

## Comparison of Consumer Acceptances of Frozen Pizzas Assessed at Central Location Test (CLT) vs Home Use Test (HUT)

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### ABSTRACT

Selection of sensory testing location plays an important role on the sensory evaluation. Not only does test location define how product is sampled and perceived, but different results may be obtained from different test sites with a given sample sets and consumers as well. This study was to investigate the consumer perceptions on frozen pizzas as affected by various testing locations: central location test (CLT) vs. home use test (HUT), and to determine if the tested products matched the consumer ideal product profile. In CLT, 137 panelists assessed frozen spicy chicken and pepperoni using the acceptance test based on various attribute categories: appearances, tastes, textures and overall acceptance. However, data analysis ( $\alpha=0.05$ ) using chi-square and Student's *t*-test was based on 46% of panelists who returned HUT results. Both spicy chicken and pepperoni pizzas showed no significant difference of consumer acceptances assessed in CLT and HUT based on all attributes except crispness and tenderness. Although the overall taste of spicy chicken showed the potential ( $p=0.06$ ) that test locations may show an influence on consumer acceptance if more data was collected. Both frozen pizzas were not significant different from the consumer ideal product profiles. CLT was recommended for the consumer acceptance test of frozen pizzas due to its advantages in validity of responses, target consumer, convenient and economical aspects despite a caution that some texture attributes were influenced by the test location.

**Key words:** consumer acceptance, frozen pizza, central location test, home use test, just-right scale

### INTRODUCTION

The primary function of sensory testing is to conduct valid and reliable tests, providing sufficient data for decision making such as consumer acceptance of product and assessment of market potential before commercial launch. Many factors including test location have the influences on consumer responses in sensory evaluation. Central Location Test (CLT) conducted by setting a booth where many potential customers congregate has the advantages including controlled

conditions for product assessment, less sample, lower cost, higher percentage of returned responses and several products may be tested at once. Despite these advantages, the number of questions may be limited so less information is obtained. Also, product is assessed under relatively artificial controlled conditions as compared to normal conditions at home. In this case, Home Use Test (HUT) is preferable due to natural use conditions for product assessment, stabilized information rather than the first impression in CLT and sufficient time for the completion of questions.

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However, HUT is time consuming, costly and has high possibility for unreturned responses, causing less respondents and smaller sample sets than CLT. Also, the family opinion or the influence of one family member on another has to be taken into account.

Not only does the test location define general aspects of how the product is sampled and perceived, but it is also possible to get different result from various test sites with a given set of samples and consumers. Thus it is crucial for sensory analysts to design the proper test location for the test purposes. The objectives of this study were to compare the consumer acceptances of frozen pizzas perceived at different test locations: CLT versus HUT whether the test location has an influence on the responses, and to determine if the tested products match the consumer profile of the ideal products.

## MATERIALS AND METHODS

### Target consumers and sample preparation

Consumer acceptances of two different flavors of commercial frozen pizzas: spicy chicken and pepperoni were assessed by 137 potential consumers at CLT (school and local church, Columbus, OH, USA) and HUT (residential home). Demographic questionnaires were used to prescreen the potential customers from a large group of candidates, and to justify for marketing research tests. The target consumer of these pizzas was a general population (family and individual) who liked spicy tasted frozen food, and was a non-vegetarian. The tested pizzas at CLT and HUT were stored at  $-14^{\circ}\text{F}$  and home freezer temperature, respectively. The cooking direction for both of CLT and HUT were  $400^{\circ}\text{F}$  for 20 minutes before serving warm. In CLT, each panelist was randomly served a slice of each flavor of pizza whereas in HUT the panelist could consume as many slices as their usual.

### Consumer acceptance test

Consumer acceptances of frozen pizzas were evaluated using the 5-point hedonic scale for overall taste, overall appearance and overall acceptance. The just-right scale was used for attributes in three categories: appearance (amount of pepperoni, amount of chicken, amount of vegetables, amount of cheese and amount of sauce), taste (oiliness, saltiness, pepperoni flavor, spiciness and chicken flavor) and texture (chewiness, crispness, thickness and tenderness). The detail of 5-point just-right scale slightly varied to match each attribute, but generally the scale referred 1, 3 and 5 as not-enough, justright and too-much, respectively. Each panelist were also given two boxes of commercial spicy chicken and pepperoni pizzas and the instruction on how to prepare the samples at home to repeatedly evaluate each attribute of pizzas during recommended dinner time. The HUT set was tasted within 3 - 7days after the CLT, and results were asked to return by mail or email. Data analysis for just-right and hedonic scales used chi-square, since observation frequency was taken into account and rating mean was compared to the mean of ideal product profile, and Student's *t*-test at  $\alpha=0.05$ , respectively.

