

THE EFFECT OF PAST EXPERIENCE AND
ATTITUDES UPON TASTE EVALUATIONS OF SQUID CHOWDERS

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ABSTRACT

The influence of past experience and attitudes on taste evaluations of squid were investigated in a taste test of clam and squid chowders. Within this test, an experiment was conducted which examined the effects of salience of squid identification and the physical concentration of squid upon taste evaluations. Hedonic and paired comparison judgments were collected, scaled and analyzed. The research indicates past experience, prior attitudes and expectations of social acceptance affect consumers' taste evaluations and their sensitivity to changes in product formulations. Based on these findings, improved taste testing procedures are recommended and the implications of the results for marketing squid are discussed.

INTRODUCTION

Taste testing is an important step in the development of food products. New products and reformulations of old products must be liked by consumers, but acceptance has to be balanced against ingredient costs. For example, as prices of coffee beans increased, manufacturers considered new products based on mixing coffee beans with chicory or roasted grains. If taste evaluations are not affected, considerable cost and price reductions could be made by these formulations. If taste evaluations are adversely affected, cost reductions would have to be balanced against potential reductions in sales as alternate ingredient proportions are considered. There is a need to have a taste testing procedure that indicates when a product tastes "good" and how formulations can be improved.

Many procedures have been developed by psychophysicists and used by food manufacturing companies (see [6] for comprehensive review). Recently, Moskowitz [9, 10] developed a new method which links physical ingredients to consumer's taste perceptions and overall acceptance. For example, he relates the concentration of sucrose in a cherry beverage to the consumer's evaluation of sweetness and overall acceptability of the beverage. Power functions between ingredients and perceptions have been calibrated and used to guide formulation of products [9, 10, 18].

While Moskowitz's studies provide evidence that the physical properties of food affect taste evaluations, there also are studies that indicate the presence of non-physical psychological effects. Allison and Uhl [1] found that when consumers tasted and rated labeled beers, they rated the brand of beer they drank most often significantly higher than other beers. But when they tasted and rated the same beers without labels, there were not significant

differences between the ratings of brands. The label and its psychological associations affected the taste evaluation. In a study involving turkeys, Marquardt, Makens and Larzelere [7] found consumers would pay a premium price for one brand over another. Tucker [16] observed that when confronted with a choice of loaves of bread differing only with respect to letter labels, consumers formed loyalties toward specific labels. McConnell [8] studied the effect of price on the perceived quality of beer. In this study all of the beer was physically the same and only the price level was changed. McConnell found the taste ratings (undrinkable, poor, fair, good and very pleasant) were significantly related to price with the higher priced beer receiving better ratings. Price was apparently being used as a cue for quality.

These studies indicate some of the complexity of taste testing. Although physical ingredients are important, past experience and perceptions may affect taste evaluations. The purpose of this paper is to explore the effects of past experience and attitudes on respondents' taste evaluations and their sensitivity to physical and psychological product differences. Squid chowder is utilized as the test product in this research. We attempt to determine if previous consumption of squid, attitudes towards the taste of squid, and expectations of squid popularity affect respondents: (1) overall taste evaluations, (2) sensitivity to differences in the physical concentration of squid and (3) response to changes in the salience of squid identification.

Squid was chosen for this research because of its managerial relevance and desirable measurement properties. Managerially, squid is an abundant and nutritious but under-utilized species. Widely accepted in the Orient and the Mediterranean countries, it is not popular in the United States. Little is harvested by the U.S. fishing industry, although Japan and other countries utilize the very large supply of squid off the U.S. coasts.

Recently, conventional seafood supplies have become depleted and prices have risen. For example, the reduced supply of clams and the increased demand for them has resulted in a tripling of the price of clam chowder. Squid is a possible substitute for clams in chowder. However, a number of managerial questions arise considering this opportunity. Will squid be accepted at all? Will consumers like the taste of squid? What is the psychological effect of the name "squid"? FDA regulations would require that squid be prominent on the label. Does this make the product unacceptable to consumers? These managerial questions will be considered in this study along with issues of taste testing methodology.

In addition to the managerial issues, squid is a good subject for research since it represents a new taste to many consumers and is rich in psychological connotations. Common word associations with squid are "ugh" or "tentacles." Jules Verne probably has influenced many people's perceptions of squid. In an experiment squid becomes a major treatment effect and thereby facilitates measuring and estimating significant physical and emotional effects.

