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The effect of meal situation, social interaction, physical environment and choice on food acceptability

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Abstract

Consumer acceptance of food and beverage was measured after modifying four key factors or 'context effects' in five consumer central location tests: its function as a meal component, social interaction during consumption, the physical environment in which the food is selected and consumed, and food choice. One of two flavor variations each of salad, pizza and iced tea were served. Acceptance ratings and self-reported food intake were obtained from consumers. In Tests 1–5, context effects were added sequentially, so that by Test 5 all context effects were present. Sixth test served as a comparison to 'real life' and took place at a local restaurant. Our hypothesis was that product acceptability would increase with the addition of the various context effects. Meal context had the strongest positive effect on tea; social context had a strong negative effect on pizza; environment had a weak but positive effect on pizza and tea and a negative effect on salad; and choice had a positive effect on salad. These results suggest that context variables do affect product acceptance, but that the relationship between context effect and consumer acceptance may not be consistent within and across meal components.

Keywords: Acceptability; Consumer; Context effect; Choice; Environment; Meal; Menu items; Restaurant; Sensory; Social interaction

1. Introduction

The dictionary defines context as 'the circumstances in which an event occurs; a setting' (The American Heritage Dictionary of English Language, 2000). With regard to food and beverage products, these contextual conditions can occur in the past (e.g. what was consumed previously), concurrently (e.g. physical location where food is consumed) or the future (e.g. fear of halitosis at upcoming social obligation). Rozin and Tuorila (1993) have emphasized past and simultaneous contextual variables. Research on the past can study, for example, the effects of yesterday's food choices on today's choices, and research on the future could, for example, use fear of gaining weight on food choices. Nevertheless, most contextual research focuses on simultaneous contextual variables.

Research suggests that there are at least four major concurrent context effects that can alter the perception of food and beverages during consumption (Meiselman, 2002): its function as a meal component, social interaction during consumption, the environment in which food is selected and consumed, and food choice freedom. Traditionally, these factors are controlled under laboratory-based conditions so that differences within the product are the only variable (Meilgaard, Civille, & Carr, 1999; Poste, Mackie, Butler, & Larmond, 1991). However, two problems have emerged. First, it is difficult to completely control all contextual variables, especially those which precede the allegedly controlled product testing, for example yesterday's food choices or the subject's expectations (Cardello, 1994). Second, it is becoming increasingly apparent that excluding these variables from research may oversimplify the consumer experience, thus providing incomplete and, in some cases, misleading results (Bell & Meiselman, 1995; Meiselman, 1993).

Meal. To assess the effect of meal, Eindhoven and Peryam (1959) obtained ratings for 57 single food items

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and two-item combinations. They found that individual food item preferences were not predictive of the preference for item combinations such as main dish and potato or main dish and vegetable. They also found no effect when comparing potato-vegetable combinations. In addition, several regression models have been developed where the overall meal acceptability is equal to the sum of each component multiplied by a correction factor (Hedderly & Meiselman (1994); Moskowitz, 1980; Turner & Collison, 1988). In these studies, the main meal component accounts for at least half or more of the overall meal acceptability; Hedderly and Meiselman reported that in pizza and sandwich meals, the main dish accounted for much more than half of overall meal acceptability. To date, no reported study has compared acceptability of a food or beverage product presented alone as compared to within a complete meal.

Physical environment. Research has investigated individual elements of the physical environment, such as lighting and sound (Bell & Meiselman, 1995). Also, research has demonstrated that identical foods will perform differently in different settings; for example, people expect food to be better and indeed rate them higher in the home or at a restaurant versus a laboratory or an institutional cafeteria (Cardello, Bell, & Kramer, 1996; Meiselman, Johnson, Reeve, & Crouch, 2000). Differences in ratings were attributed to contextual effects and the expectations they produce as well as product differences. This combination of contextual and product effects will be discussed in the results of this paper also.

