INFLUENCES OF BRAND IN SUBJECTIVE MAGNITUDE OF CHOCOLATE TASTE

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ABSTRACT

The aim of our study was to understand the influence of the brand in the shop decision of consumers. We evaluate 12 subjects (24.6 yrs old, ± 4.3 yrs, 3 females), measuring their judgment only to brand, to taste and to taste knowing the brand using the Direct Ratio Magnitude Estimation (RME). The RME is a psychophysical scaling method to get direct subjective impression of physical stimulus. One brand was chosen as a reference brand (modulus) and received a numerical value of 100. The subject task was to give relative numbers to other brands in the way that if the brand evocates an impression two times better, the subject have to assign a two times the reference number. The procedure was the same for the other two experimental conditions: taste and taste knowing the brand. The exponent of the power law was used as the quantification of the subject's magnitude. The exponent obtained to brand was 0.34 (Pearson's Correlation Coefficient r= 0.94) and the obtained to taste was 0.55 (r= 0.97). We can theoretically estimate the exponent to taste knowing brand using the following equation $A=b^1/b^2$. So, the theoretical exponent calculated was 0.63. Our empirical exponent obtained for that experimental condition taste knowing brand was 0.71 (r= 0.91). We successfully use direct ration magnitude estimation to quantify the subjective "preference" for chocolates considering two dimensions, taste and brand. Our data suggest that the association of taste and brand inputs a more powerful effect on the decision about how good the chocolate is, since the empirical exponent to taste knowing brand is higher than that theoretically calculated. In conclusion, we can suggest that brand has a strong bias in the decision.

Keywords: *Psychophysical Scaling, Magnitude Estimation, Taste Perception, Decision Making, Neuromarketing.*

Introduction

Recently, researchers and professionals in the field of marketing and advertising has sought the aid of neuroscience as a way to understand the foundations of market behavior, as the motivational aspects and decision making (Lee, Broderick, & Chamberlain, 2007; Morin, 2011; Oreja-Guevara, 2009). On the same wave, great attention has been given to methods of psychophysical scaling as a tool for quantitative study for understanding behaviors related to consumption (Crandall, 1992; Labbe, Pineau, & Martin, 2012).

Psychophysical scaling has been applied to a great diversity of conditions, from simple perceptual events as time duration of light and dark conditions (Marinova, 1978), the judgment of odor and flavor (Engen, 1964; Fons, 1970), the sensation of softness (Friedman, Hester, Green, & LaMotte, 2008), to complex events such as the severity of offenses (Kvalseth, 1980) and hedonic values (Lim, 2011; Veldhuizen, Wuister, & Kroeze, 2006).

Although in neuromarketing is called for the use of psychophysiological methods such as measures skin impedance, heart beat rate and the use of high complexity techniques such as functional magnetic resonance imaging (Plassmann, Ramsoy, & Milosavljevic, 2012) and event-related evoked potentials (Ariely & Berns, 2010), the behavioral techniques of subjective scaling measurements has been little used, but with impressive results. Multidimensional scaling was used to planning marketing strategies to attract new physicians to the hospital (Pegels & Sekar, 1987). Another example is the marketing based in the physicians health service based on the patient perception of the medical procedures determining factors for patient satisfaction (Jung & Hong, 2012).

In our study, we addressed a more basic question related to the consumer decision. Can the brand influence our chocolate taste perception? Our rational is regarding to the fact that our decision-making processes are based in both top-down and botton-up processes. The Top-down process in this context means that our perception could influence the chocolate taste and, in our case the brand, could influence the buy decision by the consumer.

Methods

We used the Direct Magnitude Estimation (DME) to assess the subjective metrics related to chocolate taste and the brand strength. The DME method was developed by SS Stevens (Stevens, 1956; Stevens & GALANTER, 1957; Stevens, 1966), in which numbers are directly addressed to the subjective magnitude regarding a stimulus presented. The relation between the subjective magnitude and the physical manipulation of the stimulus can be expressed by the power function:

$$\psi = k\varphi^{n} \qquad\qquad (Eq.1)$$

This means that the magnitude estimated ψ grows as the physical φ raised to a power of n.

