

The Components of Food Acceptance and Their Measurement*

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MANY FACETS of one's life are related to eating. In addition to its essentiality to health, eating is recognized as a pleasure in its own right. Further, it is not only a personal matter but serves a social function and contributes to interpersonal relationships. Another aspect that must usually be considered either for understanding an individual's eating pattern or for planning group feeding is the economic factor. The planning of a feeding program for a particular group requires knowledge of the patterns of eating behavior of the members of the group. Basically then, we are faced with the problem of predicting the acceptance of foods.

Three things are necessary in order to predict behavior. We must have a criterion, know the components or factors operative in determining the behavior, and have adequate technics for measuring the effects of the components.

CRITERIA

The criteria for establishing the value of a food are different for various disciplines. For the physiologist the nutritional adequacy of the food consumed is the primary criterion while

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for the menu planner the cost may be an important consideration. The food technologist has other criteria, such as ease of preparation or the keeping quality of the food. For the psychologist, the behavior of the individual or a group, including affective reactions, is the *sine qua non*. In the case of food acceptance, consumption might appear to be the logical and objective criterion, and for many purposes, the operational definition of acceptance, in fact, is consumption. Sometimes we may be interested in nothing more; at other times, consumption may be the only measure which can be obtained. However, in order to include the affective reactions, the criterion of food acceptance should be specified as "consumption with pleasure"—we might say, "the nutrition of body and soul."

COMPONENTS

A "model," or a structure around which to organize the components, should help to systematize the work in this area. It may serve as a guide for establishing testable hypotheses.

The more important components, as we see them at the present time, are illustrated in Figure 1. The words under the heads, such as "internal" or "learning" and "appetite," indicate either the origin of the component or some of the factors that enter into it; other words such as "stimulus," serve only as definitions or explanations. For convenience, each of the three components is shown as contributing its own part to the perception and final acceptance of the food. This does not imply independence of the components; in fact, mutual interactions are known to operate.

Deglutition depends finally on an immediate, favorable sensation; but before one is even tempted to try the food, a number of recent and

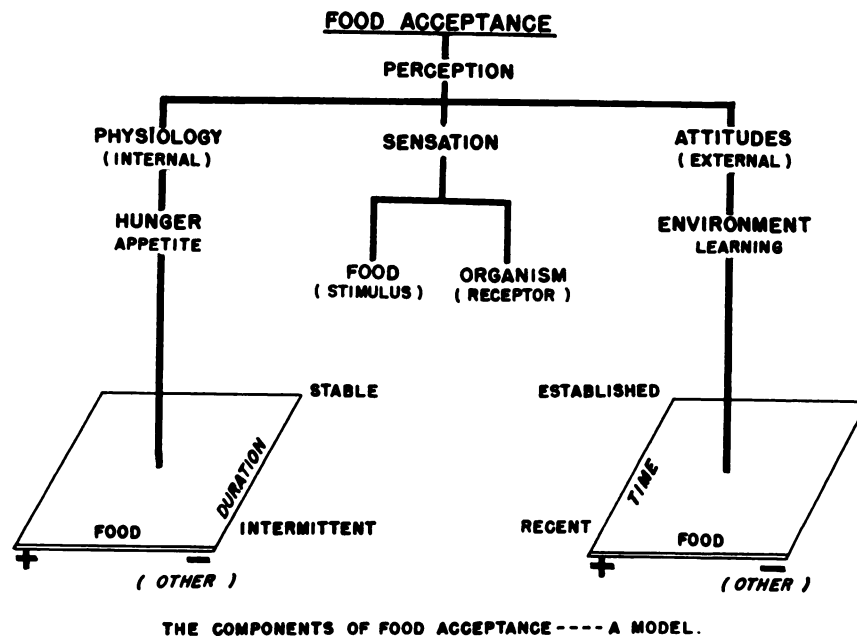


Fig. 1. Relationship Between Methods of Measurement and Components of Food Acceptance.

past events have conspired to influence the organism. Some of the events occur within the individual and others come from the environment. Part of the *milieu* is even non-food in its nature. Both food and non-food factors affecting perception may be recently acquired or long-established, and ingrained. These factors can be represented by points on the planes under **PHYSIOLOGY** or **ATTITUDES** (Fig. 1). For example, a relatively stable non-food factor would be endocrine balance; an intermittent food factor would be the metabolic changes following the ingestion of food or the injection of glucose.