Social effects. The great majority of meals are consumed in the company of someone else (Rozin, 1996). Food diary studies have shown that more food is consumed by individuals in a group than by individuals alone, the so-called social facilitation effect (de Castro & de Castro, 1989; de Castro, 1990). Group studies show a 'follow the leader' mentality when rating products in group settings by both pre-schoolers and soldiers (Birch, 1980; Engell, Kramer, Malafi, & Salomon, 1996).

Choice. Consumers seek variety when they eat and most natural eating situations contain elements of choice (Rozin & Markwith, 1991). Research has been reported on the relationship between dietary variety and food intake (Beatty, 1982); however, no previous literature was found on the relationship between food acceptance and degree of food choice freedom. Perceived variety was highly correlated with satisfaction (Bell, Meiselman, Pierson, & Reeve, 1994). Monotony studies performed with and without choice appear to yield different results; monotony in the laboratory without choice yielded decreased acceptability and decreased intake, whereas self-selected monotony in the field yielded higher acceptability and intake (Kramer, Lesher, & Meiselman, 2001).

The purpose of this research was to conduct a series of controlled experiments isolating each context effect, and also showing these effects working in combination. These tests allow us to begin to understand the effect of these factors on the acceptability of food in efforts to better predict consumer response.

2. Materials and methods

2.1. Approach

Five tests were conducted at the McCormick Sensory Science Center in Hunt Valley, MD to isolate the four context effects: meal, social, environment and choice. The first test consisted of a standard central location test where consumers were presented with small portions of each item in a random fashion. Each consumer only evaluated one flavor of each tea, salad and pizza. (Table 1 presents information on each test in more detail.) Each

Table 1
Testing Protocol (this protocol contains the context factor options included in each test)

Context Effect Isolated	Test	Meal	Social	Environment	Choice
Meal	1	Individual meal components	Self	Plain room	No choice
Social	2	Meal	Self	Plain room	No choice
Environment	3	Meal	Social	Plain room	No choice
Choice	4	Meal	Social	Mock Restaurant	No choice
	5	Meal	Social	Mock Restaurant	Choice
'Real Life Environment'	6	Meal	Social	Restaurant	Choice

The assigned context names on the left-hand portion of the table represent the context factors being investigated in each individual test and how tests were compared to ascertain the effect of each factor.

subsequent test built-on the previous test by adding a new context variable. In Test 2 a new group of consumers evaluated full portions of each sample. The food items were served as a meal, that is, all the food items were served at the same time. Test 3 was similar to Test 2 with the addition of social interaction during sample consumption; consumers sat in groups of two or more and ate their meals. Participants were allowed to discuss about their meals with other members at the table; however, we noticed that consumers spent little time comparing meals and focused their discussions on other topics. Test 4 included all of the components of Test 3 with the addition of a modified environment. The room used to complete these tests was decorated to look like a restaurant. Pictures and planters were hung on the walls; the tables were set similar to the restaurant used in Test

Table 2
Presents sample preparation and presentation protocols for each test (this includes food preparation, food presentation, as well as other items used to facilitate social interaction as well as create a restaurant-type effect in the room)

