Appetite [redacted], 1983, 4, 301–312

A Robust, Brief Measure of an Individual's Most Preferred Level of Salt in an Ordinary Foodstuff

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A single-session procedure to assess an individual's most preferred level of a factor in a product is justified theoretically and illustrated by the results for salt concentration in samples of bread and tomato soup tested on 30 young men who had had no previous experience of the task. Each man rated the saltiness of each sample as a distance below or above his ideal for that food type. Without the rater knowing, his stimulus set was coordinated to his rating responses in order to minimise biases in what others have shown can be a linear response mode.

The Weber fraction is constant for the medium range of NaCl solutions when concentration units are used, and so Fechner's principle of direct scaling was applied: mean linear regressions between ideal-relative intensity responses and the logarithm of salt concentrations in each individual were nearly always statistically reliable with only six to 20 ratings of three to six salt levels in bread or soup. Values of the regression intercepts for bread at the initial session and five months later correlated significantly, as also did the regression slopes.

Thus, a robust value for each individual's ideal salt level for each food could be interpolated from the regression equation. There was no effect of sequence of bread and soup sessions. Bread and soup salt-ideals were correlated, as were their slopes. A regression slope appears to represent an individual's tolerance of deviations from ideal. The relation of the slope to choice behaviour, and its relative dependence on intensity sensitivity and a preference motivation characteristic of the individual and test situation, remain to be elucidated. This procedure should have wide application in consumer preference measurement.

We present here a procedure for assessing an untrained individual's most preferred level of a controlled factor that is perceptible in a consumer product such as a food (bread or soup, in the present illustration of the method). Tolerance of deviations from the ideal is also assessed, at least as evinced in the test situation.

The procedure requires a total of as few as six to ten presentations of samples containing several different levels of the factor (sodium chloride in this instance). Thus, the individual's ideal can be estimated from the results of a single session, if such brevity is desired. We show here that, despite the small amount of data, the results for a single assessor are remarkably precise and robust. We attribute this efficiency of the procedure to its theoretical design to minimise various sources of bias that afflict common procedures in psychophysics and sensory testing.

We thank Richard Griffiths and RHM Research Limited for advice and the provision of breads. Owen Maller kindly provided a copy of the habits and attitudes questionnaire on salt and sugar used by Maller *et al.* (1982). Dick Shepherd helped us by providing preliminary results from weighed intakes validations of a food frequency and salting questionnaire being developed in Norwich to estimate salt intake (Note 1).

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0195–6663/83/040301+12 $03·00/0

Our procedure leaves the assessor completely free to specify the saltiness intensity he most likes, and the steepness with which he rates differences from that ideal. Salt levels are selected in the light of initial ratings so that ratings are centred on the ideal point (Poulton, 1979) and ratings near the extremes of the response continuum are avoided. Furthermore, we minimise range–frequency bias (Parducci, 1963) by selecting samples from the set of salt levels in an endeavour to distribute the individual's responses evenly over the response range being used. These salt levels will necessarily be a selection within the assessor's tolerated range on either side of his ideal saltiness for the food tested. If the bias-minimising procedures succeeded, then in theory (see below) linear functions of ideal-relative intensity ratings against logarithm of sodium chloride concentration should be obtained. Hence, by linear regression, the individual's ideal salt concentration can be interpolated, and a tolerance slope derived.

The procedure seeks a direct estimate of the influence of physically measurable parameters on consumer action tendencies without assuming that preferences result from first sensations and then affect (Booth, 1979). These preference ratings could be scaled onto a purchaser's or eater's real-life choices between factor levels in a product, either before or after aggregation across representative individuals (Blamires, 1981; Green, 1975). Indeed, the rating procedure modifies only to a modest extent the multi-sample response tests sometimes used in market research (critical though those modifications are). Also, the familiarity of the ordinary complex stimulus used in our procedure may well make the task easier than expressing preferences for artificial simple stimuli. Thus, the procedure offers the prospect of practical measurement of individual untrained consumers' ideals for product characteristics or attributes. Furthermore, unlike the opinion-polling and aggregate analysis that are usual in so-called quantitative market research, the present procedure can be used to test models of the determinants of product preference in the minds of individual consumers (Booth, 1981).

