

Analysis of the impact of age and gender in sensory perception and perceptual response for caffeinated beverages

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ABSTRACT

This paper systematically reviews the impact of age and gender toward the perceptual response for tea, coffee and a selected cola beverage. Study was conducted by a survey with a paper questionnaire and samples of each beverage were given to the selected respondents and tested according to ISO 8589:2007 standards. Collected data were analyzed for multinomial regression by SPSS 22.0 statistical software and results revealed the effect of age and gender were significant ($P < 0.050$). Further fried man test with a post hoc test was conducted to check the significant variations of the sensory attributes. Results indicate that tea and coffee has higher perceptual responses by females and older ages, while cola beverage has higher perceptual response from younger males. Overall, the study found that pattern of consumer perception has a correlation with age and gender as the impact fluctuate consumer's perception on beverages even on the sensory profile.

Keywords

Age, Beverage, Gender, Perception, Sensory profile

1. INTRODUCTION

Even though product development is a mission of designing, determination of the consumer acceptance and preference, it is truly based on the perception of the consumer [1]. Perceptual response is the mental phenomena which involves with immediate sensory experience to recognize and react on environmental responses. This usually associated with the field of food science and technology, since product purchasing is oriented on the perception of the consumer.

Perception includes five human senses; sight, sound, smell, taste and touch. It also includes proprioception and the cognitive ability where the information gathered is concerned. Apart from environmental stimuli; psychological, physiological and demographical factors are affecting the perceptual response of the consumers [2].

Preference for products which associated with perceptual response becomes impaired with the

age and even with the gender. The changes associated with the variations of the preference for same products are resulted by the variations in the perceptual responds of the consumers. Perceptual response which rooted from the perception is the pattern of mindset of people in which they get aware about the quality and other features of a product through their senses and experiences. So, perceptual response as well as preference of customers is an important context in the business of food and beverages.

Perception or the perceptual response is related with the perceptual sensitivity. According to the studies individuals are differ in perceptual sensitivity [3, 4]. The decline of the sensitivity causes the deprivation in the perception on flavor, taste and other sensory attributes. Due to many physiological, psychological factors ageing process effect to the perceptual response of the people. It was found that sensory perception is altering with the ageing [2].

According to previous researches the effect of perception towards products and product development were examined, but studies on the perceptual response and the effect of age and

gender towards food products are very less. Since most of the people have a habitual trend to use caffeinated beverages (natural/artificial) in their life, perceptual response of the respondents were intended to analyze towards the preference for caffeinated beverages. This study identifies the effect of age and gender of the consumer towards the perception of tea, coffee and cola beverages and the impact on sensory profiles.

2. METHODOLOGY

2.1 Selection of respondents for the study

Participants for three age groups as 15-30, 30-45, and 45-60 were selected for this study in two gender sub groups; male and female. 205 volunteered participants were engaged for the study but 25 were dropped by the screening¹. Each group consisted 30 respondents, totally 180 participants were taken after the screening process (n =30, Gender- Male, Age range 15–30 years; n =30, Gender-Female, Age range 15–30 years; n =30, Gender-Male, Age range 30–45 years; n =30, Gender-Female, Age range 30–45 years; n =30, Gender-Male, Age range 45–60 years; n =30, Gender-Female, Age range 45–60 years). All the participants were recruited from a semi urban area of Matara district, Southern province, Sri Lanka. And all respondents selected were having normal, good health condition.

2.2 Preparation of gustatory stimulants

A volume 200 mL Tea and coffee samples were prepared with Ceylon black tea (5g) and instant black coffee separately, by incorporated with hot water. 200 mL of Cola sample was given from a selected Cola brand bottles which were immediately opened. For Tea and Coffee, respondents were given the chance to add sugar according to their preference. And similarly, the temperature condition (Hot/Cool) was provided for the beverages according to the preference of the respondent. Samples were not coded in particular order, but named three samples referring to the beverage as by its common name.

2.3 Task and Procedure

A prearranged questionnaire contained subjects as name, gender and age and other relevant

queries was given to the respondents in which first part contains survey based paper questionnaire of perceptual analysis by the ordinary or the unguided method and the second part consists a sensory evaluation for Tea, Coffee and Cola beverage.

