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A preliminary study on digital image performance to stimulate food taste experience

Nur Hasni Nasrudin, Afdallyna Fathiyah Harun
Faculty of Computer & Mathematical Sciences, Universiti Teknologi MARA, Malaysia

Article Info

ABSTRACT

Users and food marketers alike would share images of food in the hopes that viewers would be able to capture the emotion/sensation presented by the food. This is a form of food digitization, shifting away from the mechanical aspect of taste stimulation to the use of digitized visuals. This paper aim to evaluate the performance of taste perception made by users by just looking at food image. Using food images as a medium of taste stimulation, this paper reports international users' perception of the taste of Malaysian local food through an online channel. By applying SPSS analysis, the author studied the patterns of similarity and dissimilarity of users' perception of food images that have been compiled using an online survey. Interestingly observed, the results of the analysis enable the author to assess how close user perceptions were akin to the real taste. The author found that most user perceptions are closely matched with the food's real taste which allows the author to conclude that visual media is possible in stimulating food taste experience. It is good news for food marketers and food tourism. Nevertheless, more samples of food images are required to further attest these findings.

Corresponding Author:

Nur Hasni Nasrudin,
Faculty of Computer & Mathematical Sciences,
Universiti Teknologi MARA,
40450 Shah Alam, Selangor Darul Ehsan, Malaysia.
Email: nurha932@uitm.edu.my

1. INTRODUCTION

It cannot be denied that food is the basic need for a human being. As the acquirement for food taste becomes sophisticated, humans have been foraging for food taste experience to the point of travelling the world to taste local cuisine of various countries. Part of the foraging strategies have included browsing the website to see list of other countries local cuisine as well as the sharing of experience through digital postings (i.e. twitter, Instagram). Some researchers have resorted to bringing taste experience to the users without the actual tasting of food. This comes in the form of mechanically enhanced chemical-based and electrical-based food taste stimulators [1] where the former for example, requires users to place the device in the user's mouth [2, 3]. These technologies are rather impractical because the technologies require chemical substance refill with vigilant care [2, 4], while the use of electrical device can be rather large and tedious to set up [5]. Moreover, the natural interaction between a human user and the devices leaves much to be desired. Consequently, [6] have suggested that the stimulation of food taste experience evolve from physiological setup to cognitive neuroscience and psychological studies. However, simply omitting devices in stimulating taste experience is not simplistic as it concerns the cognitive and perceptual processing

systems in human memory [7]. Besides, taste involves the integration of various sensations that implies a perceptual experience [8].

However, it is imperative to acknowledge that the challenge of perception is largely dependent on the individual-particularly their previous experiences and facts stored in their individual memory [9]. Memories and experiences are constructed from sensorial experience such as vision, auditory, tactile, olfaction and gustation which are processed by our sensory input-sight, hearing, touch, smell and taste. Multimedia elements which are text, graphic/static image, animation and video [10] can map to some of these sensories influencing the manufacturing of perception and experience recall. In [11] and [6] have attested that multimedia elements have the capability to virtually represent food multisensory information such as temperature, viscosity, texture, fat contents, pungency, nutrient intake and irritation. The obsession to share food image via social media has exponentially increased [12] indirectly proving that the use of multimedia elements to express food experience is socially acceptable. The food images shown appealed to users and has the capacity to increase the intrinsic desire to consume the food [13]. However, it is still unclear either users would develop the right taste perception based on the images presented to them. The purpose of this paper is to evaluate the performance of taste perception made by users by just looking at online food image. We analyse how close the taste perception with the actual taste of the food. It may help food lover, food marketers and food tourism to know that the food image they share in online medium should not only looks appealing but it is also possibly convey the food taste as well.

2. RESEARCH METHOD

This section explained in detail the methodology of this research in four subsection. First, research design that explain the approach of the study well as data collection method. Second, explained about the method of food selection made and the source of food list, it is to ensure the food list are valid Malaysian Food. Third, the participants involve in this research is explained. Fourth, how data being leaned and analysed were explained.

