

Impact of Age and Gender on the Perceptual Response of Sri Lankan Consumers for different types of Biscuits

Gunathilaka UGSA¹, Wijewardhana US², Navaratne SB³

¹⁻³ Department of Food Science and Technology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka

Abstract

The perceptual response of persons in demographic settings is an important deciding factor in consumer food choice. This paper explores the effect of a person's age and gender on the sensorial response using five types of biscuits such as crackers, sweet biscuits, cream biscuits, savory biscuits and wafers. According to ISO standards, 125 respondents were selected as a consumer panel from a suburban area in Sri Lanka and a sensory analysis was conducted using a five-point hedonic scale. Results were subjected to statistical analysis using IBM SPSS 21.0. Results revealed that there was a positive correlation ship between the age, gender and type of biscuits (P value < 0.05). To quantify this relationship, regression analysis was performed for five types of biscuits and the regression equations were developed. According to the study, age and gender are deciding factors in selecting types of biscuits.

Keywords: perceptual response, sensory stimuli, gender, hedonic scale, demographic settings, Biscuits

1. Introduction

The perceptual response of the individuals for food is considerably affected by the factors associated with the demographic settings, particularly the lifestyle and behavior of the individuals [1]. In addition, age, gender, educational level, income level, occupation, etc. also significantly contribute to consumer behavior on food choice [23, 45].

Age and gender are two of the most important deciding factors for consumer behavior. These factors affect both the physical and psychological conditions of a person. As an example, with aging some of the sensory organs such as taste buds are imparted, changing the perceptual response of the person. In addition, youngsters who are leading more busy lifestyles seek relaxation and comfort through consuming more snack type food. Further, studies reveal that women are unwilling to consume high-calorie food as they are more attentive about their appearance and health. Also, males who have a lower taste bud intensity go for more intensive tastes, either sweet or savory. Like this, people of different age and gender categories exhibit various perceptual responses. To address their market needs efficiently, these behavioral changes should be identified.

Though food is a basic need, the human does not consume it to merely pacify the hunger. particularly it can derive pleasure and comfort [6-7]. Moreover, in the case of comfort food, which is simply consuming for pleasure or as a habit to bridge the gap between two major meals or to celebrate an occasion or function rather than suppressing the hunger [8-10]. All the types of snack foods, such as biscuits, chips, fast food fall into this comfort food category.

Although snack foods are meant to provide pleasure, they have a significant contribution to the nutrition and the health conditions of the consumers. And most importantly within the present, the snack food consumption has been increased to a considerable level. So, it is important to identify the

dietary pattern of snack foods in both nutritional aspects and commercial aspects.

Dry crisp bakery products are major types of comfort food, which are widely consumed by the customers as snacks. Among them biscuits with different varieties are predominant; because biscuits are supplemented with an attractive sensory profile [11-12]. Biscuit consumption is bound with the culture of many countries including Sri Lanka, which has been ranked as the third largest biscuit consuming nation in Asia. A variety of biscuits are spread out all over the world and they can be categorized into different types according to their composition, manufacturing method, ingredients, secondary processing, etc. [13]. Among them, biscuit types selected for this study are Crackers, Semi-Sweet Biscuits, Cream Biscuits, Savory Biscuits, and wafers.

The perceptual response for a food item is highly governed by its sensory profile. So it is important to pay attention to the sensory characteristics of the product. In the case of Crackers, they are hard dough biscuits with low fat and sugar content and a crispy texture. When it comes to semi-sweet biscuits, cream biscuits and savory biscuits they might be either soft or hard dough, including a wide range of products. And cream biscuits or sandwiched biscuits are soft dough biscuits with a wide sensory profile together with high fat and sugar content. And often enhanced with different flavors. Savory biscuits also are similar to that with a different range of sensory characteristics. Other than that savory biscuits are considered as snacks compared to other biscuits, due to their crunchy texture, salty and savory taste. Wafers have considerably different sensory characteristics. They have a light and crispy texture with creamy fillings. Due to these different sensory profiles, each biscuit category attracts respondents in different consumer groups.