Sensory evaluation took place in a calm environment usually from 10:00 a.m. to 14:00 p.m. Whole evaluation was carried out, while making it in compliance with the ISO 8589:2007 International Standard. Before performing the sensory evaluation for taste; colour and smell was assessed, and thereafter taste and overall acceptance was evaluated using the 5 point hedonic scale (1- Extremely dislike, 2- Dislike, 3- Moderate, 4- Like, 5- Extremely like).

Visual Detection of the samples- Each participant was advised to look at the colors while taking breaks of 20s between each glimpse to avoid sensory-adaptation.

Sniffing the Samples- Each panelist was given instructions to perform sniffing properly. Three deep and quick sniffs were achieved from the sample and then the odor source was removed. Clean air was breathed between each assessment. A gap of 20 s was maintained between individual odor assessments.

Tasting the Samples - Each panelist was given instructions to perform tasting properly. Sufficient volume of the solution was provided from the sample and the solution was tasted and spit out the mouth. Mouth was flushed using clean water between each assessment. A gap of 20 s was maintained between individual taste assessments.

2.4 Statistical Model

Using IBM SPSS version 22.0 the Statistical Software package with a significance level of 0.05 was taken into contemplation to analyzed perceptual response related to demographic factors, age and gender. The relationship of perceptual response with distinct age group respect to the gender was interpreted using the multinomial regression analysis.

Since selected sensory panels (consumer panels) are consisting untrained panelists, as the non-parametric evaluation method for the sensory evaluation, Friedman test was used. And to the post hoc test by means of mean separation, Wilcoxon signed rank test was used. These tests were conducted respectively for the 3 age groups (15-30, 30-45, 45-60) while representing the gender (male and female). Existing

¹ Screening was done to drop the respondents with inappropriate personal behaviors (smoking, chewing beetle, etc.) who regard as unfitting respondents for sensory analysis.

significant differences and the fact of the different were identified using both tests methods aforementioned. By way of a supplementary assessment, web diagrams were

drawn for Tea, Coffee and Cola for the each age group (15-30, 30-45 and 45-60) demonstrating the genders.

3. RESULTS AND DISCUSSION

Collected data through the questionnaires was analyzed using SPSS 22, multinomial regression analysis and summarized in the table 1.

Table 1 Summarization of the statistical analysis outputs

Analysis	Sig. value
Model fitting information (sig. value)	0.000
Pseudo R square test (Nagelkerke value)	0.518 (51.8%)
Likelihood ratio test	
Intercept	0.100
Age	0.000
Gender	0.001

According to the model fitting information, applied multinomial regression for the study was significant ($P < 0.050$). Since Nagelkerke R^2 value was exceeding 50%, considered factors for the perceptual response of the respondents were satisfactorily contribute for the correlation as the major segment of the factors were considered in the study.

Likelihood ratio test shows the relationship in between perceptual response and the factors considered. Further results showed intercept was insignificant ($P > 0.050$). It depicts that, to initiate a perceptual response an external factor should be influenced the process of perception as it begins with pre-attentive processing [5].

According to the results; age and gender are significant ($P < 0.050$) as age is the key factor which affects the sensory perception, especially to the perception of the taste with the heterogeneous nature of the older public [2]. It has found further, the relationship of the perceiver's attitude as the expectation and external factors combined to the perceptual response.

Results of the conducted non parametric analysis, friedman test for the study is summarized in the table 2, which depicts the significance of the difference in the sensory profiles of the respondents toward tea, coffee and cola beverage. Since the all the age groups (15-30, 30-45 and 45-60) and sub groups for gender were having significant difference in sensory attributes ($P < 0.050$), the difference was further analyzed by the post hoc test, Wilcoxon signed rank test.