2.1. Research design

The acceptance of social media sites as tools to promote and advertise product has greatly increased [14]. It is proven that ability to present products or services using the right visual cues especially for food related product is a key element for successful social media website [7, 15]. Therefore, in this study, the authors have attempted to analyze the participants' taste perception when looking at the food digital image and relationship with their prior knowledge and background. The taste dimension in this study are salt, sour, sweet, bitter, spicy and umami. The study was deployed using quantitative approach and employing a cross-sectional design. Cross-sectional design is suitable because the study involves a sample of international population and the data are collected one point at a time [16]. The author runs a survey by designing an online questionnaire and used selected Malaysian food images as objects in mediating online food taste experience through an image. The authors have also requested the participants to give the taste perception of each food by selecting from a checklist of taste provided. As the options were listed in checkbox format, participants are allowed to answer more than one taste dimension for a particular picture. The targeted participants in this study are the ones located abroad, and snowball sampling method is applied for data collection purposes [17]–each participant will be required to nominate other potential participants until the target are met. The hypotheses of this study is digital image able to stimulate the food taste perception.

2.2. Food selection

The list of food adopted in this study is the top most traditional food frequently mentioned for the categories of rice, noodles, gravies, appetizer and dessert as found by [18] which listed in National Food Heritage by the Malaysian National Heritage Department. Additionally, the authors search the food image using google search engine since Google is the most prominent search engine used worldwide [19] and people are dependent on Google for knowledge and information [20, 21]. The author selected food served on a white plate as the image search criteria to fit into [22] research finding where it mimics an authentic natural setting as well as help avoid distracting the user from the food elements [22]. In the questionnaire, the food image is labeled as Picture 1 for 'Nasi Lemak', Picture 2 for 'Bubur Cha Cha' Picture 3 for 'Kerabu Mangga Muda', Picture 4 for 'Laksa', and Picture 5 for 'Rendang' as shown in Table 1. The author decided not to label the food with its name as the author presumed that the awareness of the name might inadvertently influence users' taste perceptions hence affecting the study outcome. In the other hand, the actual taste of these foods gather from established article as per shown in Table 1.

2.3. Participants

The author recruited international participants as respondents to the online survey where they need to be 18 years old and have not been to Malaysia. The author believes such user profile will not be well versed with Malaysian cuisine hence more able to provide a genuine taste perception towards the digital images of Malaysian food as per Table 1.

Table 1. List of Malaysian food and the established actual taste used in this study

Malaysian Food	Actual Taste	Food Picture
Nasi Lemak Labeled as Picture 1	Spicy, salty and a bit sweet [23]	
Bubur Cha Cha Labeled as Picture 2	sweet dissert [24]	
Kerabu Mangga Muda Labeled as Picture 3	sweet, sour and spicy [25]	
Laksa Labeled as Picture 4	Swett-sour [26] spicy, slightly sweet with a hint of fish [27]	
Rendang Labeled as Picture 5	Gravy, spicy, [28] creamy and creamy beef slowly stew for hours in coconut milk and aromatic spices [29]	

2.4. Data analysis

The data analysis began by removing noise-responses that came from users who did not match with the required user profile. The author then performing crosstab analysis using SPSS statistical software to analyze and grouped the similar taste perception from the participant for each picture as well as understand the relationship between taste perception and the user experience with Malaysian food. Crosstab analysis produces the result in tabular format as shown in Figure 1, then from that author proceeded to generate graphs to see the distribution of user response. Crosstab analysis is suitable for this study as user responses are from multiple-choice format questions [30, 31].

PICTURE 1														
		Bland/ Dull	Salty	Salty, Spicy	Sour, Salty, Umami (commonly used to describe food that has savoury flavour or make your tongue salivate)	Sour, Spicy	Spicy	Spicy, Bland/ Dull	Spicy, Umami (commonly used to describe food that has savoury flavour or make your tongue salivate)	Sweet	Sweet, Salty	Sweet, Sour, Salty, Umami (commonly used to describe food that has savoury flavour or make your tongue salivate)	Sweet, Spicy	Umami (commonly used to describe food that has savoury flavour or make your tongue salivate)	Total
Have you taste Malaysian food before?	Yes	0	1	1	1	0	9	0	0	5	1	1	2	2	23
	No	2	0	1	0	1	1	1	1	0	0	0	0	0	7
Total Response		2	1	2	1	1	10	1	1	5	1	1	2	2	30