An experiment on sensory testing methodology suggests how an important interaction among the factors might occur.¹ The triangle test is used routinely to determine if people can detect any differences in foods due to treatment, source, etc. Two samples are the same and one is different. The subject's task is to indicate which sample is the different one. However, if he is then asked to express his preference between the pair and the third sample an unexpected result may be obtained. If the samples are all the same, or even if the pair has been slightly contaminated with an off-flavor that shows up as a lower preference on a prefer-

ence test as it is usually conducted, the subject may show a higher preference for the pair than for the odd sample. Now, it is recognized that people often dislike that which is different—the fear of the unknown. This bias is applied to many things in life. The preference results from the triangle test have been interpreted as an effect of this bias. A long standing non-food attitude has altered the perception of the foods that have just been sensed. The sensation and the attitude acted together to produce the effective reaction. We can see that the relative strengths along several dimensions must be known in order to predict whether or not a recent food sensation will take precedence over a long-standing non-food attitude, but one that is able to be generalized to include foods.

METHODS

The methods for the study of acceptance behavior can be grouped for convenience into three classes: attitudes, sensory tests, and consumption. Each of these can be further subdivided into specific technics. Attitude studies can be classified in two dimensions: technic, written or oral; and, population, surveys² (general) or case material³ (particular). Sen-



sory tests are based on two types of response, discriminative judgments and affective reactions, depending on the question asked. The affective reaction is hedonic tone or preference which is the basis of much work in food acceptance. Measurement of the actual consumption of food can be conducted under two conditions, the normal and the experimentally modified. If the latter is more common in animal experimentation, it is only because it is more convenient.

It may be well to outline some of the approaches used at this Institute. For attitude studies we use the survey technics. The most common one² is a questionnaire concerned with the degree of preference for each of a number of foods. This is coupled with information on the environmental background of the respondent, including age, region of origin, size of town, length of military service, etc. For some pur-

eating conditions, and under such conditions as climatic extremes or other stresses, and a restricted number and type of dietary items, such as those discussed by Siegel⁴ and by Torrance.⁵

Table I presents our best estimate of the influence of the components of acceptance on the measures obtained with the three methods outlined above. Surveys undoubtedly reflect attitudes previously established; however, we recognize the probable influence of the present physiologic state of the organism on expressed attitudes. For example, in the surveys when the word and not the actual item is the stimulus, soups receive lower preference ratings when the ambient temperature is high than when it is low. The results of sensory tests depend on the immediate sensation produced by the food but the perception of the food is altered by attitudes, both general and food-specific, and by the physiologic state of the individual. Actual

TABLE I
Relationship Between Methods of Measurement and Components of Food Acceptance

Component	Measurement			
	Surveys	Sensory Tests		Consumption
		Affective	Discriminative	
Attitudes	+++	++	+	++
Physiology	±	+	++	++
Sensation	-	++	+++	++

poses we employ interviews concerning feelings about and knowledge of specific food items. Sensory evaluation of foods involves mainly people's likes and dislikes for samples of foods presented to them in a laboratory setting. Most often these involve preferences for various treatments of the same food item, for example, canned sweet potatoes with different amounts of added sugar or stored for different lengths of time at various temperatures. For special purposes a discrimination test or a flavor analysis, i.e., degree of intensity of specific attributes such as sweet, burnt, musty, etc., may be performed on foods. Preference is not asked for because of the possible biases that could arise. Actual consumption of food has been measured in animals with experimental modification of the diet and with modification of the internal *milieu* by drugs or hormones. In man, consumption has been measured under "normal"

consumption will be influenced by the sensations derived from the food and by the physiologic condition of the organism. Past experience or "attitude" may play some role in the case of non-human species; however, in man, one can be reasonably certain that past experience and the attitudes established by them are going to be at least as important as the physiologic state of the person and the sensations elicited by the food. In some cases attitude is the most important factor, as is evidenced by refusal to even sample a food that has never been experienced, i.e., sensed. For example, the idea of eating snails is so repulsive to some people that they refuse to try them.