Subjects

The scaling procedure of DME was performed by 12 subjects, mean age of 28.6 yrs (SD= 6.3; 4 females). Inclusion criteria were best-corrected visual acuity of 20/20 or better measured monocularly at 4 meters using an ETDRS chart – tumbling E (Xenonio, Sao Paulo, Brazil), refraction of $\leq$ 3.0 diopters considering the spheric equivalent of astigmatism values, absence of ophthalmological diseases and absence of known neurological and systemic diseases. Smokers and users of alcohol (defined as more than 1 daily dose) were excluded since it could interfere negatively in taste. All subjects gave a signed informed consent to participate in the experiment. All were naive to the specific experimental question. Demographic data are presented in Table 1 leftmost columns. This study is also in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

Table 1. Descriptions of chocolates and the DME scores

Brand	Price*	Taste Score	Brand Score	Combined Score
1	15,00	62,9	51,2	28,0
2	21,00	72,4	61,9	75,0
3	30,00	96,4	84,6	84,0
4#	28,00	100,0	100,0	100,0
5	35,00	102,5	118,7	100,9
6	41,50	107,5	122,7	107,9
7	100,00	127,2	144,2	136,2

* Price based on a kilogram of the chocolate
\# Chocolate used as the modulus

Materials

Commercial chocolates available in regular markets of Brasil were selected for the study. We chosen seven different brands, based in their price to the consumer. Two brands were of inferior price, three of medium prices and two of superior prices. The prices were based in a kilogram of chocolate and are presented in Table 1 leftmost columns.

The chocolates were fragmented into small pieces sizing approximately 2 cubic cm, immediately before the evaluation begins to avoid lost of odor and taste proprieties.

Procedure

Direct Magnitude Scaling is a very simple procedure and consists of arbitrarily associates a number to a particular dimension, in our case, the chocolate taste first, than the brand. The subject task was to judge the chocolate tastes relating then to the first chocolate tasted, adjusting the number to match their impression. Is the first chocolate taste was numbered as 10 and the second taste appears to have three times more sensation, the subject had to give a corresponding number, in this case 30. For more detailed explanation regarding the method see (Stevens, 1956; Stevens, 1987).

A preliminary training session was performed for each subject to guarantee they had understand the procedure and were able to perform it. The preliminary training consisted of a DME procedure in a task of judge the line length in a series of ten lines. All subject performed it satisfactorily.

The chocolate numbered of four was chosen as our modulus (reference). The subject tasted that chocolate and the arbitrary reference number 50 was associated to it. Randomly chosen pieces of the other chocolates were tasted and subjects had to associate the respective number related to their sensation. Than the subject did mouthwash with filtered water to reduce the adaptation to the previous taste and rebalance the mouth pH. Mouthwashes were performed in between all chocolate tastings. This procedure of taste the modulus chocolate and the test chocolates runs continuously until the subject tastes all other six chocolates.

Similar procedure was performed to brand judgment and chocolate taste knowing the brand judgment conditions.

A theoretical exponent can be calculated based on a cross-validation procedure. Since both taste and brand were related to numbers of equal scale, they could be correlated and the final exponent should be calculated by the following equation:

$$\psi = \varphi^{na/nb} \qquad\qquad (Eq.\ 2)$$

In which *na* and *nb* are the exponents measured by the power law of chocolate taste and chocolate taste knowing brand conditions. Additionally, at the end of the experiment session each subject reported their preference for chocolate on a Likert-like interval scale of 1 to 10 (do not like - like a lot).

Results

All subjects performed the entire session, evaluating the chocolate taste, the chocolate brand and the chocolate taste knowing their brands. The summary of results is shown in Table 2.