2. Material and Methodology

2.1 Consumer panelists

The study area was selected using a Google map and where the total number of residents was 7354 according to the Department of Census and statistics. Thereafter, 125 respondents from the chosen territory were selected randomly using ISO 8589:2007E sampling plan. This sample included 75 females and 50 males. In age wise 32 panelists in 15-30 age group, 37 in 30-45 group, 29 in 45-60 group and 27 in 60-75 group. In selecting the panelists, made sure that they were not suffering from any disease such as cold, diabetics, mouth cancers, etc. Other than that, any habit, behaviors or addictions, which hamper the accuracy of the final outcome of the sensory evaluation, were taken into account. And also made sure that the panelists did not have any habit of taking drugs for a

prolonged time.

Further, in selecting of 125 consumer based panelists, a basic questionnaire was served for 150 occupants. Majority of the respondents (about 83.6%) accepted the questionnaire and expressed it was in the state of understandable except 16.4% respondents whose answer was "difficult" on the ground of vocabulary and the capacity of realization. Hence, for the consumer panel, 125 respondents for the study were selected from the understandable category.

2.2 Biscuit Samples

Using the data collected from a market survey, five types of biscuits were selected from a popular commercial brand. To represent five biscuit categories as given in table 1 they were numbered with 3 digits.

Table 1: Selected biscuits types and categories

Biscuit-type	Selected Variety	Sample Number
Crackers	Cream Cracker	101
Semi-Sweet Biscuits	Marie	102
Cream Biscuits	Chocolate Cream Biscuits	103
Savory Biscuits	Savoury Nuts Biscuits	104
Wafers	Vanilla Wafers	105

2.3 Sensory evaluation

Required conditions for the sensory evaluation were set in compliance with ISO 8589:2007 standards and it was carried out in a calm and quiet environment in the respondent's residence within the time period from 9.00 to 12 noon and 2.00 to 4.00pm while avoiding the lunch times. Sensory evaluation was also carried out at the same time where the panelists did not have physiologically unfit situations such as tired, hungry, hurry, thirsty, etc. Panelists were asked to indicate their perceptual response over a five-point hedonic scale with respect to the types of biscuits.

touching the skin of the nose. Thereafter, allowed to breathe the clean air at least for 20 seconds before moving to the next sample. Panelists were also asked to assess the textural attribute of the samples. The texture was assessed by touching the samples. Thereafter, about 20g of each biscuit type was served for the taste stimulus and mouth was rinsed with clean water and given 20 seconds break before moving to the next sample to avoid sensory fatigue. After analyzing the samples, respondents were asked to rate the preference for the samples using a five-point hedonic scale.

2.4 Evaluating perceptual response

From the questions given, information was obtained for the perceptual response of the respondents on biscuit types. Preference of the respondents for the biscuit types and also the reason for their preference was also obtained. Panelists were advised to analyze initially the appearance of the samples taking 20 seconds breaks for each type particularly taking into consideration the sensory stimulus-color. Thereafter, the Panelists were asked to assess the odor character by sniffing the samples. They were asked to take three deep and quick sniffs from the samples without

2.5 Statistical analysis

The perceptual response of the respondents for all sensory stimuli was subjected to statistical analysis to determine whether there is a correlation ship between biscuits types and age, gender using IBM SPSS 21.0 version statistical software at 95% confidence level. Finally, a regression analysis was carried out to quantify the correlation ships.

3. Results and Discussion

3.1 Brand perception

Biscuit types for the study were selected after conducting a market survey in the designated area.

