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Brief Communication

## Effects of social interaction, physical environment and food choice freedom on consumption in a meal-testing environment

Annette J. Weber<sup>a,\*</sup>, Silvia C. King<sup>a</sup>, Herbert L. Meiselman<sup>b</sup>

<sup>a</sup>*McCormick and Company, Inc, 204 Wight Avenue, Hunt Valley, MD 21031, USA*

<sup>b</sup>*U.S. Army Natick Soldier Center, Natick, MA, USA*

### Abstract

Consumption of pizza, salad and iced tea was assessed in four separate tests at a central location. Three aspects of context were added in successive tests—social interaction during consumption, the physical environment in which the food was consumed and choice among foods—so that the fourth test had all effects present. The proportion consumed averaged from 79 to 82% of the food presented and increased significantly in the presence of one or more of the context manipulations. Salad consumption was higher when there was a choice of dressings in an enhanced environment. Pizza and tea consumption were higher in an enhanced restaurant-like environment. Social interaction alone has no detectable impact on food consumption. It is concluded that people eat more in enhanced contexts and careful consideration should be given to the environment in studies of food consumption.

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### Background

Human interaction with food can be altered by several contextual effects: social interaction during consumption, the environment in which it is selected and consumed and food choice freedom. Social interaction has consistently been demonstrated to increase food intake in humans, which is attributed to a variety of factors such as increased emotionality, modeling behavior and meal duration (Berry, Beatty, & Klesges, 1985; de Castro, 1990; deCastro & deCastro, 1989; Clendenen, Herman, & Polivy, 1994; Edelman, Engell, Bronstein, & Hirsch, 1986; Feunekes, de Graaf, & Van Staveren, 1995). However, little research has been conducted on other contextual effects that may influence consumption or on these variables in combination with each other. The present study investigated the effect of social interaction, physical environment and food choice freedom on consumption in a meal setting.

### Participants

Participants were recruited by either of two procedures, either using office workers from nearby businesses or

recruiting local citizens from a database. For social tests, local database subjects were asked to bring a friend and office workers invited their co-workers. Due to the make up of the local database, there were more females ( $n = 257$ ) than males ( $n = 149$ ). Gender ratios were inconsistent among tests as the 'bring a friend' recruitment method was difficult to balance. Panelists were most likely in the age group 26–45, followed by 46–64. Four central location tests of about 100 people each were conducted at McCormick and Company, Inc. to investigate three context effects: social interaction, physical environment, and choice (Table 1).

### Foods

The meal for all four tests consisted of an individual size pizza (17.8 cm in diameter), of either sun dried tomato or Romano (extra garlic) a small side salad (0.24 l lettuce) with zesty ranch (ranch with jalapeno peppers) or raspberry red wine vinaigrette dressing, and a glass (0.35 l plus 0.24 l ice) of peach or black raspberry iced tea. Second helpings were not permitted (except for iced tea in the choice test), and panelists were told to eat as much as they wanted, but were not encouraged to finish their lunch meal.

\* Corresponding author.

E-mail address: [annette\\_weber@mccormick.com](mailto:annette_weber@mccormick.com) (A.J. Weber).

Table 1  
Experimental conditions for four tests to investigate three context effects: social, environment and choice

Factors varied	Test 1 (meal alone)	Test 2 (meal + social)	Test 3 (meal + social + environment)	Test 4 (meal + social + environment + choice)
<i>Social</i>				
Seating	Facing wall	Seated around tables with friends and co-workers, in groups of two to six people (restaurant style).		
Talking	Not allowed	Free flowing discussion allowed (yes, even about products).		
<i>Environment</i>				
	Dinnerware	White plastic utensils, 15 cm soft plastic bowls (for salad), 22.5 cm paper plates (for pizza), 480 ml soft plastic cups (for tea), three digit codes.	Real silverware, 15 cm hard plastic bowls (for salad), 22.5 cm hard plastic plates (for pizza) and 480 ml hard plastic cups (for tea). No product codes.	
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'.		
Server attire	Hairnets, gloves and laboratory coats	No hairnets, no gloves, black pants, white shirt		
<i>Choice</i>				
Freedom of choice	No, products assigned according to rotations	Yes, choice of each meal component variation		