For the chocolate taste, we found an exponent of 0.34, with a high correlation coefficient (r= 0.95), expected in DME procedures. The brand was scaled with an exponent of 0.55 (r= 0.97). These results are shown in Figure 1.
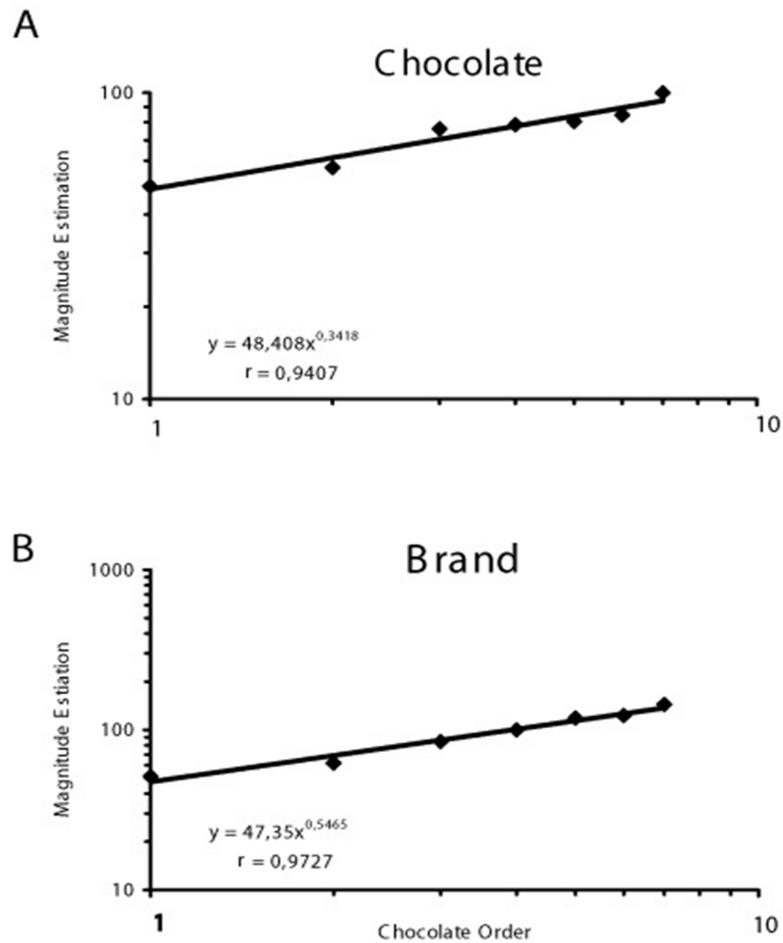
The value of the theoretical exponent was 0.62. The empirical result found an exponent of 0.71 (r= 0.91) (see Figure 2).
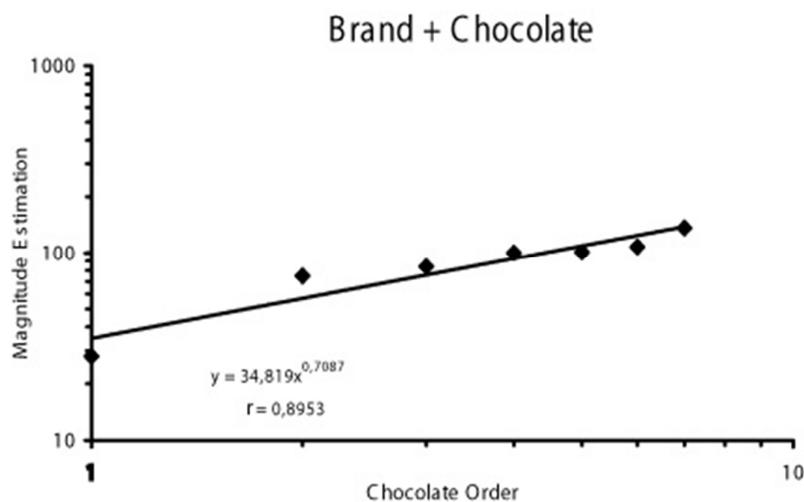
A significant negative correlation was found between the note for chocolate preference and the amplitude between the numbers given to the worst and best tastes (r= -0.54; p= 0.042) (Figure 3).
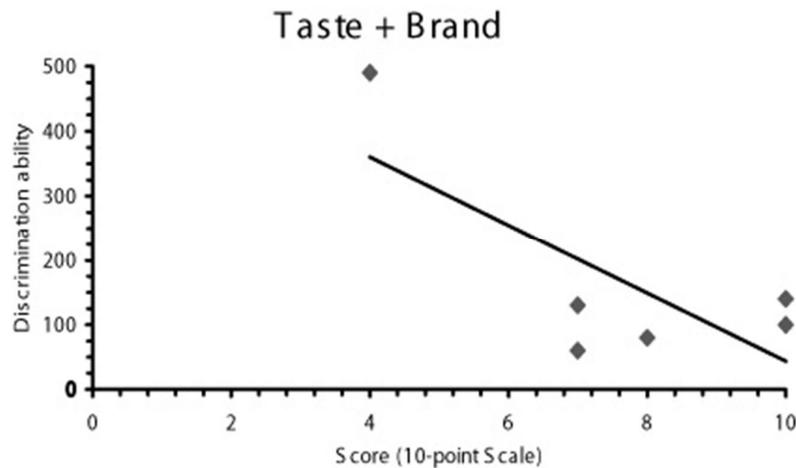
Discussion