PROBLEMS

The studies reported in the literature and those now under way or contemplated at this Institute serve to point out some of the prob-



lems that need to be investigated. A few examples of past studies are cited in order to lead up to the problems.

Although we do not yet know which attitudes are most important in determining food preferences, a number of studies have shown, either directly or indirectly, the effects of environment and learning on expressed food preferences, both in surveys and laboratory tests. Surveys of food preferences conducted by this Institute,² in which the subjects respond to names and not to the foods themselves, have shown that the respondents' region of origin is related to preferences for many foods. For example, the southeast and southwest are different from the rest of the country. For some foods, age and even the educational level of the respondent seem to be important determiners of acceptance. We have to find out which attitudes are the most important ones, what is their origin and strength, and to what extent they can be modified.

The surveys also suggest that experience in the early years of life, prior to age 16, are among the strongest controlling factors in food preferences. The fact that they appear to be effective determiners of behavior in later life may be a clue to their strength. Yet the work of Lewin⁶ and others suggests that food habits are modifiable. The possibility of modifying food attitudes remains as one of the most challenging problems in food acceptance. It would have a special significance for the Armed Services which must feed great numbers of individuals with the minimum of labor and cost. Within the last several years a pilot study was made on the possibility of modifying food attitudes through the use of a mass communication medium, the sound motion picture. This approach looks promising.

The physiologic bases of food behavior have received a good deal of attention over the years, and several approaches are represented by papers at this Symposium. Our organization has been active recently⁷ in seeking agents, mainly parasympathomimetic drugs, that increase food consumption. This type of study is just one more way of attacking the problem of the mechanisms regulating hunger and thirst, since it is evident that one or two specifics, such

as stomach contractions or blood glucose levels come nowhere near explaining the physiology underlying eating behavior.

An area that demands extensive exploration is that of the effects of stress, including physical exertion, climatic extremes and that most elusive of all, psychologic stress. This area is virgin territory. Unfortunately, there are too few intrepid experimenters who are willing to tackle such problems. If monotony is included as a type of stress, then we can point to two studies.^{4,8} However, this research must be recognized as the introduction to a series of investigations that will be required to elucidate the factors that contribute to food monotony.

In recent years, advancements were made in methods for the evaluation of foods on the basis of direct sensory processes. The most useful tool in our own laboratory has been preference measurement by the single stimulus method, using the hedonic scale⁹ which is a nine-category continuum from "like extremely" through "neither like nor dislike" to "dislike extremely." However, such a technic does not get at the basis of the differences in preference that arise from processing, storage or other experimental variables. Therefore, we are studying methods of obtaining more analytic data on foods. Flavor analysis appears to offer much promise. However, the greatest obstacle is that we have no adequate system for the description of odors, and odors represent the most important component of most flavors. At the present time we are conducting experiments designed to establish an effective classification system for odors.

PREDICTION

Having recognized the number and magnitude of the variables in food acceptance, it may appear rash to speak of prediction. Nevertheless, we have obtained leads that look promising. It now appears that food preferences, as expressed on a questionnaire, are a fair predictor of consumption. Preference not only predicts the average amount of food consumed in certain situations but also the proportion of persons taking or "accepting" a serving of the food. Because preference, or degree of liking, does predict amounts consumed we can tenta-



tively answer a question raised early in this paper by the definition of acceptance as "consumption with *pleasure*." If we accept "like" as a synonym for pleasure we may conclude that a high correlation between relative preference and amount consumed suggests that the broader operational definition of acceptance has been met, and that preference predicts "acceptance," or consumption with pleasure.

There are numerous problems to be investigated in the three areas of food acceptance outlined in Figure 1. Discovery and integration of the mechanisms by which sensations, attitudes and physiologic phenomena lead to the development of preferences for and behavior toward foods stands as a challenge to research ingenuity.

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