CONTEXT	FACTORS VARIED	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
MEAL	Serving Size	- 15 ml dressing, on side - ½ cup chopped Romaine, no vegetables - ¼ pizza - 60 ml iced tea, chilled, no ice	- 30 ml dressing, on side - 0.24 L chopped Romaine, with carrots, peppers, red onion and grape tomatoes - 11.78 cm (diameter) pizza - 0.35 L tea served over 0.24 L ice cubes				
	Presentation	Randomized sequential monadic, 48 serving rotations	All at once, 8 serving rotations			All at once. Products as chosen.	All at once. Choice of dressing. Tea and pizza rotated over 8 test days.
SOCIAL	Seating	Facing wall		Seated around tables with friends and co-workers, in groups of two to six people (restaurant style).			Restaurant seating
	Talking	Not allowed		Free flowing discussion allowed (yes, even about products).			Restaurant environment
ENVIRONMENT	Dinnerware	White plastic utensils,22.5 cm paper plates, 10 cm styrofoam bowl. 3 digit codes.	White plastic utensils, 22.5 cm paper plates, 15 cm plastic bowls. 3 digit codes.		Real silverware and 15 cm hard plastic bowls, 22.5 cm hard plastic plates and 480 ml cups. No product codes.		Restaurant dinnerware
	Decor	Florescent Lighting. Plain Walls.			"McCormick Café" mock restaurant: Incandescent lighting, plants hanging from ceiling, flowers on Tables, Placemats, pictures on walls, salt and pepper/sugar caddy, printed 'menus'.		Restaurant Decor
	Server Attire	Hairnets, gloves and laboratory coats.			No hairnets, no gloves, black pants, white shirt.		
CHOICE	Freedom of Choice	No, products assigned according to rotations				Yes, choice of each meal component variation	Yes, choice to choose the pizza special from the menu. Choice of dressing only (to decrease back of house confusion).
BALLOT	Time of Presentation	Instructions and questionnaire presented at start of the test. Questionnaire completed throughout the test	Instructions and sealed questionnaire presented at start of the test. Panelists were instructed to remove the seal after completing their meal (about 15 min after start)		Menu presented at start of the test. Questionnaire presented and completed after the meal	Menu presented at start of the test. Questionnaire presented and completed after the meal	Questionnaire presented with check after the meal

6, which included paper placemats, silverware, condiments such as salt, pepper, sugar and sugar substitutes and a flower centerpiece. Servers were dressed in restaurant-style attire (black pants, white shirt) and were responsible for providing a set menu to each consumer as well as serving and clearing the food. In Test 5 consumers were given choices based on the flavor variations within each food item. Consumers were presented with a menu that allowed them to choose between two flavors of iced tea, salad dressing and pizza.

Results were compared to a 'real life environment' in a sixth test that took place in a local restaurant. A pair of tests was used to isolate each context effect (Table 1) and specific factors were varied within each test (Table 2). Tests 1–5 each took 1 day in five-45 min sessions during the late morning/early afternoon (lunchtime). There was no charge for food in the laboratory; in the restaurant, the test meal was offered as a lunch special on the menu for $5.50.

2.2. Sample preparation/presentation

The three meal components were a side salad with dressing, a small pizza, and iced tea. Each meal component had two alternative forms that were served in random combinations. Salad dressing consisted of Zesty Ranch Dressing (salad 1) or Raspberry Wine Vinaigrette (salad 2). The pizza flavors were Sun Dried Tomato (pizza 1) or Pizza Romano with a garlic-type flavor (pizza 2). The iced tea flavors consisted of Peach (tea 1) or Black Raspberry (tea 2).

All menu items were prepared by McCormick personnel using retail purchased and McCormick proprietary ingredients. Salad dressings were prepared in a commercial batch and were refrigerated until testing. Salads were prepared in the morning of testing using fresh ingredients. Pizzas were batch prepared and frozen until needed. To ensure consistency of samples, a Lincoln 1000HP Electric 1508-R industrial belt oven was used to cook pizzas (~7 min at ~218 °C). At the restaurant, a pizza deck oven, Bakers Pride Oven Co., Inc was used. Iced tea was prepared fresh the week prior to each test and refrigerated until use. Serving sizes and utensils varied by test as described in Table 2.

2.3. Ballot

A similar ballot was used for all six tests. A 9-point structured hedonic scale (1 = dislike extremely; 5 = neither like nor dislike; 9 = like extremely) was used for the following attributes: overall liking for the entire meal (Tests 2–6) and overall liking for each meal component. Demographic information (age, gender) were also collected at the end of the questionnaire. Data on consumption, historical consumption habits and restaurant usage were also collected, but will not be discussed in this paper.

2.4. Consumers

Approximately 100 male and female respondents ages 18 and higher were recruited for each central location test (CLT) (Tests 1–5). The demographic breakdown varied among tests (Table 3). Tests 1–5 were predominantly female, but Test 6 in the restaurant was predominantly male. Most consumers fell in the 26–45 or 46–65 age category. The 46–65 age group predominated in Tests 3–6 and the 26–45 age group in Tests 1–2. In addition, participants were required to be consumers of pizza, salad and iced tea to qualify for the test. Respondents were recruited via McCormick's automated telephone recruiting system or through advertisements at local offices (Tests 3–5 only). For social tests, respondents were asked to bring one or more friends or co-workers with them.