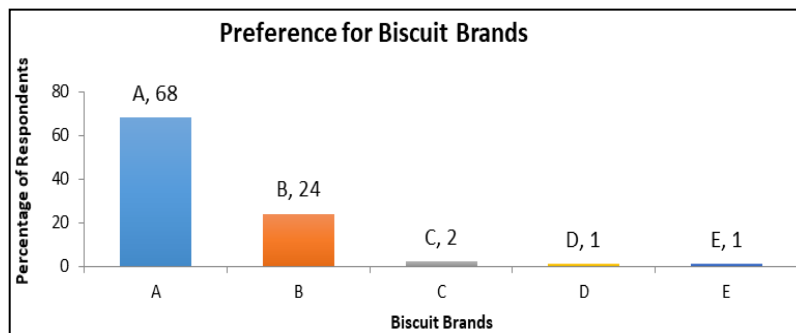


Fig 1: Brand Preference according to the market survey.

Based on the answers provided in the market survey Cream Cracker, Marie, Chocolate Cream, Savory Nuts and Vanilla

Wafer biscuits of brand A were selected for the sensory evaluation.

3.2 Preference for the biscuit types.

According to figures 2 and 3, Perceptual responses of the

respondents exhibit variations upon their age and gender.

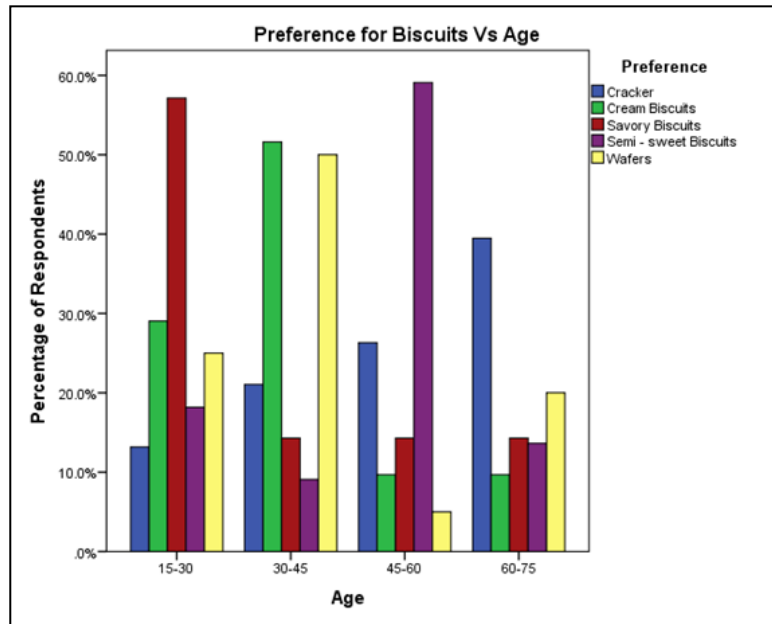


Fig 2: Perceptual Response for biscuits depending on Age.

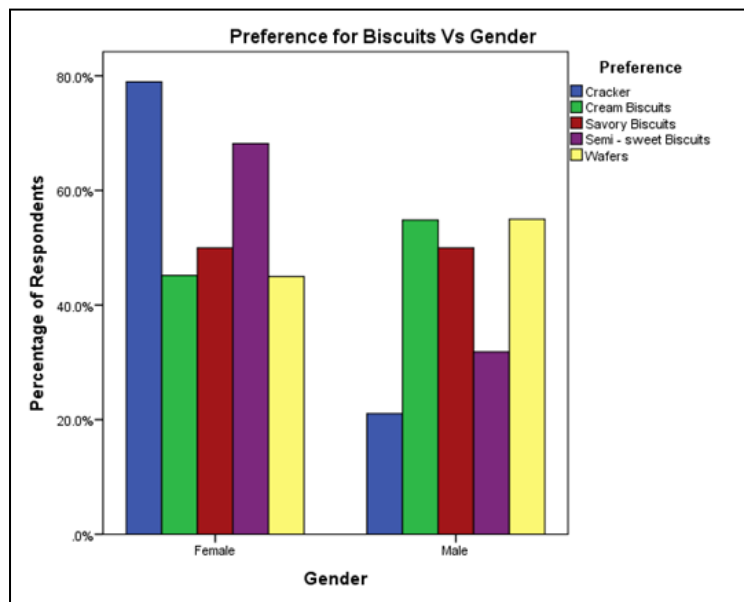


Fig 3: Perceptual Response for biscuits on Gender as a whole.