THEORY

An essential principle of our procedure is that the strength of the perceived effect of the preference factor under study is rated relative to the most preferred strength of the perceived factor. The cross-modal matching tasks of marking distances or positions on a categorised line may well give the least biased ratings when used appropriately (see below). Therefore, like Frijters and Rasmussen-Conrad (1982) and McBride (1982), we obtained these ideal-relative intensity ratings on graphic analogues. The verbal categories in these three papers are formally identical also—the perceptual characteristic is labelled *a priori* (sweet, salty), the analogue ends are anchored at verbal extremes, and there is a middle category of ideal intensity.

Frijters and Rasmussen-Conrad (1982) call these ideal-relative intensity ratings a "liking scale" or pleasantness (hedonic) difference estimates. However, this rating procedure differs from the common verbal category "scale" of like and dislike (Peryam & Girardot, 1952), the "Smiley" and food action categories (Birch, Birch, Marlin & Kramer, 1982; Schutz, 1965) or the pleasantness or pleasantness/unpleasantness responses—whether graphic analogues, several numerical and/or verbal categories [often arbitrarily taken from Likert's (1932) attitude scaling procedure, e.g., Cabanac, 1971 and successors; Chisnall, 1981], or unbounded numerical responses under ratio instructions (Moskowitz & Sidel, 1971). All these hedonic ratings are "folded"

(Coombs, 1964) around peak preference ("break point" or ideal) in a curve which is not usually considered to fit a mathematical equation and so the ideal point cannot be estimated accurately. Mere visual estimation relies unduly on the factor levels tested nearest the peak. Indeed, as in so much psychophysics, apparent despair at the variability within individual subjects reduces most investigators to the manoeuvre of pooling individuals' preference functions into a "group function" which is both logically dubious and liable to flatten the peak even more by including individuals with monotonic functions (e.g., Bertino, Beauchamp, & Engleman, 1982; Riskey, Parducci, & Beauchamp, 1979; Thompson, Moskowitz, & Campbell, 1976; Trant, Pangborn, & Little, 1981). Frijters and Rasmussen-Conrad (1982) made the advance of specifiying a linear equation for the preference function, by substituting a linearised psychophysical power function (log intensity against log concentration) into a linear "psychohedonic" function (distance of intensity from ideal, against log intensity). They could then estimate a peak preference (and preference slope) for each person by linear regression over all the individual's data (which is a major merit also of our procedure).

McBride (1982) presented his assessors sucrose-concentration ranges narrow enough to stay well within the limits of the graphic continuum provided for rating ideal-relative intensity, thus avoiding end-effects. However, he demonstrated the existence of centring bias when he presented several solutions in one session. McBride pointed out that this bias could be avoided by presenting a stimulus range that centred ratings on the response dimension, as recommended by Poulton (1979).

However, Frijters and Rasmussen-Conrad (1982) used the very wide range of factor levels that is conventional in psychophysics (2–45% sucrose). Numerical responses which range over two or three orders are generated by rating so much of the sweetness dimension. Such ratings are liable to logarithmic bias: even under ratio instructions, 9 and 10 may seem closer than 90 and 100 (Torgerson, 1958). Indeed, ratio ratings can often be approximated to distance ratings by logarithmic conversion (Birnbaum, 1982). That is why Frijters and Rasmussen-Conrad obtained very high correlations with log concentrations of sucrose when they took the logarithm of their intensity ratings—although it must be noted, against the assumption of a power function, that almost any monotonic data can be linearised *ad hoc* by a log–log plot (McBride, 1983 a; Uttal, 1973).