2.5. Data analysis

Data were analyzed using univariate and multivariate analysis of variance procedures of the SAS system (Cary, NC). Duncan means separation test was used to differentiate samples. Differences described throughout the paper refer to statistically significant differences. Other differences noted are based on trends in the data.

3. Results

Overall test comparison. Significant differences ($p < 0.0005$) existed among the tests when average rat-

Table 3
Demographic information by test

	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
Total sample size	104	93	106	106	101	35
Male (%)	18	26	42	44	33	61
Female (%)	82	74	58	56	67	39
18–25 years (%)	3	5	10	8	15	9
26–45 years (%)	28	38	79	49	58	46
46–64 years (%)	65	51	9	41	27	27
65+ years (%)	4	6	1	2	0	0

ings of tea, salad and pizza were combined. Test 6 mean score (7.4) was significantly higher than Test 1 (6.7). Tests 2, 3, 4 and 5 were similar to each other with means of 7.2, 6.9, 7.1 and 7.2 respectively.

Meal components. Overall meal results as well as the results for individual meal components (salad, pizza and tea) for each of the test conditions are shown in Table 4. Overall meal scores were not collected in Test 1 since small portions of each meal component were presented as individual randomized items rather than as a meal. Scores for the overall meal in the five tests were consistent between 7.3 and 7.5. Highly significant differences existed among the tests for each meal component (salad, pizza, tea). Testing foods as items (Test 1) rather than as part of a meal (Test 2) yielded lower scores for salad and tea. Compared to Test 2, Test 1 was about 1/2 point lower for salad, and about 1 point lower for iced tea. Compared to Test 1, pizza scores were lower in Tests 3, 4, and 5.

Flavor variations. Table 5 shows the results for each flavor of each meal component in each test. This extends the data in Table 4 to comparisons across tests for each meal component (e.g. salad 1 or salad 2). Statistically significant differences existed for each flavor across tests with the exception of tea 2. In addition, comparisons were made between flavor 1 and flavor 2 for each component. Salad 1 rated significantly higher (Tests 1 and 3) or similar to salad 2. Pizza 1 scored significantly higher (Tests 2 and 3) or similar to pizza 2 with the exception of Test 5 where pizza 2 scored higher than pizza 1. Tea 1 scored similar to tea 2, except for the restaurant test (Test 6), where tea 1 scored higher than tea 2. Salad and pizza scored similarly in Test 6. This information is valuable to the product developer since the focus of many consumer tests is to compare the acceptability of two variables in a product, in this case, two different flavors of iced tea, salad dressing or pizza and select the variable most likely to succeed in the market place.

Gender effects showed no significant differences on liking scores for the meal overall, meal components, or flavors within meal component. Average liking scores for males and females were generally the same or within 0.1 scale points.

3.0.1. Effects of individual context factors

The effects of individual context factors on the acceptability of the overall meal and each meal component are presented in Tables 6 and 7. Results compare tests with or without the context effect. The results are presented as mean differences, where a positive result indicates an increase in acceptability, and a negative score indicates a decrease.

Meal. Salad and tea results were significantly higher when the items were presented as part of a meal versus individual item. Meal presentation had no apparent effect on pizza results. The results were further compared

Table 4
Mean values for overall meal acceptability for combined flavors within menu item across tests

Meal component	Test						
	Test 1, traditional ($N = 104$)	Test 2, meal ($N = 93$)	Test 3, social ($N = 106$)	Test 4, enhanced environment ($N = 106$)	Test 5, choice ($N = 101$)	Test 6, restaurant ($N = 35$)	P value
Overall	–	7.5a	7.3a	7.3a	7.3a	7.5a	0.3617
Salad	7.0c	7.5abc	7.6ab	7.1bc	7.7a	7.4abc	0.0021
Pizza	7.2ab	7.2ab	6.5c	6.9abc	6.7bc	7.4a	0.0032
Tea	5.9b	7.0a	6.8a	7.2a	7.1a	7.3a	<0.0001

One-way analysis of variance were used to compare the effect of test (context) for each meal component as well as the overall meal effect. Within row, means sharing letters are not significantly different. Overall stands for overall meal acceptability.