We begin this paper with a description of the research design. Then the results and conclusions are presented and the implications for test tasting and marketing of squid discussed. The paper closes with an identification of some future research needs and the relevance of this work to non-food product testing.

RESEARCH DESIGN

The overall methodology was to measure attitudes and past experience in a representative sample of people and to expose them to a taste test. Each respondent tasted one clam chowder and two of four possible squid chowders. The squid chowders were experimental stimuli from a 2x2 factorial design with the salience of squid identification and the physical concentration of squid serving as treatments.

Sampling

A sample of 201 respondents was recruited at a shopping mall in the suburban Boston town of Brockton. The respondents were required to be the household meal planner and to have served fish at home as a main meal item in the last month. Age quotas were utilized to assure the sample would not be unrepresentative. Qualified respondents were taken to a room in the mall where they filled out a questionnaire and tasted squid and clam chowder. Respondents were paid \$2.00 as compensation for approximately 45 minutes of their time.

Questionnaire Design

Attitudes towards squid as a food item and other seafoods were obtained by ratings of two seafoods the respondent had served at home and several squid concepts. Each respondent was shown a set of three concepts described by a one-page statement and a picture of the product. The sets of three were randomly chosen from six concepts: (1) fresh squid mantles (fresh cleaned squid), (2) squid rings tempura (fried and frozen rings of squid mantle with a tempura coating), (3) baked stuffed squid (frozen squid mantles stuffed with vegetables), (4) Chinese stir-fried squid (canned rings of squid with Chinese

vegetables), (5) Seafood Croquettes (frozen breaded mixture of seafoods), and (6) Calimarios (frozen rings of squid mantles). The respondent rated the three concepts and two actual seafood dishes on a set of 17 scales generated in consumer focus group discussions (see Appendix One for scales). Five-point agree/disagree scales were used. After rating the two existing foods and three concepts, respondents rank ordered them with respect to their preferences. These ratings were factor analyzed to scale respondents' attitudes toward squid as a food item relative to existing seafoods.

Past experience was ascertained by a direct question of whether the respondent had ever tasted squid and, if he or she had, a seven-point hedonic (like/dislike) scale was administered. Social acceptance was measured by the response to the question "Do you think that any squid dish will ever be popular as a dinner item?" on a five-point scale (definitely no to definitely yes). The last section of the questionnaire collected age, income and other demographic information. In order to test the reactivity of the questionnaire on the taste evaluation and to randomize possible order effects, half the respondents filled out the questionnaire first and half were subjected to the taste test first.

Taste Test

Two types of chowders were tested -- clam and squid. They were prepared by the MIT food service department and were heated and served at the shopping mall facility. The total weight of the clams and/or squid was constant in all chowders as were other ingredients. The respondent was presented with a bowl of chowder and a concept board describing the product. For example, the clam chowder concept board said in large letters "Clam Chowder" and smaller letters "a delicious clam soup." On the bottom, the ingredients were listed

in small print as "clams, milk, water, potatoes, onion, seasonings." The squid chowders were varied in terms of the salience of squid identification and physical concentration of squid. The degree of identification was varied by two concept boards. One de-emphasized the presence of squid and was called "Fisherman's Chowder." It was described as "a delicious blend of seafood" with ingredients of "clams, squid, milk, water, potatoes, onion, and seasonings." The presence of squid was emphasized by "Sclam Chowder" and described as "a delicious blend of squid and clams" with ingredients of "squid, clams, milk, water, potatoes, onion, seasonings." Two physical formulations were tested. In the first, the actual physical concentration of squid was 90 percent of the total clam and squid weight. In the other, 90 percent of the weight was clam and 10 percent was squid.

Each respondent tasted the clam chowder and two squid chowders. One squid chowder was labeled "Fisherman's Chowder" and half the respondents received a 90 percent squid product and half a 10 percent squid product under this label. The other chowder was "Sclam Chowder" and again half of the respondents were given a 90 percent squid product and half a 10 percent squid product. The order of presentation was rotated and concentration randomized within the "Fisherman's" and "Sclam" chowder.