Table 2 Results of fried man test and post-hoc test

Statistical analysis	Tea*	Coffee*	Cola beverage**
Fried man test	0.000	0.000	0.001
Post hoc test (Wilcoxon signed rank test)			
Age 15-30 Male	Colour	0.000	0.250
	Smell	0.300	0.000
	Taste	0.000	0.100
	After taste	0.150	0.070
	Overall acceptability	0.000	0.060
Age 15-30	Colour	0.000	0.560
	Smell	0.230	0.700
		0.730	0.500
		0.000	0.700

Female	Taste	1.000	1.500	1.500
	After taste	0.300	0.000	0.320
	Overall acceptability	0.000	0.000	0.070
Age 30-45 Male	Colour	0.000	0.780	0.000
	Smell	0.000	2.100	0.000
	Taste	1.000	1.000	0.000
	After taste	1.600	0.300	0.000
	Overall acceptability	0.000	0.056	0.080
Age 30-45 Female	Colour	0.800	0.000	0.900
	Smell	1.300	0.000	0.000
	Taste	0.200	0.067	0.000
	After taste	0.000	0.000	1.000
	Overall acceptability	0.000	0.000	3.000
Age 45-60 Male	Colour	0.000	0.000	0.760
	Smell	0.000	0.000	1.000
	Taste	0.500	1.000	1.300
	After taste	0.000	0.800	0.000
	Overall acceptability	0.000	0.000	0.600
Age 45-60 Female	Colour	0.000	0.000	1.300
	Smell	0.000	1.000	3.000
	Taste	0.000	1.500	0.500
	After taste	0.670	0.000	1.000
	Overall acceptability	1.000	1.200	0.068

* indicates post hoc test was done compared to cola, ** indicates post hoc test was done compared to cola - compared to coffee

Results obtained from the table 2 shows that; in age group 15-30, for the male gender, colour of tea, smell of cola, taste of tea and overall acceptability of tea and cola has a significant difference in their sensory profiles. But gender female shows a significant difference in the sensory attributes of colour of coffee, smell of tea and coffee, after taste of coffee and overall acceptability of tea and coffee. Results were validated by using web diagrams for the sensory profiles of the respondents in age 15-30 (Fig.1).

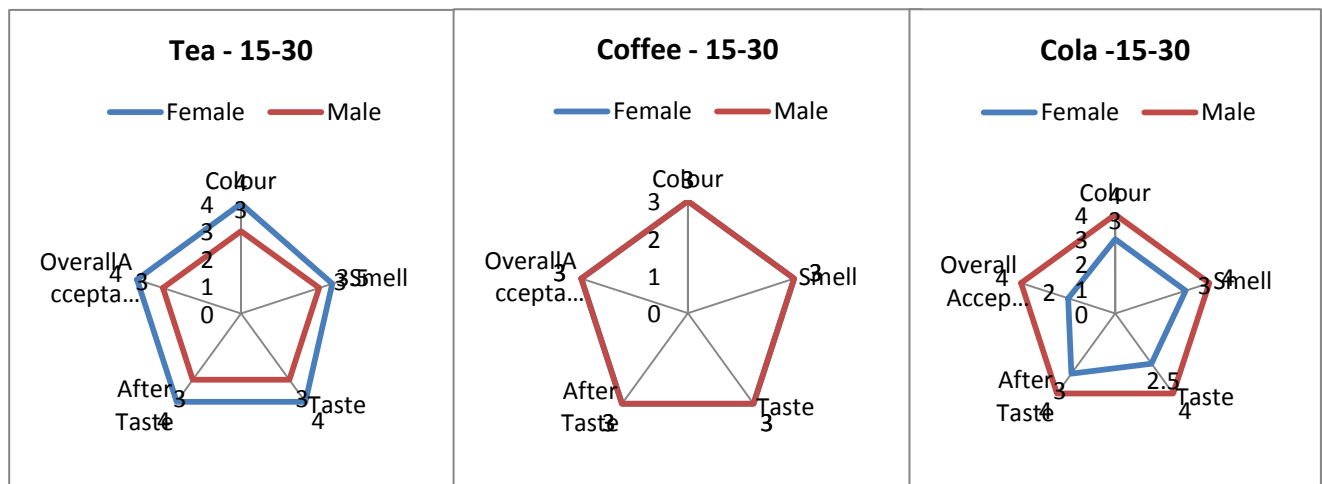


Figure 1- Age 15-30 sensory profile analysis by web diagrams

According to the fig. 1 there is an outstanding perceptual response for cola by males compared with female. Female prefer tea than males, but coffee has same response by both genders for the age group 15-30.

In the age group 30-45 male (table 2), colour of tea and cola, smell of tea and cola, taste of cola, after taste of cola and overall acceptability of tea (preferred) having a significant difference over the sensory attributes while colour of coffee, smell of coffee and cola, taste of cola, after taste of tea and coffee and overall acceptability of tea and coffee showed a significant difference over sensory attributes.