Table 5
Mean values for salad, pizza and tea for each flavor variable across tests

Meal component	Test							
	Flavor	Test 1, traditional ($N = 104$)	Test 2, meal ($N = 93$)	Test 3, social ($N = 106$)	Test 4, enhanced environment ($N = 106$)	Test 5, choice ($N = 101$)	Test 6, restaurant ($N = 35$)	P value
Salad	1	7.3ab	7.6ab	7.8a	6.9b	7.8a	7.3ab	0.0148
	2	6.7b	7.4ab	7.3ab	7.3ab	7.6a	7.3ab	0.0467
Pizza	1	7.4ab	7.6a	6.8bc	6.9abc	6.2c	7.3ab	0.0003
	2	7.0a	6.8ab	6.2b	6.9ab	7.1a	7.3a	0.0368
Tea	1	5.7c	7.0ab	6.6b	7.4ab	7.2ab	7.8a	<0.0001
	2	6.1a	7.0a	6.9a	7.1a	6.9a	6.1a	0.1563

Within row, means sharing letters are not significantly different.

Table 6
Multivariate analysis of variance of context factors (meal, social, environment and choice)

Context	Meal component			
	Overall	Salad	Pizza	Tea
Meal (M)	–	+0.4*[a]	0.0	+1.1**
Social (S)	−0.2[b]	0.0	−0.7**	−0.2
Environment (E)	0.0	−0.4*	+0.4	+0.4
Choice (C)	0.0	+0.6**	−0.2	−0.1
M + S	–	+0.5**	−0.7**	+0.9**
M + S + E	–	+0.1	−0.3	+1.4***
M + S + E + C	–	+0.7***	−0.5*	+1.2***
S + E	−0.2	−0.4	−0.3	+0.2
S + E + C	−0.2	+0.2	−0.5	+0.1
E + C	0.0	+0.2	+0.2	+0.3

Results of combined factors resulted form a one-way analysis of variance comparing mean differences between combinations of tests with and without one or more context factors.
*,**,***Significant at $p < 0.05$, 0.01 and 0.001 respectively.
[a] A positive value indicates the context had a positive impact shown by a increase in acceptability for the meal component.
[b] A negative value indicates the context had a negative impact shown by a decrease in acceptability for the meal component.

Table 7
Mean differences for each flavor, between tests, with and without one or more context factors

Context	Meal component					
	Salad		Pizza		Tea	
Flavor	1	2	1	2	1	2
Meal (M)	+0.3	+0.7*	+0.2	−0.2	+1.3***	+0.9*
Social (S)	+0.2	−0.1	−0.8**	−0.6	−0.4	−0.1
Environment (E)	−0.9	0.0	+0.1	+0.7*	+0.8*	+0.2
Choice (C)	+0.9**	+0.3	−0.7	+0.2	−0.2	−0.2
M + S	+0.5	+0.6*	−0.6*	−0.8**	+1.1*	+0.8*
M + S + E	−0.4	+0.6	−0.5	−0.1	+1.7***	+1.2*
M + S + E + C	+0.5	+0.9**	−1.2***	+0.1	+1.5***	+0.8
S + E	−0.7	−0.1	−0.8*	+0.1	+0.4	+0.1
S + E + C	+0.2	+0.2	−1.4***	+0.3	+0.2	−0.1
E + C	0.0	+0.3	−0.6	+0.9**	+0.6	0.0

A positive value indicates the context had a positive impact shown by a increase in acceptability for the meal component.
A negative value indicates the context had a negative impact shown by a decrease in acceptability for the meal component.
*,**,***Significant $p < 0.05$, 0.01 and 0.001 respectively.

by flavor. Salad 2, and tea 1 and tea 2 showed significant increases in scores from Test 1 to Test 2, while salad 1 and both pizzas did not show a significant change.