## RESULT AND DISCUSSION

### Consumer demographic information

One hundred and thirty seven potential customers were employed but only 46% of panelists who returned their responses from HUT were used for data analysis. Nine demographic information including preferences of spicy food, chicken and pepperoni, gender, age, education level, employment status, the frequency of frozen pizza consumption and favorite frozen pizza brand were obtained. The majority of consumers liked spicy food and chicken extremely while pepperoni was preferred moderately (Table 1).

**Table 1** The observation of consumer preferences of frozen pizza based on various flavors.

Preference choices	Spicy food		Chicken		Pepperoni	
	Number	%	Number	%	Number	%
Like extremely	49	36	73	53	44	32
Like moderately	47	34	37	28	50	37
Just fine	25	18	23	17	37	27
Dislike moderately	13	10	2	1	4	3
Dislike extremely	3	2	2	1	2	2
Total	137	100	137	100	137	100

The balanced number of men and women were obtained as 51 and 49%, respectively. The age of consumers ranged from 10-60 years old with the majority of 16-30 years old. Education level of panelists was mainly college students followed by graduate students and college graduates as 33, 23 and 22%, respectively. The balanced number of employees and students were also achieved as 42 and 52%, consecutively. The consumers usually purchased frozen pizza as often as once a week to once every 2-3 month where the highest purchase frequency (25%) was within a month. The most often purchased pizza brand was Tombstone followed by Tony's, Red Baron and DiGiorno, respectively. Pizza brand ranking was affected by reasons such as taste, brand image, and prices. Some panelists clearly stated that they preferred the "whatever" brand, which was on-sale or the cheapest.

#### Consumer acceptance information

According to the samples assessment, the averages of pizza consumption at CLT and HUT were 1 and 3 slices, respectively. The consumer

acceptance of frozen pizzas based on overall acceptance, overall appearance and overall taste attributes of products were assessed by hedonic scale (Table 2). The rest of attributes were assessed by just-right scale that the rating mean from the observation frequency (Table 3) was compared to the ideal product profile in which 3 referred to just-right (Figure 1, 2).

The test locations did not significantly influence the consumer acceptance for both of spicy chicken and pepperoni pizzas based on overall appearance, overall taste and overall acceptance. Although the overall taste of spicy chicken showed the tendency ( $p=0.06$ ) that test locations may have an influence on consumer acceptance, but more collected data was recommended to confirm the statement. The mean values of those attributes indicated that consumer preference toward the product ranged from just-fine to like moderately.

The just-right scale was used for attributes including amount of pepperoni, amount of chicken, amount of vegetables, amount of cheese, amount of sauce, oiliness, saltiness,

**Table 2** Consumer acceptance mean values of pizzas based on various attributes using hedonic scale.

Sensory attribute	Spicy chicken pizza		Pepperoni	
	CLT <sup>a</sup>	HUT <sup>b</sup>	CLT <sup>a</sup>	HUT <sup>b</sup>
Overall acceptance	3.6 $\pm$ 0.11	3.9 $\pm$ 0.11	3.2 $\pm$ 0.12	3.4 $\pm$ 0.12
Overall appearance	3.5 $\pm$ 0.12	3.8 $\pm$ 0.12	3.2 $\pm$ 0.11	3.4 $\pm$ 0.11
Overall taste	3.6 $\pm$ 0.11	3.8 $\pm$ 0.11	3.2 $\pm$ 0.12	3.5 $\pm$ 0.12

a, b The amount of pizza consumptions were 1 and 3 slices, respectively.

pepperoni flavor, spiciness, chicken flavor, chewiness, crispness, thickness and tenderness. According to these attributes, consumer preferences of frozen pizzas tested between CLT and HUT were not significantly different except crispness and tenderness. This was affected by several factors including a variation of the pizza oven specification used in HUT including baking temperature and time so the control of product preparation was difficult. In addition, the influence

of family member such as different texture preference and the amount of pizza slices consumed in HUT could influence the evaluation. Thus it indicated that panelists may not have proper samples in similar conditions in both taste locations.

