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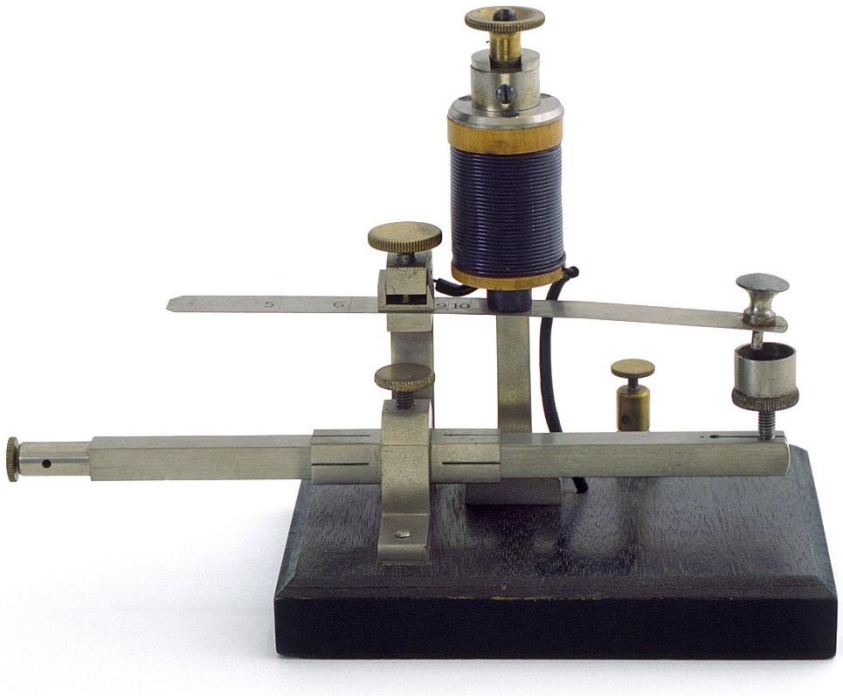
FACULTY OF PHILOSOPHY, UNIVERSITY OF BELGRADE



INSTITUTE OF PSYCHOLOGY
LABORATORY FOR EXPERIMENTAL PSYCHOLOGY
FACULTY OF PHILOSOPHY, UNIVERSITY OF BELGRADE

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FACULTY OF PHILOSOPHY, UNIVERSITY OF BELGRADE

Institute of Psychology, Faculty of Philosophy, University of Belgrade

Laboratory for Experimental Psychology, Faculty of Philosophy, University of Belgrade

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The Effect of Color, Expectation and Gender on Sweet Taste Perception

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Abstract

Color has great importance in creating certain associations in terms of acceptance or rejection of a food product. Research has also shown that respondents most often associate red with a sweet taste and yellow with a sour taste. The aim of this research was to determine whether the taste sensation changes when the intensity of the red color changes. In addition to the visual characteristics of the stimulation, the influence of the "internal" cognitive factor - expectation and gender on gustatory perception was also examined. Three factors were varied: intensity of the red color (dark and light shade), expectation defined by the instruction given to the subjects (instruction that suggests the taste of sweet and "neutral instruction") and gender (male and female). The sample consisted of 100 subjects, with an equal number of males and females. The results showed that there is a statistically significant interaction between color and gender in taste assessment. Female participants rated the drink that had a more intense red color as sweeter. There was no statistically significant effect of cognitive factor (expectation) on taste sensation. The obtained results indicate important psychological determinants of taste perception.

Keywords: color, expectation, gender, taste perception

Introduction

The sense of taste represents one of the basic biological channels of knowledge (Ognjenović, 2002). The main task of this sense is to provide important information about food (whether it is edible or poisonous), but on the other hand, it is also a source of pleasure (Zdravković, 2008). Although the gustatory perception refers to the perception of basic tastes, it is also related to other components. Thus, the gustatory perception can be influenced by the smell of food and drink, as well as the color of the product itself, but also the sound with which the product is prepared. These components give the overall experience of food and drink (Spence, 2015). Gustatory perception can also be influenced by the state of the organism, as well as immediate experience.

Visual characteristics such as color, shape and size are important determinants when choosing food products. Color is the most important sensory cue for a product when it comes to setting people's expectations about the taste of food and drink (Spence, 2015). The use of food coloring is common, and therefore can have certain effects on the consumers themselves. Different colors affect customer behavior in different ways. Various psychological effects of food colors have been shown. Some of them are effects on the sensory thresholds of some basic tastes (Maga, 1974), then the creation of product taste associations and its attractiveness, their influence on the choice and consumption of food, etc. (Spence, 2015). In a recent study, it was determined that red and orange were rated as the sweetest, white as the healthiest color, and yellow as the most acidic color (Hopppu et al., 2018). Accordingly, we assumed that this research will show the influence of color on gustatory perception, where more intense colors were considered sweeter and artificial

In addition to the visual characteristics of stimulation, our perception is also largely influenced by cognitive factors. One of these factors is expectation. The expectation is defined as a state of mind that is a consequence of prior information about what is likely or possible in the upcoming sensory environment (Summerfield & Egner, 2002). Expectation facilitates but also shapes perception, because it narrows the reference "sensory frame" and the subject focuses on the desired interpretation of input information.. In the literature, there are several attempts to explain the relationship between expectations and gustatory perception. One explanation is that expectation and taste cues are linked together based on prior experience (Epstein, 1977; Woods et al., 2010). Another explanation uses the assimilation-contrast model which includes an affective component (Cardello, 2007). If the previous gustatory sensations were pleasant, such experiences are remembered and assimilated into the appropriate scheme with which new sensations are compared. The same author further states that two types of expectations can be distinguished – *sensory* based and *hedonic* or *affective* based expectations. Sensory-based expectations refer to the beliefs that the product will possess certain sensory attributes at specific intensities. The second type of expectation refers to the belief that a product will be liked/disliked to a certain degree (Cardello, 2007).

