

Bridging the gap between sensory evaluation and market research

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There is much to be gained from an integration of sensory evaluation and market research to provide a full understanding of the overall evaluation and acceptance of food. This can be achieved if research paradigms and practical applications are broadened to address key issues: the choice of appropriate research subjects, the use of realistic foods and of more complex and realistic environments, the appropriate selection of sensory methods, and the consideration of contextual influences. Improved research paradigms will contribute to our theories of how human eating is controlled and, hence, to the use of this information in product development and biomedical applications.

As both participant and observer in the research field of sensory evaluation for ~30 years, I have periodically critically examined its development and direction. Sensory evaluation of food developed in the middle of this century, as food product development and production became more technological. Sensory evaluation was seen primarily as a technical support for product development or a technical support for quality assurance during production. Alongside this practical application of sensory evaluation, a more academic tradition also developed. Within this academic tradition, basic research was carried out on sensory methods and on factors underlying sensory properties of foods¹. While academic sensory research contributed to the industrial application of sensory evaluation by developing new methods and identifying critical variables, it never drove the level of applied sensory evaluation in the sense that research developments in the computer field drove product development. Although no hard figures are available, it appears that more money is spent on applied sensory evaluation than on sensory research.

Market research also developed in the middle of this century, as the economy shifted from being production-oriented to being consumption-oriented². Market research is the link with the consumer, providing information that assists companies to carry out marketing and

to monitor the marketplace. Market research is used for planning, problem solving and controlling the marketplace. Just as for sensory evaluation, market research is carried out in industry, in government and in academia. Most marketing money is not spent on research; although larger firms tend to have a market research budget, most smaller companies do not.

Which brings us to more contemporary times. Several recent conferences have focused on sensory evaluation, one³ in 1988 held in the UK in honor of Roland Harper, and another⁴ in 1992 held in Finland in honor of Rose Marie Pangborn. Both of these meetings reflected the growth and complexity of the field of food evaluation, by which I mean a somewhat broader context than sensory evaluation. In both meetings, a broad range of variables in addition to sensory variables were introduced and discussed. These included social and cultural factors, individual psychological factors, situational or contextual factors, economic factors and physiological factors.

It was apparent from these meetings that the sensory evaluation of food was developing into the evaluation of food, and that a much broader view of food acceptance would be the outcome. In fact, at the Pangborn memorial meeting there was active discussion about whether contemporary sensory evaluation and market research would eventually merge, combining the strengths of both fields. Such a merger would make sensory evaluation stronger through greater ties to non-laboratory, consumer-oriented situations, and would make market research stronger through the more quantitative, biological basis of sensory evaluation. This merger has not occurred in any general sense, for reasons that I have discussed in other reviews: the stagnation of the applied sensory evaluation of food⁵, and the misdirection of much research into human food habits⁶.

Sensory evaluation

First, let us consider the sensory evaluation of food. I had the opportunity to review critically this area for the Pangborn memorial meeting⁵, and noted serious methodological problems in sensory evaluation.

Choice of test subjects and stimuli

With regard to the choice of subjects for sensory evaluation, there appears to be wide use of convenience samples, without concern for matching the target population. The use of consumer or trained panels seems to be arbitrary, without an understanding of either the differences between them or the appropriateness of each one for the question(s) being asked. It is encouraging that academic studies on this topic are increasing. Papers presented at the recent 1994 meeting of the Institute of Food Technologists and papers published in the *Journal of Sensory Studies* from 1993 to date deal with this topic, and all report differences between panels with different levels of training or familiarity. Heymann⁷ even reports that two panels that had received the same training actually performed the same in a quantitative descriptive analysis (QDA) task. What is needed now in the field is a better conceptualization of what function(s)

training accomplishes and a better application of this – that is whether to use training and, if so, when.

With regard to foods and sensory stimuli, the sensory evaluation field has not been able to move beyond its traditional link with product development and quality assurance. Very little is known about how people evaluate combinations of foods, based on sensory properties. In fact, workers in the sensory field have found it difficult to model simple combinations of tastes and/or odors. Frankly, it is hard to see how it will ever be possible to deal with the sensory complexity of a multi-component meal. Many studies still vary only one dimension or one ingredient in a very simple model food system, and some methodological research in food sensory science still uses very simple chemical stimuli (see many articles in the *Journal of Sensory Studies*). However, recent information gleaned from reading journals and attending conferences indicates that sensory evaluation is leaving behind the heavy use of simple chemical stimuli in favor of foods. In order to move the sensory evaluation of simple products to the overall evaluation of complex products and multicomponent meals, the field will need to move towards more complex, realistic foods and combinations of foods similar to those found in natural meals.

Context and the role of expectations

The testing of environments or, even better, the effect of environmental or contextual variables represents another problem for sensory evaluation. Sensory testing has sought either to control the testing environment or to ignore it; it has rarely looked at how the environment interacts with the sensory aspects of a food or meal. In view of the increasing evidence of the importance of situational variables in food acceptance and food choice, the consideration of such variables is long overdue. As support for product development, the narrow view of a product in isolation would not need this contextual perspective. However, if one wants to predict sensory impact and acceptance in the real world, then context is important. A review of recent research presented at conferences and in journals shows little or no change in contextual research in sensory evaluation.