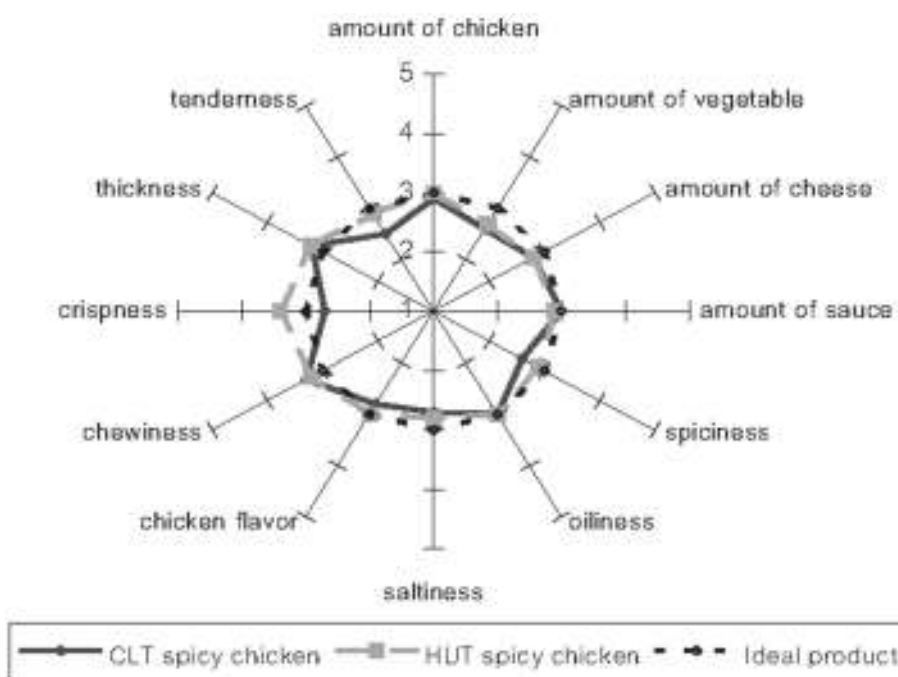
Moreover, this may indicate the separation of two consumer groups that preferred crispy pizza and tender pizza. Since HUT was tested under normal consumption condition, the