Frijters and Rasmussen-Conrad obtained ratings by Stevens' (1957) "magnitude estimation" procedure, under ratio instructions. S. S. Stevens claimed that this directly measured the intensities of sensations but Poulton (1968, 1979, 1981) has repeatedly pointed out the dangers of a "pseudo-psychophysics" arising from Stevens' arguments. The only cogent rationale that has been offered for asking assessors for ratings in ratio on an unbounded number series is the danger of end-effects at either extreme when a category series is bounded (Moskowitz, 1982). Yet the risk of end-effects arises only if the stimulus range and the extreme response categories are not adequately co-ordinated. Furthermore, it is only the factor levels within a tolerable distance from the ideal for an individual rater (and indeed within the marketable range) that are relevant in applied psychophysics (i.e., the sensory testing of products' physicochemical characteristics). Our procedure is designed to focus on this practical range, avoiding end effects and also minimising other biases to which any rating procedure is subject.

When the measurement properties of category ratings are independently assessed, e.g. by Thurstone's (1927) principles, by functional measurement of mixed (additive and multiplicative) models (Anderson, 1982) or by comparison with indirect scales such as Fechner's (1860) accumulation of just noticeable differences (McBride, 1983 b), then such distance or position rating proves to be linear. Hence it is the ratio-instructed rating that is biased and there is no evidence for a psychophysical "Power Law". That is not to suggest the existence of a psychophysical Log-Linear *Law*, however. A psychophysical function from category ratings could indeed turn out to be linear in the logarithm of the physical variable but, at best, this is to be expected only in cases where a physical unit can be found which gives a stimulus range over which there is approximate constancy in the Weber fraction (the difference threshold divided by the mean of those levels that are just discriminable). This use of Fechner's (1860) principle, that sensory strengths are based on sensory differences, resolves the problem posed by Weiss (1981) and Myers (1982) that the choice of physical measurement units is arbitrary. In the case of tastants, including sucrose and sodium chloride (in pure solution at least), Schutz and Pilgrim (1957) showed that, in concentration units, the Weber fraction is constant except at the lowest and highest levels. Therefore, in the middle range, the psychophysical function for sucrose or salt should be linear when unbiased intensity ratings are plotted untransformed against the logarithm of concentration (see McBride, 1983 b). Although Frijters and Rasmussen-Conrad (1982) used magnitude estimation for simple intensity rating, they used for their ideal-relative intensity rating the three-category continua we are advocating. Their correlations of the untransformed ratings with log concentration were not as high as those for the log magnitude estimates, but that could be because of serious end-effects, arising from the wide stimulus range presented.

Thus, in theory we should obtain linear semi-log preference functions, 1. if we take logs in physical units for which the preference factor has a constant Weber function over the tested range (i.e., concentration units for NaCl) and 2. if we collect ratings of the distance of a sample's saltiness from ideal that are not biased (a) by the tasting of a sample that would be rated near either extreme category, (b) by the selection of a set of samples that generates a mean of the ratings that is off the mid-category (Poulton, 1979) or uneven distribution of ratings over the range tested (Parducci, 1963), or (c) by any memory effects from expectations of sample repetition (Teghtsoonian & Teghtsoonian, 1983).

Method

Materials

Soup

This was prepared from ingredients in the following proportions: 1 lb of tomatoes, one onion, one tablespoon of corn oil and $\frac{1}{4}$ pint of distilled water. The onion was diced and gently fried in the oil for 5 min. Chopped tomatoes were added and, after a further 5 min, the distilled water was poured in. The soup was brought to boiling point and allowed to simmer for 15 min. After cooling, the soup was liquidised in a kitchen blender and strained through a coarse wire mesh. The above quantities made 1 pint of unsalted tomato soup.

