individuals. Eye-tracking was recorder by a Tobbi that allows to measure the point of gaze or the pupil center corneal reflection (PCCR) revealing what people look at, the attention on certain visual elements, fixation time, its order as well as an individual´s gaze returning to a visual element revealing areas of interest (AOI) and visual paths.

Results

The heatmaps comparative shows similar areas of interest concentrated in the logo at the top, some in the center and in the text at the bottom (Figure 1). The gaze path is identical for three of the four packaging (packaging A, C, D) with three attention points, starting from the center of the packaging, going up to the logo at the top and ending with the text at the bottom (Figure 2).

| PACKAGING A (WHITE) | PACKAGING B (YELLOW) | PACKAGING C (WATERCOLOR) | PACKAGING D (ELEGANT) |

Figure 1. Heatmaps Comparative

| PACKAGING A (WHITE) | PACKAGING B (YELLOW) | PACKAGING C (WATERCOLOR) | PACKAGING D (ELEGANT) |

Figure 2. Comparative path gaze and areas of interest

Packaging B (yellow) showed five different areas coinciding with the five design elements, in this case, subjects stared from the logo at the top and champed from one to other sharing the time in every area and causing a lot of visual activity (Figure 3). Comparing the heatmaps by gender we found some differences in the packaging A (White) where women showed a higher level of attention in the label in the center "1 Fruit serving" while men showed a slightly higher level of attention on the logo "HealthCare" at the top (Figure 4).

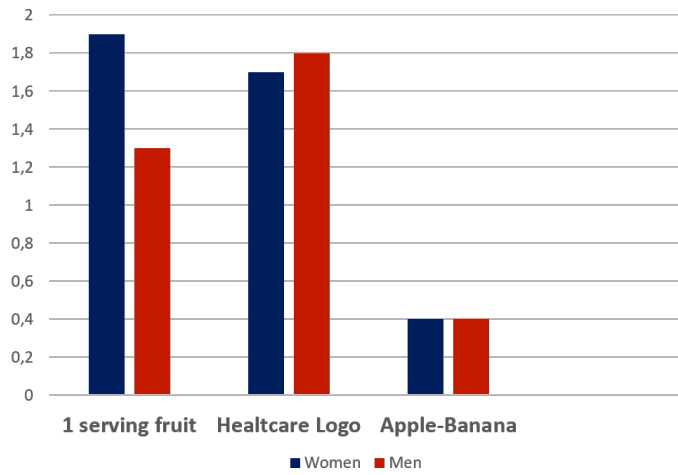Figure 3. Areas of interest and time fixation packaging B (Yellow)

Figure 4. Comparative time spent in areas of interest by gender

Regarding attention, the values of GSR were similar for the four packaging but only packaging A (White) (FE + 6,4) and packaging B (Yellow) (FE+ 5,5) provoke a significant positive valence in facial expression (Figure 5).
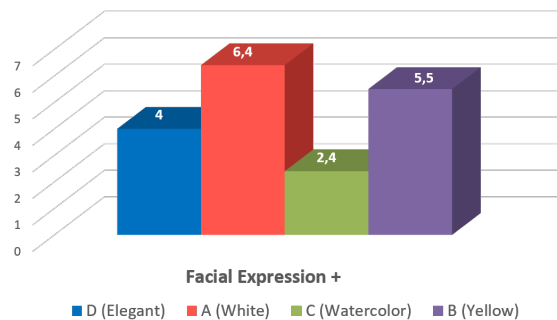

Figure 5. Comparative positive valence facial expression

Finally, subjects were asked to pick up a physical demo of the four packaging and requested their aesthetic preference, reasons of product choice of rejection. Almost half of the subjects (46%) choose packaging B (Yellow) because of its color (34%), the label "100% Fruit" (20%) and the typography (11%). While the most rejected (34%) was

packaging D (Elegant) because of the color (6%), the fruit image seemed as it was in bad conditions (6%) and because it looked classic and distant (6%).

Conclusion and Discussion

The results indicated a consistent pattern of relationship between all of the variables that allow a better understanding of the underlying mechanism. The package B (Yellow) was the most chosen by the subjects, since it had an easy understanding of the product, reminding that it was 100% fruit, because of its funny typography and because the yellow color reminded them of a banana, what was associated to a pleasant association with fresh fruit. Regarding attention, paths gaze and emotion, data showed that greater visual activity (visual path) and greater positive emotions (facial expression) predicted the consumers choice. However, arousal (GSR) and time spent did not show a significant correlation. These results showed that emotions seems to be a good predictor of choice, and also, that visual activity is important, for example through a complex pattern of visual path. Also verbal associations with colors and images seemed to play the most important role. Unexpectedly, the grade of attention during the exposure was not relevant for the choice. Some gender differences were found in terms of visual attention but not in the others variables.

There is no doubt that visual attention plays a crucial role in consumer decision making. However, there is no a simple formula in how the consumers make a purchase choice. The final choice emerges a result of complex interactions among stimuli, attention processes, working memory, visual semantic associations and preferences. Apparently top-down and bottom-up process work together in this choice task. More research with eye tracking is yet to be done and also research that crosses visual data with emotional and arousal variables is especially necessary.

Refereces

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