Previous research has shown that the color of the product has great importance in creating certain associations in terms of accepting or rejecting the product (Hoppu et al., 2018; Piqueras-Fiszman et al., 2012; Spence, 2015). Research has also shown that respondents most often associate red with a sweet taste and yellow with sour (O'Mahony, 1983). However, although experiments have monitored the effects of specific colors on perceived flavor intensity, few studies have examined the effect of varying color intensity on a taste sensation. In this research, the focus was precisely on the analysis of the influence of intensity, i.e. color shade on taste perception. Given that empirical findings have consistently shown the existence of an association between the color red and sweet taste, the aim of this work was to determine whether the taste sensation changes when the intensity of the red color changes. In addition to the visual characteristics of the stimulation, the influence of the "internal cognitive factor - expectations on perception within the gustatory sensory

modality" was examined. We also wanted to check whether there are gender differences in the assessment of taste depending on the color or expectations, because previous research has shown that there is a difference in taste-guided behavior between males and females (Bartoshuk, Duffy, & Miller, 1994; da Silva et al., 2014). Females had more accurate sensory perception. This research confirmed gender differences because female participants rated the drink that had a more intense red color as sweeter.

Method

Sample

The research sample consisted of students of the University of Banja Luka, aged 19 to 25. One hundred participants, equally distributed by gender participated in the experiment.

Design and Procedure

This is an experiment with three independent variables: intensity of the red color (dark and light), expectation defined by the instruction given to the subjects (instruction that suggests the taste of sweet and "neutral instruction") and gender (male and female). The dependent variable was an estimate of the intensity of sweetness defined by a value on a seven-point scale.

A drink without any smell or taste was used - water colored with food coloring. The drink was placed in transparent cups so that appropriate visual information was available to the subjects. There were two intensities of red: darker (more intense red) and lighter (less intense red), which were obtained by different concentrations of added food coloring.

The subjects' task was to judge the taste of the drink they tasted. One group was instructed to judge the "sweetness" of the taste, while another group was instructed to judge the taste (without the term "sweet"). Darker and lighter drinks were evaluated in both groups. The subjects rated the taste on the answer sheet by choosing a number on a scale from 1 to 7, where 1 means "not at all sweet", while 7 means "very sweet".

Results

The results of the analysis of variance did not show a statistically significant effect of color, gender or expectation on the evaluation of the sweetness of the beverage. A statistically significant interaction of gender and color on taste sensation was confirmed ($F(1,100) = 4.52$; $p < .05$; $\eta^2 = .047$). This interaction explains 4.7% of the variance of the dependent variable, which is a low effect according to Cohen's classification (Cohen, 1988). Female respondents rated the drink that had a more intense red color (darker shade) as sweeter, while the results showed the opposite for male respondents. They considered a drink with a lower intensity of red (light) to be sweeter. The results are shown in Figure 1.

Figure 1. Graphical representation of the statistically significant interaction between gender and color

Discussion and Conclusion

The goal of this research was to examine the influence of color intensity as a visual factor and expectations as a cognitive factor on gustatory perception. We chose the red color because research shows that people most often associate it with a sweet taste (O'Mahony, 1983). Based on earlier research that showed the influence of color on gustatory perception, where more intense colors were considered sweeter and artificial (Clysdale et al., 1992; Johnson & Clysdale, 1982; O'Mahony, 1983) we assumed that similar results would be obtained in this research. But the statistical analysis did not confirm the initial assumption. The effect of color was not statistically significant. In addition, the obtained results did not show significant effect of expectation (instruction received during the research) on taste perception. The obtained results showed that there is only statistically significant interaction between color and gender in the assessment of taste. The female subjects rated the drink that had a more intense red color (dark shade) as sweeter, while the results showed the opposite for male subjects. The obtained result partially confirms the hypothesis that assumed that women evaluate the dark red drink as sweeter compared to men, which is in line with research indicating gender differences in taste sensation (Bartoshuk, Duffy & Miller, 1994; da Silva et al., 2014; & Hoppu et al., 2018). The opposite results were obtained for males. They rated lighter drinks as sweeter. The results are in accordance with earlier research, wchich assumed that women perceived more intense drinks as sweeter (Hoppu et al., 2018). Also, men may had different expection. It could be related to earlier sensory based experiences if they drank sweeter less intense drinks before.

Although certain differences in gustatory perception were obtained in the research in relation to the color of the drink and the gender of the participants, other characteristics that could be significant, such as age, body mass index or personal preferences, should be taken into account in subsequent research.

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