One exception to this is the area of expectations; Tuorila, Cardello and others are manipulating context by changing the expectations of products, which is an important component of contextual effects (for example see Tuorila *et al.*⁸). Expectation research is an excellent example of the type of research that is essential to bridge the gap between sensory evaluation and market research. It appears that consumer decisions are strongly influenced by expectations and other cognitive factors. In fact, subjective expectations might actually control behavior more so than objective sensory characteristics. If this is true, then paying too much attention to sensory characteristics might mask the critical variables.

Temporal effects

Another aspect of context, which I noted in my earlier review⁶, was the consideration of temporal factors.

Most sensory testing involves the brief presentation of samples just once. There is no examination of repeated stimulation (as occurs in repeated sips or bites), no examination of longer-term effects over the sequence of a meal and no examination of even longer-term effects over repeated meals. Sensory testing has studied the time variable through time-intensity measurements, although these are usually limited to multiple measurements over 1–2 min. Time-intensity measurements certainly extend traditional sensory testing, but present additional problems⁹ and pose additional questions regarding the validity of the results. Again, the way sensory evaluation handles the temporal issues does not help it to address overall food evaluation in an eating situation. Temporal factors are beginning to receive new attention in the form of studies of contextual variables¹⁰, which might prove to be a more profitable approach.

Choice of test

There appears to be a developing body of information on how to choose sensory tests (for example see Refs 1 and 11). There is, however, very little discussion on the validity of various sensory tests, and there is reason to question the ability to predict the 'real world' situation from results obtained in the sensory laboratory. However, all of this has not had much impact on sensory consultants, who tend to push one technique exclusively. It should be the norm that sensory practitioners offer a full range of options and fit the correct one to an individual situation.

The search for sensory-instrumental correlates has long been a tradition in the sensory evaluation of food. The hope that reliable machines could replace not-so-reliable humans was very attractive. The results in this area have been impressive at the level of specific sensory characteristics, but not at the level of complex sensory attributes or overall acceptance¹². Sensory-analytical work is now extending into a new phase in which more complex models of relationships are proposed rather than the simple substitution of an instrumental measure for a human measure. Kokini and Chou¹³ have presented examples of such models for liquid foods.

Relationship of sensory evaluation to eating

Another factor in making sensory evaluation relate better to real-world food evaluation is the correlation between sensory properties, acceptability and actual consumption. Some argue for the contribution of sensory factors¹⁴ and acceptance¹⁵ on food consumption, whereas others¹⁶ argue that situational factors are probably more critical in determining consumption in real eating situations. There are still very little data linking the sensory properties of foods with food habits. Tanimura and Mattes¹⁷ showed the relationship between bitter taste sensitivity and the consumption of beer and coffee. Tuorila *et al.*¹⁸ also included consumption measurement in their laboratory study of combinations of cookies and juices.

All in all, there is progress in addressing some of the methodological and substantive aspects of sensory

evaluation. There is still relatively little progress in those areas that would make sensory evaluation more easily applicable to real-world eating rather than to product development and product assurance. For these reasons, a bridge is being developed between sensory evaluation and market research, but this bridge is largely limited to academia. One exception to this is the approach taken by Moskowitz¹⁹, who has preached a market research approach in addition to or instead of sensory evaluation. His books and papers embrace marketing concepts such as segmentation and optimization. However, even Moskowitz does not address issues such as overall meals, food consumption and longer-term temporal patterns.

Eating habits

A number of the concerns already considered above for sensory evaluation are also applicable to research into eating habits, namely the lack of the use of real meals and the use of shorter-term studies⁶. Let us now review the status of the remaining concerns relating to research into food habits.

Valid models of eating behavior in humans

Eating behavior research continues to use models, which makes the translation to eating behavior in humans very difficult. I am referring to the continued emphasis on animal models of eating and abnormal human models of eating. There are relatively few published studies of eating behavior in normal people. One is often forced to examine control group data in studies of abnormal eating behavior to obtain normal data. In addition, studies and models of laboratory animals will never simulate the complexity of human eating.

If one wants to know what determines the food choices made by humans in the real world, then such eating behavior research is not very useful. In addition to the problems of the animal orientation and the abnormal orientation, there is an emphasis on sensory and physiological determinants. There is a real risk here for sensory evaluation and even more so for customers of sensory evaluation, because the field of eating behavior research has this inherent bias in favor of sensory and physiological determinants. Instead of seeing the human as acting in a richly complex environment with powerful social, environmental, economic and cultural focus, human eating behavior research is more likely to consider the animal (in a cage or laboratory), impinged upon by internal physiological signals or external sensory signals.

It is difficult in this research environment to get a real sense of how important the sensory properties of food are. Some people might feel that this is not a

shortcoming of sensory evaluation, whose job is limited to revealing the sensory attributes of a product. I disagree. Sensory science needs to help us understand how such sensory attributes combine with other attributes to result in the overall acceptance of a product and its purchase and consumption.

The way forward

I am not pessimistic about bridging the gap between sensory evaluation and market research. I am, however, impatient. The whole field of food evaluation could be moved ahead if we developed more complex strategies for research, and if we were willing to abandon some of our traditional and simpler models.

At the recent 1994 joint meeting of the Society for Ingestive Behavior and the 3rd Food Choice Conference, a number of speakers called for just such a change in research strategies. Campfield²⁰, speaking from the animal-physiological perspective, and Herman²¹, speaking from the human-social psychology perspective, both called for change. Perhaps we are getting closer to real change. Perhaps we will be able to combine the strengths of sensory evaluation research, market research and food choice research to arrive at a science of human eating behavior that covers the whole range of food choice, food acceptance and food consumption.

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