After each chowder was tasted, a seven-point hedonic scale and a five-point intent to buy scale were administered. After tasting the three chowders alone, paired comparisons were administered based on a procedure first proposed by Scheffe [13]. For each pair, the respondent first identified the preferred item and then specified the degree of preference (slightly better, better, much better). Paired comparisons were made in terms of overall taste, appearance, flavor, texture, and aroma. Pairs were used since previous research in psychometrics [14], marketing [5], and food testing [4,11] indicate they are better discriminatory measures.

Analysis of the taste test can be done at two levels: (1) Clam chowder ratings can be compared to the average of the squid ratings, and (2) the experimental differences between squid ratings can be examined as a function of the treatments -- salience of identification and physical concentration. We first report the effects of past experience and attitudes upon average squid chowder evaluations and then the response to physical and psychological product changes.

RESULTS

Average Taste Evaluations

The overall taste evaluation for clam chowder and the average of the ratings for the squid chowders are shown in Table one. The squid chowders rate consistently lower on all measures, but none of the differences are significant at the 20 percent level. The value reported under "paired comparisons" are the average of the individual values. Each individual was scaled by Scheffe's [13] least squares procedure. Clam chowder was defined as zero so that individual differences would be removed. In view of the consistency of the measures, past research on the discriminatory power of pairs, and the ease of removing individual differences, we used the scaled paired comparison values in the remainder of our analysis.

The overall comparisons of means implies there is no statistically significant penalty given to the squid chowder in the taste evaluation. Order effects of the questionnaire and taste test did not account for the lack of significance. The mean evaluation of all chowders for those who completed the questionnaire first was .038 and for the taste test first -.002. There is a small positive effect of the questionnaire, but the differences were very insignificant ($t = .05$ for the difference of means).

TABLE ONE:

OVERALL EXPERIMENTS - MEAN TASTE EVALUATION

	<u>Clam Chowder</u>	<u>Squid Chowder</u>
Hedonic (7-point)	5.72	5.53
Intent (5-point)	3.62	3.52
Paired Comparison	0	-.09

We next investigate heterogeneity effects due to past use and attitudes. Table two shows the mean taste evaluations for squid chowders for the total sample and subgroups of it. Thirty-nine percent of the sample had tasted squid previous to this study. Their average evaluations were higher, but not significantly different from those who had not tasted squid. Although our analysis of those who had tasted squid and liked or disliked it was limited by small sample sizes and statistical significance was not obtained, consistent results were observed. For the 25 percent of the sample who liked the taste of squid (a value of greater than 4 on the 7-point hedonic scale) their mean was somewhat greater than clam chowder (+.05) and for the 13 percent who did not like the taste of squid the mean was negative (-.13).

When the sample was segmented by attitudes, significant differences were observed. Attitudes towards squid were scaled by a factor analysis of the ratings of two existing seafoods and three squid main meal concepts. Four principal component dimensions accounted for 63 percent of the variance (see Appendix One for the scales and loadings). Common factor analysis yielded a similar pattern

TABLE TWO: EVALUATIONS OF SQUID CHOWDER

OVERALL	-.09
PAST EXPERIENCE	
Tasted	-.03
Not Tasted	-.12
t-statistic	.90
ATTITUDE TOWARD TASTE OF SQUID	
High	.11
Low	-.29
t-statistic	1.81 *
SOCIAL ACCEPTANCE	
High	.25
Low	-.34
t-statistic	2.6 **

* Significant at 10% level (two-tail)

** Significant at 5% level (two-tail)

of loadings. The first dimension was labeled "taste" since the scales loading heavily on it were: tastes good, pleasing texture, fresh, pleasing smell, and flavor. The other dimensions were termed "convenience, wholesomeness, and cost/value." The taste dimension was the most important dimension in estimating respondent preference. A linear regression of individual preferences versus factor scores indicated taste was five times more important than any of the other three dimensions. ($F(4,990) = 38.9$ for regression, $t=12.1$ for the taste coefficient.) The average of each individual's factor scores for the squid concepts (those with squid in their titles) was used as a measure of the respondent's prior attitude toward squid. The sample was divided into one group of all those with factor scores above the mean and one group with scores below the mean. The taste evaluations for all squid chowders were compared between the two groups.¹

The mean squid chowder evaluation for those with high prior attitudes towards squid taste was .11 and significantly different at the 10 percent level from the average evaluation of -.27 for those with low attitudes ($t=1.81$, $df=403$).