Figure 1. Example of crosstab analysis result generated by SPSS before transforming to a graph

Then the author attempted to compare respondents' taste perception resulted from crosstab analysis to the actual food taste as listed in Table 1. To evaluate the performance, the author did categorize the taste perception into two categories (i) "highly in common" – user respondents similar to the food's actual taste, and (ii) "out of common" – respondents' taste perception is dissimilar to the food's actual taste. The analysis process illustrate in Figure 2.
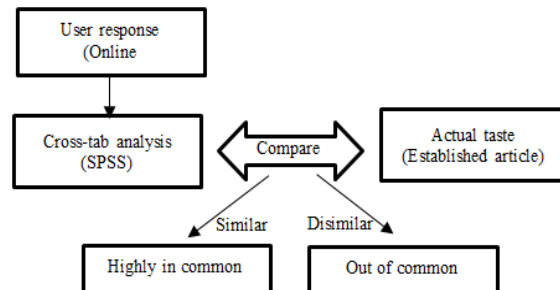

Figure 2. Analysis process to evaluate the performance of user taste perception towards digital food image presented in online medium

3. RESULTS AND DISCUSSION
3.1. Participants

Table 2 summarizes the respondents' demographic data with key insights including respondents comprise of 18 different nationalities and were largely from the 18 to 25 years age group. The latter is significant as this is the age group who frequently use the internet [32].

Table 2. The profile of the respondent (*n*=30)

PROFILE		FREQUENCY	PERCENT (%)
	Afghanistan	1	3.33
	Bangladesh	2	6.66
	Finland	1	3.33
	India	3	10.00
	Indonesia	2	6.66
	Italy	1	3.33
	Korea	1	3.33
	Libya	1	3.33
	Maldives	1	3.33
COUNTRY OF ORIGINS	Mauritius	4	13.33
	Nigeria	4	13.33
	Pakistan	1	3.33
	Somalia	1	3.33
	South Africa	2	6.66
	South Korea	1	3.33
	United Kingdom	1	3.33
	United State	1	3.33
	Yemen	2	6.66
	18 - 25 years old	9	30.00
	26 - 30 years old	3	10.00
	31 - 35 years old	4	13.33
RANGE OF AGE	36 - 40 years old	6	20.00
	41 - 45 years old	3	10.00
	46 - 50 years old	2	6.66
	51 - 55 years old	3	10.00
HAVE TASTED MALAYSIAN FOOD?	Yes	23	76.67
	No	7	23.33

3.2. Taste perception of food image's performance

The performance of taste perception evaluated of every food picture (5 pictures) used in this research. The result in tabular format has been transform into graph, which are bar graph and pie chart for better understanding and data representation. We will discuss the result in sequence, starting from picture 1 until picture 5. Figure 3 is performance for Picture 1, it can be notified that there are 13th different taste perceptions from the participants. Where 28th of them a highly common taste and only 2 of them are out of

common taste. Meaning, 93% of them able to give the right taste on 'Nasi Lemak'. Hence, for Picture 1, the author would like to suggest that participants successfully stimulating the food taste solely based on the visual of food image.
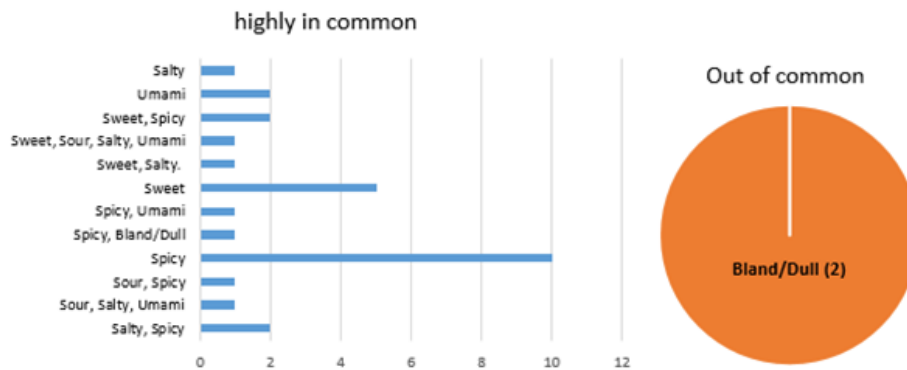