Batches of unsalted soup were thoroughly mixed and the single batch divided into 2-pint portions. Analytical grade anhydrous sodium chloride was weighed into volumetric flasks in the appropriate amounts and soup added to the volume mark, to give added salt concentrations of 0·26, 0·39, 0·59, 0·88, 1·33, 2·00, 2·33, 3·00 and 3·50 g per 100 ml of soup (i.e., concentration ratios of about 1·5, plus two interpolations at high levels). The salt content of the unsalted soup was calculated from food tables to be 0·003%.

The soups were stored in $\frac{1}{2}$–1-pint portions at −18°C until use. Just before a testing session, appropriate amounts of the various salt concentrations were warmed to 60°C in a thermostatically controlled waterbath. About 20 ml of a soup was served into a small beaker immediately before tasting.

Bread

This was prepared at the Lord Rank Research Centre, High Wycombe. Six white bread doughs were mixed, containing salt to flour percentages of 0·54, 0·89, 1·50, 2·50, 3·57 and 4·14, the yeast being increased with the salt level to sustain normal rise. These salt levels were chosen to give three levels above and three below the usual level currently of about 2%, ranging to the readily practicable extremes in ratios of 5/3 except at the highest levels. Under standard conditions, dough weights of 900 g were proved, baked in long-loaf lidded tins, cooled, medium-sliced and wrapped. Assuming a normal loss of weight as water during baking, the final concentrations of sodium chloride were about 0·3, 0·6, 1·0, 1·7, 2·4 and 2·7 g per 100 g of bread.

The wrapped loaves were kept at −18°C from the evening of baking and slices removed on the day they were required for testing. One-eighth (about 3·5 g) of a slice was tasted at room temperature without addition of any spread.

Subjects

Thirty male undergraduates participated. They came from Departments of Psychology, Mathematics, Economics and Law in the University of Birmingham and had had no previous experience of sensory testing or psychophysical experiments. They ranged in age from 19 to 28 years and all appeared to be in good health.

Procedure

Participants were informed that the experiment involved tasting two different types of food on two consecutive days. Half the subjects tasted bread on the first day and soup on the second day; the other 15 had the reverse sequence. The experimenter took each sample in turn to be tasted from an array of stocks hidden from view to the assessor. There were no sample labels or other indications as to how many varieties of the day's test food were to be presented, or whether or not any particular variety was to be presented more than once. The assessor tasted the sample, rated it, and rinsed his mouth with water in preparation for the next sample, following his own pace.

Rating response mode

Ratings were recorded by a pencil mark across a horizontal line 100 mm long on a slip of paper, which was then collected by the experimenter. At the left-hand end of the graphic analogue were the words "not nearly salty enough"; at the right-hand end was the descriptor "much too salty". A vertical mark at the mid-point of the line was labelled "just right". The distance of each response mark from the ideal point was measured to the nearest millimetre, scores to the right being taken as positive and to the left negative.

Assessors were instructed to mark the line at the point which they considered best described their opinion of the sample's saltiness level. To emphasise the ordinary meaning of the polar descriptors, it was stated that it was not expected that either extreme end of the line would be experienced.

Stimulus Selection

Stimulus selection by the experimenter was arranged to minimise biases while not putting any constraint on the assessor's choice of response. The first test food sample in a day's session was one of the two on either side of the salt level generally found in currently marketed white breads and packet tomato soups in the U.K. As a first step towards minimising range bias, the second sample was chosen with a salt level that could have been expected to be rated on the other side of ideal from the first sample. (For example, if the first rating was slightly below ideal, the next higher salt level was tested second. If the first rating was substantially above ideal, to take another example, then the second sample was two salt levels lower than the first.)

The experimenter attempted to select salt levels for subsequent samples that continued the alternation of responses on either side of ideal. The third and fourth samples (and, if necessary, subsequent samples) were chosen to extend the range of responses towards each extreme. However, the experimenter endeavoured to avoid the presentation of a salt level that was liable to elicit a rating in the extreme 10–15 mm at either end of the continuum. Occasionally one of the first few samples did elicit an extreme response from a subject and the previous ratings proved to be grossly inconsistent with subsequent ratings of other samples of the same salt levels; this was taken as evidence of an abrupt re-scaling by the assessor and the initial discrepant ratings were discarded from analysis.