In examining the effect of expectations of squid popularity, significant differences were found. The forty-three percent of the sample who felt squid would definitely or probably become popular were defined as one group and compared to the remainder of the sample. Their average rating of the squid chowder was .25.

¹Order effects on perceptions due to taste testing chowder before the attitude measurement and visa versa were not observed. The mean taste factor score for those who tasted after the questionnaire was -.36, and for those who tasted before the questionnaire was -.30 ($t=-.4$, $df=198$).

This was very significantly different from the mean of $-.34$ for those who felt squid would not be popular ($t=-2.6$, $df=401$).

In an attempt to understand the multivariate effects of these three variables on taste evaluation, regressions were executed using dummy variables for high attitudes, high expectation of social acceptance of squid, and tasted squid. (See Table three) Social acceptance was most significant. However, care must be taken in interpreting this result since the variables were not independent. High expectation of popularity of squid was significantly related to having previously tasted squid ($X^2 = 12.7$, $df=1$) and high prior attitudes toward squid ($X^2 = 11.7$, $df=1$). High attitude toward the taste of squid was associated with having previously tasted squid ($X^2=14.6$, $df=1$). Regression using the factor score magnitudes and the 1 to 5 ratings on social acceptance with the taste dummy variable yielded similar results. (See Table Three). Again, caution must be used in interpreting this final regression since the factor scores and ratings of social acceptance are correlated ($\rho = .4$). The coefficients may not be very stable and significance may be understated. However, the analysis of means (Table 2) and these results indicate that social acceptance is most significantly related to the taste evaluations and the attitude measures explain more of the variance in taste evaluation than past experience with squid.

Our analysis of average taste evaluations indicates attitudes do affect taste perceptions. High prior taste perceptions and positive attitudes toward social acceptance are reflected in higher taste evaluations for squid chowder.

TABLE THREE

TASTE EVALUATIONS AS A FUNCTION
OF ATTITUDE, SOCIAL ACCEPTANCE, AND PAST EXPERIENCE

	<u>Coefficient</u>	<u>t</u>
Attitude (0,1)	.17	.73
Social Acceptance (0,1)	.53	2.22**
Tasted (0,1)	-.08	-.34
Attitude (Factor Scores)	-.05	.41
Social Acceptance (1-5)	.37	3.68**
Tasted (0,1)	.06	.27

** Significant at 5% level (two-tail test).

Response to Physical and Psychological Differences

We now examine the experimental effects of varying the concentration of squid and the salience of squid identification. An overall analysis of variance within the squid chowder experiment showed no significant treatment effects. Table four gives the treatment means.

TABLE FOUR

OVERALL EXPERIMENT TREATMENT MEANS

		Squid Concentration		Total
		Low	High	
Salience of Squid Identification	Low	0.00	-.11	-.055
	High	-.01	-.24	-.125
TOTAL		-.005	-.175	-.09

Although the marginal totals indicate a negative effect for high squid identification and high squid concentration, these effects were not significant. The $F(2,402)$ was .38 and the t for differences in salience was $-.33$ and for concentration $-.79$. When interactions between the two treatments were included in the ANOVA, the significance did not improve and the t for the interactions effect was only $-.29$.

The lack of significance could be because (1) there truly were not any psychological effects of squid identification or physical taste effects due to squid concentration, (2) the experiment was not powerful enough to identify the effects, or (3) heterogeneity of response existed in the population. Since the experiment was carefully designed with a large sample ($n=200$), we were reluctant to accept the lack of power in the experiment as an explanation and instead suspected that heterogeneity in taste response made it impossible to discern significant effects at an aggregate level.

When the population was divided into those who had previously tasted squid and those who had not, significant results appeared. Table three shows the treatment means for the 39 percent of the sample who had tasted squid.