Figure 3. The distribution of taste perception for picture 1. (n=30)

Figure 4 reveals the majority of the respondent, which is 21 answers sweet taste for Bubur Cha Cha. However, another 7 participants (23%) give taste perception that different from the original taste of Bubur Cha Cha. The author assumes, maybe the red color in this picture makes them expected chilies are one of the ingredients in this food (refer Figure 5). The previous study reported 'sweet' taste was very complex and hardly recognized even using a mechanical method [4, 8]. Hence, it is also complex and difficult to recognize through a visual (food image) too.
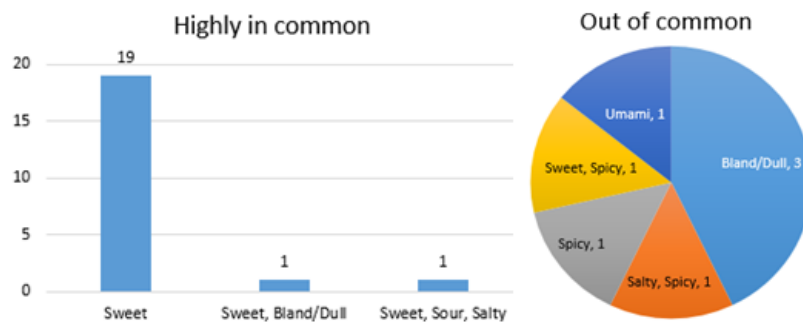

Figure 4. The distribution of taste perception for pic

Figure 5. Red color in bubur cha cha may trigger 'spicy' taste experience to the participants

For picture 3, the author placed Kerabu Mangga Muda known as mango salad. As refer to Figure 6, 83% of participants have highly in common taste perception that is sour and spicy as a taste. However, another 17% fall under as out of the common category. Meaning, this picture nearly success to mediate the actual food taste.
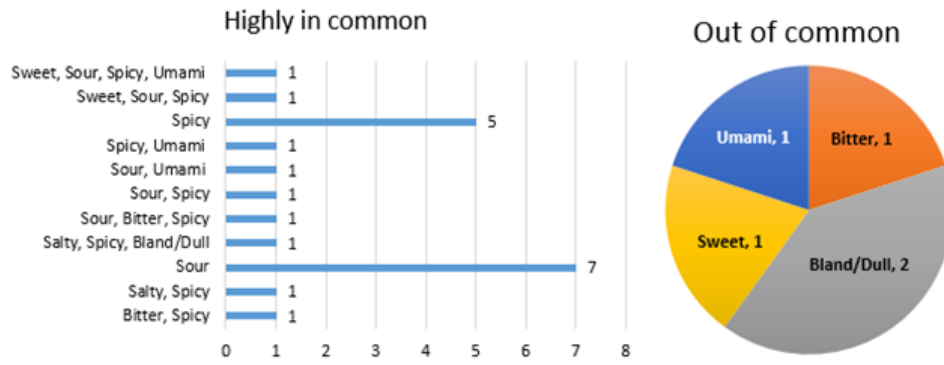
Figure 6. The distribution of taste perception for picture 3

Figure 7 shows 26 participants (87%) give a highly common taste perception towards the taste of Picture 4. Whereas the other four taste perceptions are out of common of Laksa taste. Therefore, this result indicates Picture 4 is nearly able to stimulate food taste perception.
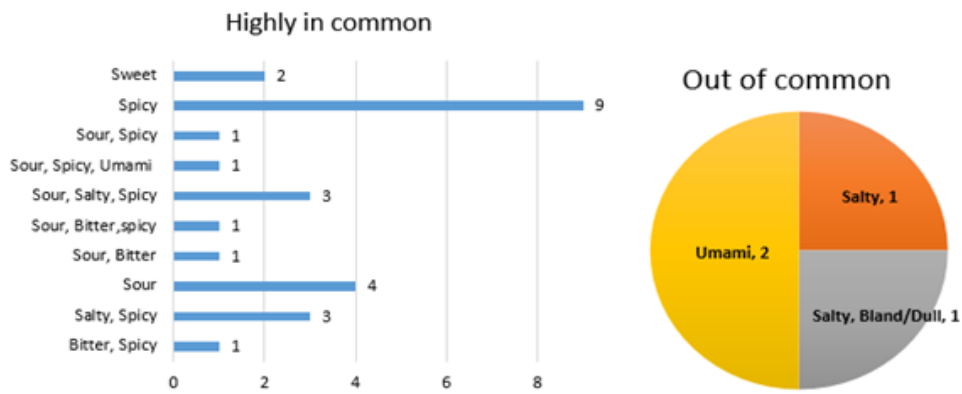