## Procedure

For each test, five sessions of 20 people each were conducted over a broadly defined lunch period from 1130 to 1515. Respondents were pre-recruited for 30-minute sessions and were compensated monetarily for their time. For all tests, respondents were provided with instructions during the first 5 min. For Test 1, respondents were given a sealed questionnaire with their meal and were instructed to not answer the questionnaire until finished. Individual meals times varied and were not recorded. For Tests 2–4, respondents were given 20 min to eat, after which the questionnaires were distributed. Respondents answered the questionnaires during the last 5 min of the session. For all tests, subjects were asked to estimate the portion of food consumed using the following scale with corresponding values: a few bites (1), about 1/4 (2), about 1/2 (3), about 3/4 (4), ate all (5). Data were recoded and analyzed for estimated %portion consumed as follows: (1) = 10%; (2) = 25%; (3) = 50%; (4) = 75% and (5) = 100%.

## Analyses of data

For the choice test, a very small number of consumers requested refills of tea; therefore, consumption estimates by these participants were pooled into the 'drank all' category.

The data were subjected to analysis of variance and Duncan's mean separation test used to identify significant differences at 95% or greater confidence.

The full details of the method are presented in a paper on measures of food acceptability (King, Weber, Meiselman, & Lv, submitted). The current paper deals with relationships between context and consumption, rather than acceptability. A third paper (Meiselman, King, & Weber, 2003) focuses on the relationship between consumption and food acceptance.

## Results

Across all tests (Table 2), estimated proportion consumed averaged from 79 to 82% for all meal components. For all tests combined, more than 50% of the respondents consumed all of each meal component while less than 5% only took a few bites.

There were significant differences in consumption for all meal items. An item's consumption was always lowest in the meal alone (Test 1) where there were no contextual enhancements. When one or more of the context effects was instituted, estimated proportion consumed increased over Test 1 (meal alone) by 13, 13 and 17% for salad, pizza and tea, respectively.

The consumption of salad was highest when respondents were in an enhanced environment and were given a choice

Table 2  
Mean scores and standard deviations for estimated %portion consumed for three components of the test meal

	All tests combined (n = 406)		Test 1 (meal alone) (n = 93)		Test 2 (meal + social) (n = 106)		Test 3 (meal + social + environment) (n = 106)		Test 4 (meal + social + environment + choice) (n = 101)		p-value
	Mean (%)	Std. dev.	Mean (%)	Std. dev.	Mean (%)	Std. dev.	Mean (%)	Std. dev.	Mean (%)	Std. dev.	
Salad	82	23	76b	26	83ab	21	80b	26	89a	19	<0.01
Pizza	81	25	74c	29	78bc	28	87a	24	84ab	26	<0.01
Tea	79	28	70b	26	72b	26	87a	22	87a	23	<0.01

p-value is for one-way ANOVA performed within each meal component, with four levels of independent variables (Tests 1–4). Numbers followed by the same letters (a,b,c) are not significantly different; different letters represent differences.

between dressings. Salad consumption in Test 4 (choice) was significantly higher than Test 1 (meal alone) and Test 3 (enhanced environment) but not in Test 2 (social).

Consumption of pizza and of tea were highest when the environment was more like a restaurant (Test 3) with no further increase seen when a choice was given (Test 4). For pizza, the enhanced environment (Test 3) showed the greatest increase in consumption. For tea, both enhanced environment and choice (Tests 3 and 4) gave significantly higher estimates of intake than did the plain meal and social interaction (Tests 1 and 2).

## Discussion

Addition of choice to the other context effects had the largest effect on consumption of salad. This may have arisen from the nature of differences between the two dressings as well as the familiarity of their flavors. That is, the degree of preference for a cream versus a vinaigrette dressing may have been greater than that for one novel pizza or tea

concept over the other. Therefore, it may not be appropriate to make generalizations about the size of an effect of food choice.

It may also be inappropriate to compare these results directly to previous research which found social facilitation of consumption. Much of that research has been conducted through the use of food diaries (deCastro & deCastro, 1989; Feunekes et al., 1995). Also, social interaction may have been confounded by variables such as the physical environment and freedom of choices among foods, which factors may operate simultaneously. Those eating with others are more likely to be in an enhanced environment such as a restaurant or at home where there is wider choice.

Another possible difference from other research is the amount of food available. The present study provided a finite amount of food but other studies of controlled environments offered unlimited quantities (Berry et al., 1985; Clendenen et al., 1994; Edelman et al., 1986; Mathy, Zandstra, de Graaf, & van Staveren, 2000). In the present study, more than half of participants finished their meal.