TABLE FIVE:
TREATMENT MEANS FOR THOSE WHO PREVIOUSLY
HAD TASTED SQUID

		Squid Concentration		Totals
		Low	High	
Salience of Squid Identification	Low	.29	-.35	-.03
	High	.25	-.31	-.03
Totals		+.27	-.33	-.03

The treatment means for concentration are substantially different and statistically significant at the 10% level ($t = -1.77$, $df = 154$). This indicates that those who had tasted squid could differentiate between the physical concentration even when the salience of squid varied from "Fisherman's" to "Sciam" chowder. The sign of the means indicate that those who had tasted squid disliked the taste of higher concentrations. The ANOVA of the squid experiment within the group of those who had not tasted squid yielded no significant results. Recall that segmenting the population revealed no significant differences between the average of the ratings of the squid chowders when compared to clam chowder between those who had tasted and not tasted squid (see Table Two). But within the group of respondents who had tasted squid, significant responses to the physical concentration of squid were observed.

Analysis of variance of the squid experiment within the other subgroups with different attitudes revealed significance only for those who had low prior attitudes toward the taste of squid. (See Table Six). Again a significantly negative effect was observed for high physical concentration ($t=-1.6$, $df=216$). This group with low prior attitudes rated on average the taste of squid chowder significantly lower than others (see Table One) and had a negative response to the concentration no matter how the chowder was labeled.

TABLE SIX:

TREATMENT MEANS FOR THOSE WHO
HAD LOW ATTITUDES WITH RESPECT
TO THE TASTE OF SQUID

		Squid Concentration		Totals
		Low	High	
Salience of Squid Identification	Low	-.15	-.49	-.32
	High	+.03	-.55	-.26
Totals		-.06	-.52	-.29

The analysis of the experiment indicates past experience and attitude affect a respondent's ability to discriminate between physically different products. The taste evaluations of people who had tasted squid before and those with low prior attitudes towards squid were significantly affected by the physical concentration of squid in the chowder.

In none of the subgroups was a significant response to the salience of squid identification found. Although the salience of squid identification

in the experiment was not significant within groups, psychological reactions were observed between groups. People who had low expectations of social acceptance of squid or had low prior attitudes towards squid, rated the taste of all squid chowders significantly lower than clam chowder regardless of salience of identification (see Table two). This appears to be a general negative psychological reaction to squid which did not vary across the two experimental levels -- "Fisherman's" and "Sclam" chowders.

IMPLICATIONS

Taste Testing

This study implies that conventional taste testing procedures may produce misleading results. Unless the data are analyzed based on past experience and attitudes, important effects may be overlooked. In this study the overall results were not statistically significant because of respondent homogeneity. Without a substantial sample size and segmentation of the sample for analysis, a taste test may produce few significant results.

Our experience with paired comparisons, specific attitude measures, and the experimental variation of ingredients and psychological positioning was positive and we recommend it for consideration by others. At a small cost, it offers substantial advantages over simple testing of a new product and a control using hedonic scales with a monadic (one at a time) procedure.

Squid Marketing

Although the prime objective of this study was taste testing methodology, several important results were uncovered relative to marketing squid. There was

a general negative reaction to squid, but it was not large. In the attitude survey, the trial propensity for the concept of "Squid Croquettes" was 19 percent "definitely" and 33 percent "probably" would intend to try. Although intent to try measures were not collected for chowder, these are probably reasonable estimates of the minimum trial for a squid and clam chowder. If one assumes all the definites and half the probables would try, 35 percent of those made aware of squid could be expected to try. If a major introduction were to be conducted in which 60 to 80 percent of the people could be made aware of the brand, the expected trial would be 20 to 28 percent of fish eaters. With the price of clams increasing, it is likely that at commercial levels of fishing, the price of squid would be substantially lower than clams. This cost advantage could be used to fund promotion to overcome the initial psychological barrier to trial. In this case, the cumulative trial rate could be conservatively estimated at 30 percent.

The repeat rates for squid chowder should be good. The intents to buy the squid chowder after tasting it was almost equal to clam chowder. For squid, 27.8 percent definite and 29.8 percent probable intent versus 28.9 percent definite and 32.0 percent probable for clam chowder. The repeat purchase probabilities are almost equal to those of clam chowder and, if the cost of squid chowder was lower than clam chowder, they could be greater than or equal to clam chowder. Based on our data, a market opportunity for a squid and clam chowder seems to be present.