Social interaction. When social interaction was introduced, only pizza showed a significant and negative change in score. Within component evaluation suggested that although both pizzas showed a decrease in acceptability, only the drop in pizza 1 was statistically significant.

Physical environment. The modification of the physical environment had a negative and significant effect on the acceptability of the salad. Although pizza and tea showed an equal but opposite increase in acceptability, these differences were not statistically significant. Analyses of the flavors within meal component resulted in significant changes for salad 1, pizza 2 and tea 1. The scores for tea and pizza increased while salad decreased.

Laboratory-field comparison. The effect of the environment was also evaluated by comparing Test 5 versus Test 6. Test 5 was conducted in a mock-restaurant setting while Test 6 was carried on at a local restaurant. The "real" restaurant environment had a significant and positive effect for pizza but no effect on the salad or tea results. Also, the two salads and the two pizzas scored the same in the restaurant as noted above.

Choice. There was a significant and positive effect on salad scores, while no effect was found for pizza or tea. Individual flavor evaluations showed that the increase in acceptability for salad was driven primarily by salad 1. Overall pizza and tea scores were unaffected by the addition of choice as a context factor.

3.0.2. Effect of context combinations

The effect of various combinations of context factors on acceptability were evaluated by comparing tests with and without two or more contexts factors in the test (note that there were not enough degrees of freedom to

analyze factor interactions through the analysis of variance procedure). Table 6 shows the results of the factor combinations.

Meal + social effects were evaluated by comparing Test 1 versus Test 3. Significant differences existed for all of the meal components. Positive effects were noted for salad and tea, while a negative result was observed for pizza. All of the flavors showed significant and similar effects within meal component except for salad 1 which although not statistically significant, it showed a similar trend as salad 2 (see Table 7).

Meal + social + environment effects were evaluated by comparing Test 1 versus Test 4. A significant and positive effect existed for tea only. Results of the individual tea flavors indicate that this effect was driven by both teas.

Meal + social + environment + choice effect were determined by comparing Test 1 versus Test 5. The effects were evident and significant in all the meal components with a strong positive effect for tea and salad and a negative effect for pizza. Individual flavor differences existed for salad 2, pizza 1 and tea1.

Social + environment effects were evaluated by comparing Test 2 versus Test 4. No significant differences were observed. However, there was a significant and negative effect for pizza 1.

Social + environment + choice effects were evaluated by comparing Test 2 versus Test 5. Again, no significant effects were noted for any of the meal components, although a strong negative effect existed for pizza 1.

Environment + choice had no effect on the meal components when comparing Test 3 versus Test 5. When flavors were evaluated, environment + choice had a significant and positive effect on pizza 2.

4. Discussion

The primary learning from this research is that context variables such as meal context, physical and social environment, and choice can have a significant impact on acceptance ratings in laboratory or central location tests (CLT). While the general effect appears to be an increase in acceptance, this is not always the case, at least based on these data. It is worth noting that the product acceptance scores in the restaurant setting were higher than the scores in the traditional CLT. This suggests that caution must be exercised in trying to predict more complex context situations from CLT data. The goal in the study was to provide identical food while changing contexts; this was largely achieved through controlled sample preparation and presentation except in the actual restaurant. However the very nature of CLT testing resulted in the samples not being identical. For example, the samples in the CLT were smaller, and this difference alone can affect consumer perception on product temperature, texture, etc. There were other differences, such as the lack of ice in the iced tea. We believe these data lead to the safe conclusion that context effects do exist, but the product contributions in different contexts remains for further study using different research paradigms.

The effect of each context variable can be summarized as follows:

Meal has the strongest positive effect on iced tea, followed by salad with a neutral effect on pizza. Results showed that meal results for salad and tea were significantly higher than individual item results, but pizza results were not different. Other factors that may have influenced meal results include the following: (1) amount served: smaller serving portions of each sample were used in Test 1 versus full serving portions in Test 2; (2) sample presentation: randomized sequential monadic presentation in Test 1 versus simultaneous presentation of samples in Test 2; (3) sample presentation of tea varied between tests; in Test 1 panelists received 2 oz of product without ice while in Test 2 panelists received a full glass with ice added which may have affected the appearance and flavor perception of the teas.