Table 3  
Mean scores and standard deviations for estimated %portion consumed for each meal component of the test meal by gender

Product and gender	All tests combined (n = 149 male) (n = 257 female)		Test 1 (meal alone) (n = 24 male) (n = 69 female)		Test 2 (meal + social) (n = 44 male) (n = 62 female)		Test 3 (meal + social + environment) (n = 47 male) (n = 59 female)		Test 4 (meal + social + environment + choice) (n = 34 male) (n = 67 female)		p-value
	Mean (%)	Std. dev.	Mean (%)	Std. dev.	Mean (%)	Std. dev.	Mean (%)	Std. dev.	Mean (%)	Std. dev.	
Salad male	84	24	75b	26	84ab	22	83ab	27	93a	14	<0.04
Salad female	81	23	77	26	82	20	79	25	86	20	NS
p-value	NS		NS		NS		NS		NS		
Pizza male	<b>93</b>	17	<b>85</b>	22	<b>93</b>	17	<b>94</b>	16	<b>96</b>	11	NS
Pizza female	<b>74b</b>	26	<b>70bc</b>	26	<b>68c</b>	26	<b>81a</b>	25	<b>79ab</b>	26	<0.01
p-value	<0.01		0.01		<0.01		<0.01		<0.01		
Tea male	<b>88</b>	23	<b>75b</b>	29	<b>81b</b>	26	<b>93a</b>	18	<b>98a</b>	9	<0.01
Tea female	<b>74</b>	29	<b>68b</b>	29	<b>65b</b>	27	<b>83a</b>	26	<b>82a</b>	29	<0.01
p-value	<0.01		NS		<0.01		<0.04		<0.01		

p-value in row under each meal item refers to the main effect for gender within each meal component by test. Bolded results indicate significant differences (95% confidence level) between males and females within each meal component by test. A two-way ANOVA was performed within each meal component with gender and test condition as independent variables. p-value in last column is for simple main effect of test condition within gender. Numbers followed by the same letters (a, b) are not significantly different. No significant interactions were seen.

This may have introduced a ‘ceiling’ effect, i.e. limited differences in consumption between test conditions. Given the time of day (lunch) and the apparent palatability of the food, provision of greater amounts might have amplified differences between conditions that did and did not promote food intake.

Findings by Feunekes et al. (1995) suggest that increased meal duration is responsible for the increase in consumption seen with social interaction. In the present study, all test sessions lasted for approximately 30 min, of which about 20–25 min were spent eating. It is possible that this time was less than adequate for meal consumption, and hence the social facilitation often observed in social settings did not occur or was reduced. Perhaps more time is needed to produce a social facilitation effect: in 20 min, people may eat as much as when they are alone, and then extra time at the table would be needed to prompt them to eat even more. This is supported by the lack of differences for any meal component between Test 1 (no contextual enhancement) and Test 2 (social context) for either the data overall (Table 1) or the data separated by gender (Table 3). It is also supported by several recent studies. Pliner, Bell, Kinshla, and Hirsch (2003) varied meal duration (12 or 36 min) and social groupings (1, 2 or 4 people), and found increased consumption with increased time but not with increased number of people. Mathy et al. (2000) found that elderly subjects did not eat more in a social setting which is similar to the present research in that subjects were brought to a research institute, which may not be considered a natural social setting. In addition, subjects may not have felt comfortable enough with other participants to socialize freely. This is consistent with the findings of deCastro (1994) who found that family and friends exhibited a greater social facilitation of food intake than other companions.

Concerning gender differences (Table 3), the main effect for gender was significant for pizza and tea with men consuming more of these items. This gender effect was not apparent for salad, perhaps due to the portion size of salad or its greater preference by females. For tea, consumption scores for men and women were similar with the addition of context effects. For pizza, male consumption scores did not change with the addition of the various contexts while female consumption scores increased significantly with the addition of an enhanced environment.

Overall, it appears that the physical environment is critical when measuring food consumption. Additionally, a significant difference was almost always seen between tests 1 and 4, indicating that the combination of several context effects is also important: people eat considerably more in a variously enhanced context. Therefore, careful consideration should be given to experimental environment when testing food and beverage products or carrying out fundamental work on factors influencing intake.

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