The acceptance of squid might be improved by a revision of the recipe. Some segments of the population reacted negatively to the high levels of squid concentration (i.e., those who had tasted squid or had low prior attitudes). A lower proportion of squid, say 50%, could increase the response from these groups. However, this would increase the cost of the product. Another possibility

is to increase the clam flavor perception by the use of more clam juice while retaining a high level of squid concentration. The feasibility of this strategy is suggested by the ratings of the squid chowders on flavor, texture, and appearance. Contrary to expectations, ratings on texture and appearance were better for the squid chowder than the clam chowder. The squid mantels were finely chopped to give a pleasing appearance and the fresh squid carefully cooked to maintain tenderness. The overall ratings were most heavily correlated to flavor and improvements in flavor without the loss of texture and appearance should improve the overall taste perceptions and the repeat purchase intents. Further taste testing of revised recipes would be appropriate.

The study also indicates that the maintenance of quality would be important if a squid product were marketed. Those who had tasted squid and disliked it, rated the product low. Most of the previous trial was in restaurants where recipes and quality vary. In a canned chowder consistency and good quality should be much easier to maintain.

The labeling of the squid chowder as "SCLAM" chowder did not produce significantly lower taste evaluation than when labeled as "FISHERMAN'S" chowder. It does not appear to be worth a legal battle over the details of labeling. "Sclam" chowder, "a blend of squid and clams" is an honest, straightforward identification and acceptable to consumers.

The study indicates an opportunity for squid chowder. Since the taste test was done in the Boston suburban area, the representativeness of this result would have to be confirmed. We did administer the attitude questionnaire to 100 respondents in Chicago. The ratings were not significantly different in Chicago, so perhaps the results of the study may have implications for other areas of the country.

The next steps in marketing of a squid chowder would be to conduct a pre-test market laboratory test [15] in a representative set of markets. If this was successful, a test market or regional introduction could be considered.

Future Research

This study suggests taste evaluations are a function of physical and non-physical psychological variables. More research is warranted. This is especially true with respect to social acceptance. Recent work on value expectancy models indicates the effects of reference group evaluation and expectation are important in consumer behavior [12]. We used a uni-dimensional scale and better measures could be formulated and tested to more completely understand the effects of social acceptance.

Villani and Morrison [17] have recently proposed a decision tree approach to analyzing the managerial implications of reformulating a product. They considered users separately from non-users. The findings of this study support their separate treatment of users, but indicate their decision tree may need to be expanded to include attitudes as well as past usage. The taste testing methodology used here could be integrated in a decision model which trades off cost versus acceptance and the effects of various levels of ingredients.

Another topic for research is the implications of these findings for product testing of non-food items. Will home-use physical product evaluations depend upon prior attitudes and past use experience? If so, revised procedures to measure and analyze the effects of product positioning, attitudes, expectations, and previous product experience would be required. Some of our informal experience and Anderson's study of expectations [2] indicates this may be true and the issue should be systematically studied.

APPENDIX ONE:

RATING SCALES AND FACTOR LOADINGS

SCALES	<u>FACTOR LOADINGS</u>			
	1	2	3	4
1. Is high in protein.	.22	.17	-.06	.76
2. Tastes good.	.78	.03	-.09	.25
3. Is a good value for the money.	.30	.30	-.54	.43
4. Is easy to clean up after serving.	.14	.75	-.11	.17
5. Has few bones or shell pieces that might get caught in throat.	.13	.63	-.05	.28
6. Is not fattening.	.17	.27	.23	.67
7. Requires little work to prepare.	.051	.74	.01	.22
8. Is appropriate for special dinners.	.48	.09	.34	.28
9. Comes from clean unpolluted waters.	.52	.31	.17	.27
10. Has a pleasing texture.	.79	.16	.06	.14
11. Tastes fresh.	.77	.16	.11	.20
12. Does not make house smell while cooking.	.37	.66	.12	-.07
13. Looks attractive when served.	.67	.24	.09	.17
14. Has a pleasing smell when served.	.78	.21	.06	.06
15. Has an excellent flavor.	.87	.06	.01	.20
16. Is nutritious/healthy for you.	.42	.20	-.02	.66
17. Cost more than most seafoods.	.25	.00	.78	.10
λ (eigenvalue)	6.8	1.8	1.1	.97
NAME	"TASTE"	"CONVEN- IENCE"	"COST/ VALUE "	" WHOLESOME NESS"
CUMULATIVE VARIANCE	.40	.51	.57	.63

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