The results in the present study showed changes on the side dishes (salad, beverage) but not the main dish (pizza). What is not clear from the present testing is whether meal as a context will have different effects with different types of meals, such as fast food meals, breakfast lunch and dinner, and full multi-course meals. Hedderly and Meiselman (1994) showed that the main dish accounted for different portions of overall meal acceptance when one examined pizza meals, sandwich meals, and traditional multi-item meals. It is possible that meal context effects vary among these meal types. The pizza meal represents the extreme meal type in that the main dish component (pizza) accounts for most of the overall acceptance of the meal.

Social context has a strong negative effect on pizza, and neutral effects on salad and on tea. We do not have an explanation for the decline in pizza ratings under social conditions, although we did not see a positive effect (increased score) for any food. Perhaps people were uncomfortable eating a hand-held food item in the presence of other people, some of them strangers. Research has focused on social facilitation of consumption and should be extended to product acceptance.

Physical environment had a negative effect on the acceptability of the salad. Analyses of the individual meal component variables showed that changes were flavor specific within meal component. Overall, the scores for tea and pizza increased while salad decreased. Thus, enhanced physical environment might tend to enhance food ratings, however, additional research is needed to validate this observation.

Choice had a positive effect on salad, and a neutral effect on pizza and tea. A stronger effect would have

been expected in this case since participants were being given the opportunity to choose which items (flavors within the each meal components) they wanted to eat.

Context in a real life environment. Salad and tea results from Test 5 (testing facility) were similar to restaurant results (real restaurant). The lower pizza scores in Test 5 may be explained by the differences in which the products were prepared and/or presented. Products were prepared in different type ovens yielding slightly different products. Moreover, the pizza at the restaurant was prepared to order and served immediately after baking, while in Test 5, pizzas were baked and stored in a warming cabinet prior to serving. In contrast, salad dressing and tea preparation were similar at the restaurant and testing facility.

It should be emphasized that Tests 1 through 5 were conducted in a testing facility with pre-recruited subjects, and both place and people are different from a restaurant facility with self-selecting patrons. Participant's expectations were different when participating at the restaurant of their choice versus an industrial site where the testing room resembled a restaurant. During Tests 1–5, participants were aware that this was a test and that they would evaluate the given products.

In addition, the questionnaire's presentation may have affected their expectation as well as their evaluation of the meal. Questionnaires were dispensed at different times depending on the test. In Test 1, participants completed the questionnaire as they evaluated each of the samples; in Tests 2 and 3 sealed questionnaires were provided with the meal and completed after meal consumption; in Tests 4 and 5, questionnaires were handed out after meal consumption; in Test 6, a questionnaire was handed out with the check. The purpose of handing out the questionnaires at different times was to create a closer-to-life situation where consumers were able to enjoy the meal before focusing on the task of completing the questionnaire.

The results for the individual flavors were not consistent with the overall results suggesting that not all variations in a meal component will perform similarly. This would also suggest that additional research is needed to determine what specific attributes in the flavor respond to each context, i.e.: flavor name, flavor profile and/or combination of flavor profiles in a meal.

Overall, the addition of the various context effects resulted in scores more similar to a 'real life' environment for tea and salad. However, context effects did not improve the ability to predict scores for pizza. These results may not necessarily be consistent for all main dishes based on work by Meiselman et al. (2000) where he demonstrated an increase in main dish acceptability score from a laboratory environment to a restaurant environment; in this case, the main dish was a plated meal composed of meat, starch and vegetable instead of a stand-alone item like pizza. In this study, various context elements impacted results differently among meal components and within meal component variables (flavors). This research demonstrated that meal might have a positive effect on tea (beverage component), while the addition of social interaction may have a negative effect on pizza (main dish). The salad (side dish) was the least affected overall with positive influences by meal and choice. We initially hypothesized positive changes for contextual factors; we found these to some degree for side dishes. We now need more research on different types of meals with different main dishes.