In line with, figure 2, the perception for crackers is less in the age group 15-30 and the preference increases with the age. But perception for cream biscuits exhibits a counter relationship as the perception decreases with the age. As well as the Perception for savory biscuits also decreases with age. The highest preference for semi-sweet biscuits in the Age group 45-60. And the perception for wafers exhibits an uneven relationship with the age.

As plotted in figure 3, while females prefer crackers and semi-sweet biscuits, males prefer savory biscuits, wafers and cream biscuits.

3.3 Regression analysis of data

Statistical analysis was performed to determine the correlation ship between the selected demographic factors and the responses pertaining to the types of biscuits. Multinomial logistic regression was used to analyze the

Validity and significance of data and results are given in table 2.

Table 2: Results of Multinomial Logistic Regression.

Statistical Test	Significant Value
Model Fitting Information	0.000
Likelihood Ratio Test	
Age	0.000
Gender	0.001

According to the likelihood ratio tests, at the 95% confidence level, both age and gender exhibit a significant effect on the perceptual response as its significance value is 0.000 (Age) and 0.001 (Gender), which is lower than P-value 0.05.

The values obtained from the regression analysis are used to interpret and quantify the factors which affect the perceptual

response of the individuals. Age and gender have exhibited a significant effect on the perceptual response on biscuits at

the 95% confidence level as shown in table 2.

Table 3: Results from Linear Logistic Regression.

Biscuit Types	Coefficients	Age	Gender	Intercept
Crackers	B value	0.875	-0.433	1.066
	Significant Value	0.000	0.049	
Semi – sweet biscuits	B value	0.215	-0.248	2.436
	Significant Value	0.035	0.267	
Cream biscuits	B Value	-0.650	0.384	4.264
	Significant Value	0.000	0.037	
Savory biscuits	B Value	-0.312	0.109	4.017
	Significant Value	0.008	0.669	
Wafers	B Value	-0.065	0.440	2.877
	Significant Value	0.564	0.080	

Using the values in table 3, models for the perceptual response for each biscuit category can be built up to identify the direction of the relationship between these factors and the perceptual response of respondents

The developed regression equation for the preference of crackers is,

Preference of Crackers
 $= 0.875x \text{ age} - 0.433 \text{ gender} + 1.066$ Equation 1

According to regression analysis, age and gender exhibit a significant effect on the perception towards Crackers, as corresponding P values are lower than 0.05. And the direction of the relationship can be interpreted with the gradient (B) values.

The B value for Gender is -0.433, which is a negative value. In the gender category, females and males were coded as 1 and male 2 respectively. Thus, the negative value indicates, that the preference for the crackers is higher in females than in males. And the age group clearly shows a positive increment through the group. It means that the preference for crackers increases with age. Therefore, old and senior citizens prefer crackers more than youngsters.

The regression equation for the preference of Cream Biscuits is,

Preference for Cream Biscuits
 $= 0.384 \text{ Gender} - 0.650 \text{ Age} + 4.264$ Equation 2

According to the regression equation, the preference for cream biscuits decreases with the increment in age. The gender group shows a positive gradient, which means males prefer cream biscuits more than females.

The regression equation for Sweet Biscuits would be,

Preference for Semi-Sweet Biscuits
 $= 0.215 \text{ Age} + 2.436$ Equation 3

According to P values, only age effects significantly on the preference for Semisweet biscuits. When considering the variables separately, the age group shows an increment of preference with the age. And B value from table 3 indicates that also females prefer Semi - sweet biscuits more than males.