In our study, we were able to show that brand can change the chocolate taste suggesting a strong impact factor of branding in our consumer buy decision. The results showing a higher exponent when the subject tasted the chocolates knowing their brand in comparison with the theoretical exponent expected by those associations support the idea that the branding is highly potential to modulate the buy decision (Bunn, 1993; Oreja-Guevara, 2009). Our data also support the hypothesis that part of the modulation effect could be regarding to a perceptual change in taste based in the knowledge of the brand.

Our study shows a significant difference, related to the application of research methods of consumer behavior related to the brand. Through scaling psychophysical methods we have been able to quantitatively measure the subjective characteristics of the choice of marks and chocolate flavor. Our results show that DME is an important tool in the study of the determinants of behavioral choices, and can be applied to marketing, for studies in various fields such as preferences, choices, decisions among others.

A critique presented in this context is the fact that neuroscientific approaches to marketing try to find the determinants or "markers" for neural consumption decisions. However, these approaches should be taken with great parsimony, in the sense that the presence of neural activations obtained in neuroimaging studies always need to be correlated with other measures, be they behavioral or electrophysiological. Only correlational research and analysis of data is that we can increase our ability to inferences based on responses neural associations and their behavioral events. We believe that the neural events obtained by neuroimaging and electrophysiological methods only have value if the aggregated behavioral measures, since by these methods just guesses are permitted, as none of them is a direct measure of subjective response.

No similar result was found in the literature. However, some studies have been found interesting neuroimaging results regarding to the power of brand in the consumer behavior. They cover the initial relations between cerebral activities and consumer choices as the cerebral activity images and brand preferences located at the *prefrontal cortex* (Deppe, Schwindt, Kugel, Plassmann, & Kenning, 2005), the influence of the manner in which options are presented, knowing as the "framing effect" activates the anterios cingulated cortical area (Deppe et al., 2007) and brand knowledge showing dramatic influences on expressed behavioral preferences and on the measured brain responses of the *ventromedial prefrontal cortex* related to them (McClure et al., 2004).

Our hypothesis that branding could modulate taste perception has some support in the literature. A neuroimaging study using fMRI found different areas related to the taste and the pleasantness judgment of food. The author suggests that magnitude estimation of intensity and pleasantness shared common activations in some brain structures, like the *insula* and the *medio dorsal nucleus of the thalamus*. They also found that in a more general way, the magnitude estimation of pleasantness produced significantly more activation than magnitude estimation of intensity (Cerf-Ducastel, Haase, & Murphy, 2012). Thus, we could argue that the pleasantness of food could be related with a more complex brain mechanisms, in which not only the taste but other information like the brand, could evoked the pleasantness magnitude.

The negative correlation between preference and amplitude added important information regarding the individual judgment ability. The highest the amplitude between the lower and the higher numbered at the DME procedure the lowest the score in a 10-point scale related to their preference for chocolate. This result suggests that subjects with lower preference to chocolate had better taste discriminability performance than those who self-titled a higher preference for chocolate.

We conclude our work by presenting results strongly suggest that the brand has a strong potential in the judgment of chocolate flavor, higher than expected by our theoretical calculation. Furthermore, our results show that there is a substantial indication that our perception of flavor is influenced by the brand. Subjects with self-entitlement of lower preference for chocolate have higher discriminative sensorial flavor than subjects with high preference for chocolate, suggesting that individual variability should be considered in studies of scaling. Our step toward future will study whether different groups have different metrics for their judgment.

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