By considering age group 30-45; gender female shows high overall acceptability in preference of tea than male and perceptual response for coffee is moderately affected by the gender with low preference in the sensory attribute of after taste in female (fig. 2). But for cola beverage still gender male shows high perceptual response than females. Compared to the fig.1 ageing has enhanced the perception towards coffee and tea, and reduces the perception for cola beverage.

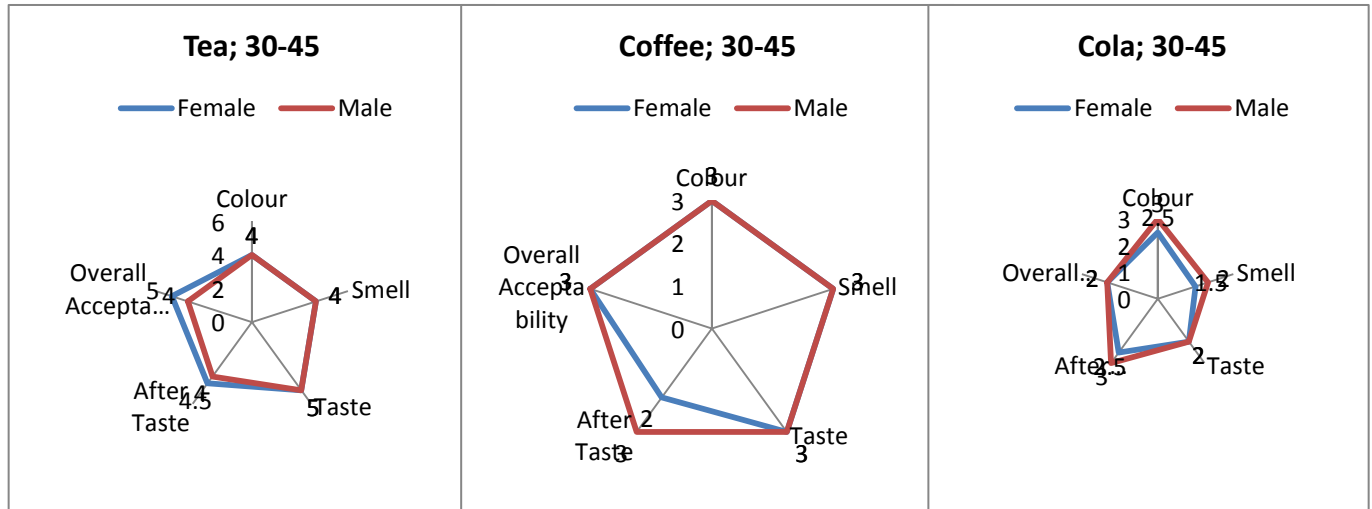
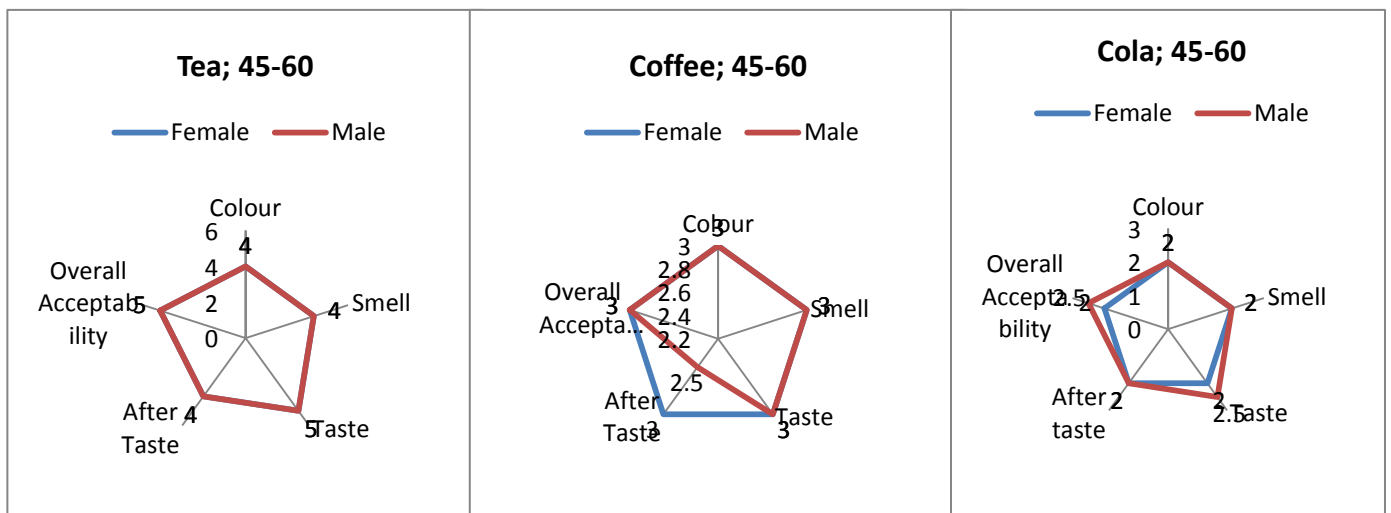