Figure 7. The distribution of taste perception for picture 4

Rendang daging or beef rendang is the name of food for picture 5. As depicts in Figure 8, the majority of participants (67%) gives highly in common taste perceptions. On the other hand, another 10 participants (33%) gives Out of common of taste perception for beef rendang. In other words, Picture 5 also nearly able to stimulate taste perceptions.
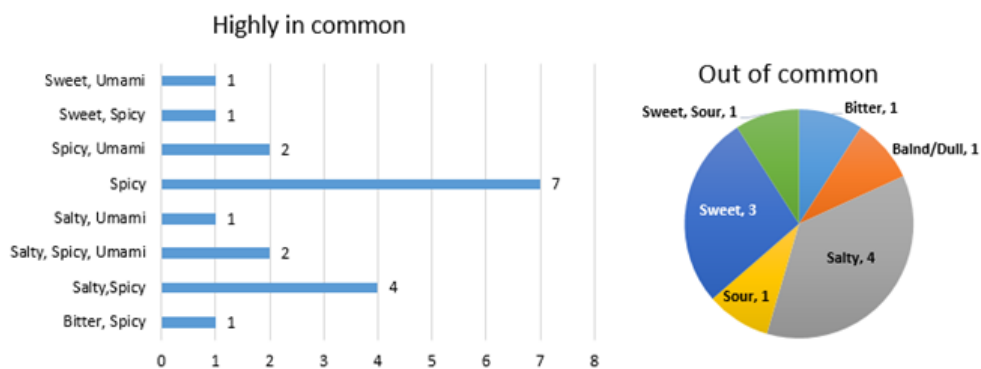

Figure 8. The distribution of taste perception for picture 5

3.2. Performance of taste perception rank and potential

Table 3 indecates the rank of tast perception performance for every picture. We can see that, the highest performance goes to Picture 1 ('*Nasi Lemak*' picture), whereas the lowest performance is Picture 5 (Beef rending). All picture has good performance where in average 81.4% respondence give highly in common test which similar to the actual taste. Meaning, it is reveal that image has a good performance to stimulate food taste to the viewer/user in online medium.

Table 3. The rank of food image's performance.

Rank	Food Name	Highly in common %
1	Nasi Lemak Labeled as Picture 1	93
2	Laksa Labeled as Picture 4	87
3	Kerabu Mangga Muda Labeled as Picture 3	83
4	Bubur Cha Cha Labeled as Picture 2	77
5	Rendang Labeled as Picture 5	67
Average performance	= (93 + 87 + 83 + 77 + 67)/5	
	= 81.4% (highly in common answer)	

Need to take in account that none of the image in this research gather 100% highly in common of taste perception. We beliefe it is due the individual taste experience stored in partcipant's memory. Therefore, this research provision the fact mention by [9] that perception is largely dependent on the individual previous experiences stored in their individual memory. At the end of the survey, the author asking either the food picture makes the participant feel hungry or not. The result shows 53% of participants say "Yes" and others say "No". This outcome reveals the food picture itself inadequate and may need an inventiveness to enhance the quality of the picture and yet able to mediate the actual taste. This finding may benefit to food producers and gastronomy tourism; they should be very cautious in producing, designing and selecting food picture for promotion and advertisement purposes.

4.   CONCLUSION

The findings of this study revealed that omitting devices in stimulating online food taste perception in a digital medium is possible. Image has good performance to mediate user's food taste experience where their taste perception are frequently close with the actual taste. The hypothesis that food picture can function as an object in mediating online food taste experience through visual has proven to be valid, that is the digital food image was able to stimulate taste perceptions. However, it needs to other factor(s) to gain better taste perception in future research.

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