The regression equation for Savory Biscuits is,

Preference for Savory Biscuits
 $= -0.312 \text{ Age} + 4.017$ Equation 4

According to the intercepts for each variable, the preference for savory biscuits decreases with the age. And the positive gradient value for gender category shows that the male group prefers savory biscuits more than the females. But only the effect of Age is significant on the preference for Savory Biscuits.

The preference for wafers is not significantly affected by the age or gender of the respondents. So that a regression equation cannot be built up for the preference for wafers. The preference for wafers decreases with age. And the gradient for gender group is positive, showing that the males show a higher preference for wafers than females.

perceptual response for food highly depends on the sensory attributes appearance, smell, taste and texture [14]. Human senses for the taste, smell and other senses decrease with the aging [15, 16]. Taste affects the food choice greatly than other sensory attributes. clinical studies state that the taste bud intensity is reduced with aging [17]. Hence, older people find food bland [18], and also as they are more vulnerable to diseases, the older generation is more health conscious than youngsters [18]. Therefore, with aging, people move towards snack types with less artificial flavors and calories. Therefore, they would reject biscuit types which are considered much unhealthy on the ground of sugars, salt and fat [19]. further, studies state that, older generation like major meal related food than the snack related food [9]. This might be because elder people lead a much organized and serene lifestyle, thus they occasionally have extra meals. Other than that due to the loss of appetite with aging, they tend to avoid heavy mini meals. So that in overall the snacking frequency of older people is lower than that of younger people. Even if they have snacks, they avoid heavy snacks. Due to these reasons, the aged generation willfully alienated to snacks as food to pacify hunger rather than providing pleasure. In the Sri Lankan society, crackers are considered generally as a snack which has a capacity to pacify small hunger. Hence elder people who consume snacks as an alternative to meals select crackers over other biscuit types. the lower amount of sugar and artificial additives in crackers further support this attitude [20].

When considering the youngsters, they would much prefer biscuits of different varieties enriched with broader sensory profiles [21, 22]. Compared to aged people, youngsters have a sharp sensitivity towards the sensory attributes (taste, smell, etc.). Thus responses for food are more taste and smell

dependent. In addition, they have a busy lifestyle and more often engaged in social eating comparatively to elder people [23]. So that they consume regular mini meals besides the major meals. Under these circumstances, they seek pleasure and comfort through consuming biscuits, rather than pacifying hunger. So that younger people prefer snack based items rather than meal based items which consist more sweet, salty or savory tastes [24], fat, crispy textures while satisfying sensory attributes [25, 26]. Proving this dietary behavior, the results reveal that they prefer savory biscuits and cream biscuits.

According to the results, males prefer sweet tasted and high-calorie biscuit types more. Researches have indicated that males have a much higher preference for sweet taste [27,24], and also compared to women they usually select food with more meal based characteristics, [9] such as high calorie, homemade, heavy, energetic, etc. Therefore, they prefer cream biscuits and wafers. Supporting this dietary attitude, males show a little concern over healthy dietary guidelines. So, when selecting food they don't consider much about the high fat, sugar or salt levels. In the other hand, females express guilty feelings, when it comes to unhealthy food [9]. Further Studies on the dietary behavior indicates that women have more knowledge on healthy dietary guidelines and they are often willing to follow them .so that when females are selecting snacks, they move towards more healthy options which are low calorie and nutrient dense [9]. Under this phenomenon, females are reluctant to eat cream biscuits and wafer biscuits, which are generally considered as high caloric and incorporated with artificial additives. Hence they select crackers which are much healthier.

Psychological studies stated that people perceive food items with more intense colors as more intensely flavored (26) [28] and more often intensely flavored snacks are considered as unhealthy as usually a higher amount of artificial additives are used to obtain the desired flavor and color in snack items. This also explains the reason for females to reject cream biscuits, which are coming in a variety of flavors and high fat and sugar levels [29,6]. This behavior proves that even in snacking, females consider on choosing more healthy options.