As soon as the experimenter had determined the range of the available salt levels to which a particular assessor gave a wide range of responses that were as similar in distance on each side of ideal as practicable, interpolations and replications within that stimulus range were presented. Stimuli were selected so that the mean rating score from the session would be approximately zero, in order to minimise centring bias (Poulton, 1979). So far as practicable with the limited number of salt levels ready prepared, this centring of the mean response was achieved by an even distribution of replicate ratings over the response range, to minimise frequency bias in any part of the range (Parducci, 1963). At least two tests of each salt level were given at the response levels at some distance from ideal, because the ideal point and slope were to be determined by linear regression, in which the extremes would be influential.

The procedure can be specified in formal algorithms. However, until on-line computerised guidance in stimulus selection has been programmed, it is much easier for the experimenter to choose informally than to follow formal rules. The effects of different experimenter-judged strategies or of differing programmed algorithms remain to be studied.

Salt-use Questionnaires

Each assessor completed two questionnaires after the food tests in the second session. The first was a "Food Survey" assessing the frequencies with which salt-containing foods were eaten and the addition of salt at the table (Shepherd, Note 1; Thompson, Shepherd, Land, Griffiths, & Booth, Note 2); individual average daily salt intake was estimated from the responses, using standard food portion sizes and food composition tables. At the time of writing, this method of intake estimation has not been fully validated and so intake values are not reported here but are used merely to rank assessors for estimated salt intake.

The second questionnaire was a 20-item inventory designed by Maller, Cardello, Sweeney & Shapiro (1982) to assess habits of salt and sugar usage (five questions each) and attitudes to the health effects of dietary salt and sugar (also five items each). Each question had a ten-category response choice for degree of self-attribution of the practice or opinion.

RESULTS

Linearity of Ideal-relative Saltiness Functions

Figure 1 gives raw data from a representative selection of individual assessors. The sequence of stimulus presentations is numbered beside the data points to illustrate the nature of experimenter decisions on stimulus selection and the absence of any biasing effect on the responses.

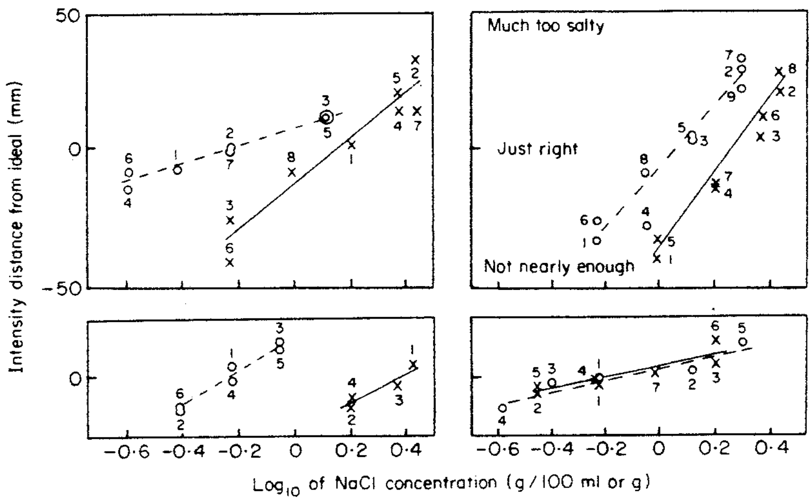

FIGURE 1. Four contrasting individual assessors' ratings of tomato soup (-○-) and bread (-×-) for ideal-relative intensity of saltiness. The raw data are plotted on identically scaled ordinates against the logarithm to the base ten of salt concentration (%). The number beside each rating represents its position in the sequence in which the stimuli were presented in each test session for that assessor.