**Table 3** Consumer acceptance on various pizza attributes based on observation frequency (%) from just-right scale.

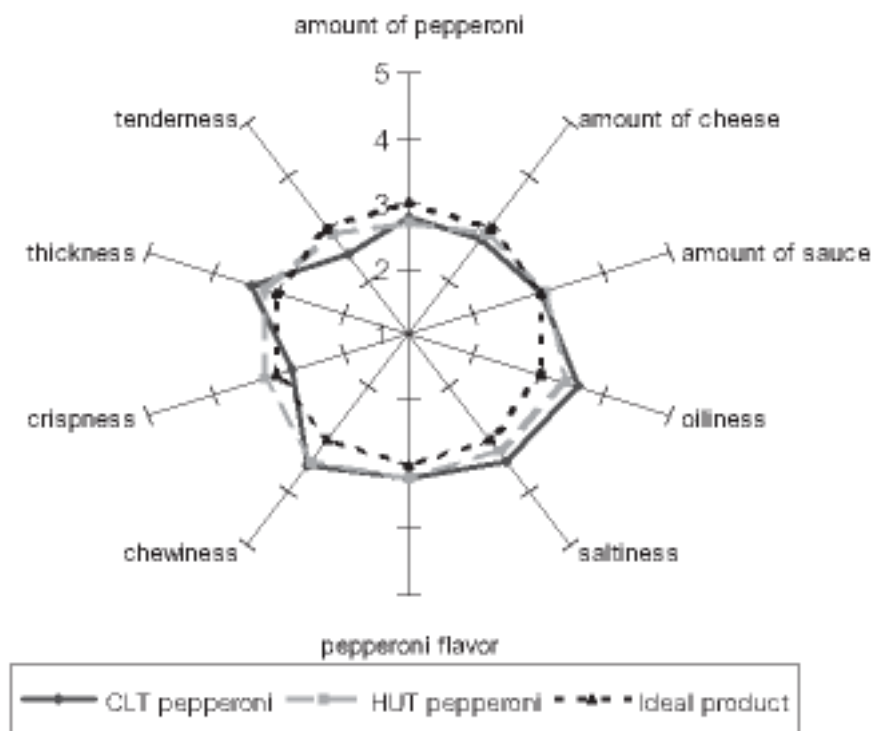
Pizza type/ Sensory Attribute	Observation frequency of just-right score (%)									
	CLT <sup>a</sup>					HUT <sup>b</sup>				
	1	2	3	4	5	1	2	3	4	5
<u>Spicy Chicken</u>										
Amt. Of chicken	5	23	<b>51</b>	20	2	2	18	<b>62</b>	16	2
Amt. Of vegetable	8	34	<b>46</b>	10	2	7	28	<b>52</b>	13	0
Amt. Of cheese	3	21	<b>66</b>	8	2	5	20	<b>67</b>	8	0
Amt. Of sauce	2	20	<b>59</b>	16	3	6	15	<b>64</b>	13	0
Spiciness	16	21	<b>49</b>	11	2	8	17	<b>57</b>	16	2
Oiliness	2	25	<b>49</b>	20	5	2	26	<b>49</b>	20	3
Saltiness	8	31	<b>48</b>	11	2	7	16	<b>64</b>	13	0
Chicken Flavor	7	31	<b>39</b>	21	2	2	20	<b>54</b>	23	1
Chewiness	2	18	<b>41</b>	25	14	2	20	<b>41</b>	29	8
Crispness*	23	31	<b>13</b>	21	12	7	11	<b>33</b>	33	16
Thickness	0	7	<b>73</b>	13	7	0	5	<b>77</b>	13	5
Tenderness*	19	23	<b>49</b>	7	2	3	28	<b>49</b>	20	0
<u>Pepperoni</u>										
Amt. of pepperoni	10	18	<b>56</b>	16	0	6	30	<b>52</b>	8	4
Amt. of cheese	2	26	<b>58</b>	14	0	0	24	<b>64</b>	8	4
Amt. of sauce	2	12	<b>66</b>	20	0	0	14	<b>66</b>	16	4
Oiliness	0	4	<b>38</b>	50	8	0	8	<b>50</b>	32	10
Saltiness	0	10	<b>50</b>	32	8	2	12	<b>56</b>	28	2
Pepperoni Flavor	2	22	<b>38</b>	32	6	0	16	<b>50</b>	32	2
Chewiness	0	10	<b>42</b>	34	14	2	4	<b>50</b>	38	6
Crispness*	14	32	<b>20</b>	26	8	4	16	<b>38</b>	38	4
Thickness	0	2	<b>68</b>	20	10	0	4	<b>60</b>	22	4
Tenderness*	18	24	<b>48</b>	10	0	2	18	<b>66</b>	12	2

<sup>a, b</sup> The amount of pizza consumptions were 1 and 3 slices, respectively.

\* referred to significant difference at  $\alpha=0.05$  between results from test locations for similar pizza.



**Figure 1** Comparison of spicy chicken pizza profiles from various test locations to consumer ideal profile.



**Figure 2** Comparison of pepperoni pizza profiles from various test locations to consumer ideal profile.

consumer may prepare samples based on their preferences or those of family members regardless of the instruction. So the acceptance of crispness and tenderness perceived at home received the rating means closer to the ideal scores (Figure 1, 2). According to the ideal product aspects, based on all attributes, the product profiles of both of frozen pizzas were not significantly different from those of consumer ideal product. The test location did not significantly influence the consumer perception of ideal profile. The acceptances of amount of ingredients of both pizzas perceived in HUT were slightly higher than those received from CLT, which was due to the fact that panelists perceived the appearance of several slices at one time so the amount of ingredient was easily noticeable. Likewise, the appearance category of spicy chicken pizza showed slight higher acceptances for HUT. In contrast, the appearance attributes of pepperoni pizza perceived in CLT had slightly higher acceptances than HUT. However, CLT has greater advantages over HUT including shorter time, controlled preparation, less influence from others and more economical. Although, at least 100 panelists, along with a caution that some attributes showed tendency to be influenced by test location, were recommended for the sensory evaluation.

### CONCLUSION

According to consumer ideal product, the product profiles of the spicy chicken and pepperoni frozen pizzas were not significantly different from those of ideal product profiles. Both of spicy chicken and pepperoni frozen pizzas also showed no significant difference in consumer acceptances, assessed in CLT and HUT, based on all attributes except crispness and tenderness. This was due to the numbers of factors including the variations in sample preparation of individual at HUT. However, CLT was recommended to economically assessed consumer acceptances of frozen pizzas

due to its advantages in validity of responses, target consumer and convenience.

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