And according to previous researches, females prefer crispy textured food more than males; which explains their behavior of preferring crackers And other than that, when considering the preference for salty taste, females are more towards salty food than the males [27]. But in the same time, women reject savory biscuits due to their high added flavors. As males are less sensitive to taste they select more intense flavors, whether sweet or savory. so that, they prefer savory taste more than females [30]. Being are less health conscious also explained their selection of savory biscuits over sweet biscuits. But results indicate that both males and females have favored savory biscuits. Most of the times biscuits are considered as snacks rather than biscuits hence all of the respondents prefer to have snack food without any difference, most especially younger respondents [24].

Perception is a psychological process. Therefore, when studying the perceptual response of an individual, previous experiences, a person's environment, mood, personality traits, etc. also should be taken into consideration [31,26,27].

4. Conclusion

Variance in the perceptual response of the respondents due to their age and gender was measured through a sensory

study, using different categories of dry crisp bakery products. With the aging process, preference moves more towards crackers, which is considered much healthy. The younger generation prefers products with a variety of sensory attributes such as intense colors, flavors, etc. When considering the gender category, males prefer sweet biscuit types and savory biscuits more. And females prefer crackers and semi-sweet biscuits which are considered low caloric. So, in conclusion, there is a significant effect of age and gender on the perceptual response for biscuit types.

5. Acknowledgment

The authors would like to acknowledge all the panelists who participated in the sensory evaluation study for their support provided in this study.

6. References

1. Costell E, Tárrega A, Bayarri S. Food Acceptance: The Role of Consumer Perception and Attitudes. *Chemical Perception*, 2010, 42-50. doi: 10.1007/s12078-009-9057-1
2. Kremer S, Bult JHF, Mojet J, Kroeze JHA. Food Perception with Age and Its Relationship to Pleasantness. *Chemical Senses*. 2007; 32(6):591-602. Doi: 10.1093/bjnm028
3. Michon C, Delahunty CM, Kerry JP. Differences in Food Perception. *Journal of Sensory Studies*. 2009; 24(6):922-937. doi:10.1111/j.1745-459X.2009.00245.x
4. Krige SM, Mahomoodally FM, Subratty AH, Ramasawmy D. Relationship between Socio-Demographic Factors and Eating Practices in a Multicultural Society. *Food and Nutrition Sciences*. 2012; 03(03):286-295. doi:10.4236/fns.2012.33042
5. Almerico GM. Food and identity: Food studies, cultural, and personal identity. *Journal of International Business and Cultural Studies*. 2014; 8:1-7.
6. James D. dietary intake, and nutrition-related attitudes among African Americans: Application of a culturally sensitive model Factors Influencing Food Choices, Dietary Intake, and Nutrition-Related Attitudes among African Americans: Application of a Cultural. *Ethnicity and Health*. 2004; 9(4):37-41. Doi: 10.1080/1355785042000285375
7. Witherly SA. Why Humans Like Junk Food. IUniverse, Inc., 2007. <https://jamesclear.com/wp-content/uploads/2013/11/why-humans-like-junk-food-steven-witherly.pdf>.
8. Bech-Larsen T, Jensen BB, Pedersen S. An exploration of adolescent snacking conventions and dilemmas. *Young Consumers*. 2012; 11(4):253-263. Doi: 10.1108/17473611011093899
9. Wansink B, Cheney MM, Chan N. Exploring comfort food preferences across age and gender. *Physiol Behavior*. 2003; 79(4-5):739-747. Doi: 10.1016/S0031-9384(03)00203-8
10. Dube L, Lebel JL, Lu J. Affect asymmetry and comfort food consumption. *Physiology and Behavior*. 2005; 86(4):559-567. doi:10.1016/j.physbeh.2005.08.023
11. Spence C. Comfort food: A review. *International Journal of Gastronomy and Food Science*. 2017; 9(2016):105-109. doi:10.1016/j.ijgfs.2017.07.001
12. Locher JL, Yoels WC, Ells J Van. Comfort Foods : An Exploratory Journey into the Social and Emotional Significance of Food. *Food and Foodways*:

- Explorations in the History and Culture of Human Nourishment, 2006-2013, 273-297. Doi: 10.1080/07409710500334509
13. Manley D. Classification of Biscuits. Woodhead Publishing Limited; 2011. doi:10.1533/9780857093646.3.271
 14. Abeywickrema S, Navaratne S. Impact of Demographic Settings on Consumer Perceptual Response of Caffeinated Beverages across Social Cross Profiles, 2018.
 15. Frank ME, Hettinger TP, Mott AE. The Sense of Taste: Neurobiology, Aging, and Medication Effects. *Critical Reviews in Oral Biology and Medicine*. 1992; 3(4):371-393.
 16. Kano M, Shimizu Y, Okayama K, Kikuchi M. Quantitative study of aging epiglottal taste buds in humans. *Gerodontology*. 2007; 24(3):169-172.
 17. Savitri Kamath K. Taste Acuity and aging1. American Journal of Clinical Nutrition. 1982; 36:766-775.
 18. Methven L, Allen VJ, Withers CA, Gosney MA, Sciences N, Rg R. Muscle wasting with age: a new challenge in nutritional care; part 1 – the underlying factor Ageing and taste Proceedings of the Nutrition Society. In: Malnutrition Matters' Nutrition Society Symposium, 2012, 556-565. Doi: 10.1017/S0029665112000742
 19. BDC. Mapping Your Future Growth- Consumer Trends, 2013.
 20. Gunathilaka UGSA, Wijewardhana US, Navaratne SB. Impact of Age on Sensorial Response of Sri Lankan Consumers on Biscuit Types. *International Research Journal of Advanced Engineering and Sciences*. 2019; 4(2):58-63.
 21. Lucas RE. Article information : Employee Relations. 2003; 15(2):33-42.
 22. Cornwell TB, McAlister AR. Alternative thinking about starting points of obesity. Development of child taste preferences. *Appetite*. 2011; 56(2):428-439. doi:10.1016/j.appet.2011.01.010
 23. Pliner P, Mississauga T. A table for one : the pain and pleasure. In: Meiselman H. ., ed. *Meals in Science and Practice: Interdisciplinary Research and Business Applications*. Mississauga: Woodhead Publishing Limited, 2009, 169-189. doi:10.1533/9781845695712.4.169
 24. Chapman G, Maclean H. Junk food and healthy food: meanings of food in adolescent women's culture. *Journal of Nutrition Education*. 1993; 25(3):108-113. Doi: 10.1016/S0022-3182(12)80566-8
 25. Rtid BL, Gulyas S, Mann T. Preferences for sweet and salty in 9- to 15-year-old and adult humans. *Science* (80). 1974; 190(4215):686-687.
 26. Cowart BJ, Beauchamp GK. The Importance of Sensory Context in Young Children's Acceptance of Salty Tastes Author (s): Beverly J. Cowart and Gary K. Beauchamp Published by Wiley on behalf of the Society for Research in Child Development Stable URL : <http://www.jstor.org/st>. *Child Development*. 1986; 57(4):1034-1039.
 27. Alley TR. JB. Sex Differences in Preferences for Sweet, Salty, and Hot Foods. *Socoal Science Perspectives Journal*. 1989; 3(1989):43-49.
 28. Spence C. On the psychological impact of food color. *Flavour*, 2015, 4(21). Doi: 10.1186/s13411-015-0031-3
 29. Gavin T. Determinants of gender differences in dietary behavior. *Nutrition Research*. 1997; 17(7):1105-1120.
 30. Batenburg M, van der Velden R. Saltiness Enhancement by Savory Aroma Compounds. *Journal of Food Science*. 2011; 76(5):280-288. doi:10.1111/j.1750-3841.2011.02198.x
 31. Vainikka B. Psychological Factors Influencing Psychological Factors Influencing Consumer Behavior, 2015.