Figure 2- Age 30-45 sensory profile analysis by web diagrams

Referring to table 2, age group 45-60, colour of tea and coffee, smell of tea, taste of tea and coffee, after taste of tea and cola and overall acceptability of tea and coffee was significantly different for the gender male. In the same age category colour of tea and coffee, smell of tea, taste of tea, after taste of coffee were significantly different for the gender female.

Figure 3- Age 45-60 sensory profile analysis by web diagrams



As shown in fig. 3 age group 45-60; perceptual response for tea is similar for two genders, male and female. After taste of coffee has increased for the gender female than male and cola beverage shows increased perceptual response by male than female, but the level of preference has reduced.

The study revealed that gender male in age group 15-30 has a high perception towards cola beverage, but ageing process reduces this to a considerable extent. According to some studies, due to ageing older people usually experience a condition of fatigue to cola beverages [6]. A case study on Coca cola has shown same findings, as age 20-29 prefers more cola

beverages, but ageing has reduced the preference [7]. This might be the reason of this revolting nature of the perception of cola with the effect of growing older or ageing.

According to the fallouts, gender male is responding highly towards cola beverages than females and that level reduces with the ageing. But a study has figured out that, 51% of the male and 49% of the female prefers cola as it less impact by the gender [8]. The variation of the result might be due to the behavioral pattern of Sri Lankan people with Indians as Sri Lankans prefer more natural caffeinated beverages due to the high production rate of tea, even coffee within the country.

A Consumer Survey on Sustainable Tea and Coffee Consumption conducted in Delhi, India has shown, age 18- 36 shows higher preference for tea and coffee, but it declined with the age [9]. But this study examined that increase in age has a tendency for the enhancement of the perception of tea and coffee. But the observed affinity of the higher perception for tea and coffee in female compared to males falls with similar results in mentioned survey. Both studies found that this affinity reduces with ageing, since male and female shows similar level of perception towards tea and coffee with growing older.

Since perceptual response is cross linked with loyalty of the consumer, this might effect by many other reasons also. It's not easy to get the customer loyalty as it is inflated by many other definable and indefinable factors [10]. But overall study has found that perceptual response of consumers has a correlation with age and gender, even it has effected to the sensory profiles of consumers. There are differences in the behavior of the consumer in different countries and even situations [11]. Hence these findings may get alterations due to the locations or in comparing different countries and situations.

4. CONCLUSION

Perception of the respondents was measured by the preference towards the caffeinated beverages; tea, coffee and Cola. Selected demographic settings/factors; age and gender are mostly effect to the perceptual response as analysis imparts a higher R square value.

Results concluded that, perception for tea becomes high when the age is increasing or ageing and mostly females preferred tea than

male. For coffee, ageing, female gender as well as affect positively correlated with the perception. But younger ages, particularly males prefer Cola but it declined with the age.

Sensory profiles of the respondents were changed with the age and gender by validating the result obtained. As fallouts confirm the responses of males towards Cola is high compared to females. And with the ageing both genders more pretend to use tea as the perception increases. Perception for coffee increased with the age, and was prominent for the gender female.

This further depicts through the web diagrams that higher perception for a caffeinated beverage is occurred with higher satisfaction of the sensory attributes; colour, smell, taste, after taste and overall acceptability, with the mentioned demographic settings, age and gender. These findings can be used to predict the consumer preferences and perceptual pattern of consumers for marketing purposes and even for product developments.

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