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References

Beatty, W. W. (1982). Dietary variety stimulates appetite in females but not in males. *Bulletin of the Psychonomic Society, 19*(4), 212–214.

Bell, R., & Meiselman, H. L. (1995). The role of eating environments in determining food choice. In D. W. Marshall (Ed.), *Food choice and the consumer* (pp. 292–310). London: Blackie Academic and Professional.

Bell, R., Meiselman, H. L., Pierson, J. P., & Reeve, W. G. (1994). Effects of adding an Italian theme to a restaurant on the perceived ethnicity, acceptability, and selection of foods. *Appetite, 22*, 11–24.

Birch, L. L. (1980). Effect of peer model's food choices and eating behaviors on preschooler's food preferences. *Child Development, 51*, 489–496.

Cardello, A. V. (1994). Consumer expectations and their role in food acceptance. In H. J. H. MacFie & D. M. H. Thomson (Eds.), *Measurement of food preferences* (pp. 253–297). London: Blackie Academic.

Cardello, A. V., Bell, R., & Kramer, F. M. (1996). Attitudes of consumers toward military and other institutional foods. *Food Quality and Preference, 7*, 7–20.

de Castro, J. M. (1990). Social facilitation of duration and size but not rate of the spontaneous meal intake of humans. *Physiology & Behavior, 47*, 1129–1135.

de Castro, J. M., & de Castro, E. S. (1989). Spontaneous meal patterns of humans: influence of the presence of other people. *American Journal of Clinical Nutrition, 50*, 237–247.

Eindhoven, J., & Peryam, D. R. (1959). Measurement of preferences for food combinations. *Food Technology, 13*, 379–382.

Engell, D., Kramer, M., Malafi, T., & Salomon, M. (1996). Effects of effort and social modeling on drinking in humans. *Appetite, 26*(2), 129–138.

Hedderly, D. L., & Meiselman, H. L. (1994). Modeling meal acceptability in a free choice environment. *Food Quality and Preference, 6*, 15–26.

Kramer, F. M., Lesher, L. L., & Meiselman, H. L. (2001). Monotony and choice: repeated serving of the same food item to soldiers under field conditions. *Appetite, 36*, 239–240.

Meilgaard, M., Civille, G. V., & Carr, B. T. (1999). *Sensory evaluation techniques*. CRC Press, pp. 231–263.

Meiselman, H. L. (1993). Critical evaluation of sensory techniques. *Food Quality and Preference, 4*, 33–40.

Meiselman, H. L. (2002). The effect of context or environment on choice and acceptance: is context more important than product? *Appetite, 39*, 249 (abstract).

Meiselman, H. L., Johnson, J. L., Reeve, W., & Crouch, J. E. (2000). Demonstrations of the influence of the eating environment on food acceptance. *Appetite, 35*, 231–237.

Moskowitz, H. R. (1980). Psychometric evaluation of food preferences. *Journal of Food Service Systems, 1*, 149–167.

Poste, L. M., Mackie, D. A., Butler, G., & Larmond, E., (1991). Laboratory methods for sensory analysis of foods. Catalog No. A73-1864/1991E Agriculture Canada.

Rozin, P. (1996). The socio-cultural context of eating and food choice. In H. L. Meiselman & H. J. H. Macfie (Eds.), *Food choice acceptance and consumption* (pp. 83–104). Glasgow: Blackie Academic and Professional.

Rozin, P., & Markwith, M. (1991). Cross-domain variety seeking in human food choice. *Appetite, 16*, 57–59.

Rozin, P., & Tuorila, H. (1993). Simultaneous and temporal contextual influences on food acceptance. *Food Quality and Preference, 4*, 11–20.

The American Heritage Dictionary of English Language, 2000. Fourth Edition. Houghton Mifflin Company.

Turner, M., & Collison, R. (1988). Consumer acceptance of meals and meal components. *Food Quality and Preference, 1*(1), 21–24.