All least-squares mean regression fits were statistically reliable ($ps < 0{\cdot}05$). All regression slopes were significantly greater than zero (ten breads and five soups $ps < 0{\cdot}025$, the remainder $ps < 0{\cdot}005$, one-tailed) except for a soup session with one assessor (whose prior bread session's slope was highly significantly above zero).

The stimulus sets for 23 of the assessors included at least two salt levels above the assessor's ideal and at least two salt levels below ideal. In no case was the above-ideal regression slope or intercept significantly different from the below-ideal regression. That is, whether or not lack of salt had the same perceptual characteristics as an excess of salt, in these cases of bread and tomato soup the linear preference functions operate unitarily above and below ideal.

There was no statistically significant sequence effect on either the interpolated ideal saltiness levels or the regression slopes (Table 1). This supports the notion that our procedure requires no training and shows no substantial learning or adaptation effects.

TABLE 1

Individuals' food salt preference parameters, in the two sub-groups ($Ns = 15$) differing in the sequence in which the two foods were tested

Parameter	Food tested	Sub-group: Soup first Mean	*SD*	Bread first Mean	*SD*
Ideal salt level	Soup	−0·21	0·23	−0·22	0·23
($\log_{10}$ % NaCl)	Bread	−0·07	0·15	0·11	0·16
Regression slope	Soup	88	39	97	45
(mm/log %)	Bread	75	31	112	65

Re-test Stability

Ideal point for bread in a test after five months correlated with the initial test's ideal point in the assessors who were available for re-test ($r = 0{\cdot}59$, df $= 10$, $p < 0{\cdot}05$). The slopes of the regressions from the two tests also correlated ($r = 0{\cdot}75$, $p < 0{\cdot}01$). Indeed, the hypothesis-testing but statistically insensitive procedure of fitting the individual's first regression equation to his data five months later gave no significant chi-squared values for poor fit. In addition, the group mean values of the ideal points and regression slopes did not change significantly ($p > 0{\cdot}1$). This degree of stability in individual preference parameters on an uncontrolled diet does not of course mean that the parameters could not be altered if salt intake (or other influences) were changed substantially (Bertino *et al.*, 1982). The stability over two tests under conditions involving uncontrolled differences in recent eating, and at such a distance in time, is an indication of considerable reliability in the advocated assessment procedure.

Relations amongst Preference Parameters

Individual's ideal points for salt levels in soup and bread were significantly correlated (Table 2). There may therefore exist a preferred level of salt in foods generally that is characteristic of an individual. Nevertheless, idiosyncratic patterns of salt preference over different foods should also be expected. A menu context and the test food matrix itself (as here) would tend to produce different ideals in different foods, even if levels correlated across individuals.

TABLE 2

Ranked correlations among assessments of food salt preference

	Soup ideal	Bread ideal	Soup slope	Bread slope	Salting habits	Salt and health
Bread ideal	0·48**					
Soup slope	0·14	0·06				
Bread slope	0·05	0·38*	0·63**			
Salting habits	0·02	0·3	0·23	0·25		
Salt and health	0·06	0·23	0·14	0·21	0·05	
Salt intake	0·17	−0·06	0·02	−0·15	0·24	−0·14

** $p < 0{\cdot}01$, * $p < 0{\cdot}05$ (28 df).

Individuals' ideal points for bread saltiness correlated significantly with individuals' values for the gradient of the ideal-relative intensity function (Table 2). However, soup saltiness ideals did not correlate with slope of the soup function. This difference between test foods provoked inspection of the raw data from bread assessments for a ceiling artefact, for example high slopes induced in assessors with high ideal-points by the limited range of saltier breads available for presentation; however, all the individuals with preferences for higher salt levels in bread had given responses balanced around ideal and the slopes below ideal did not appear to be any lower than those above ideal.

The gradients for bread and soup regressions also correlated significantly, suggesting a tolerance parameter of some generality (Table 2). Nevertheless, when the difference between each individual's bread and soup regression gradients was tested, it was significant in a substantial minority of individuals: $ps < 0{\cdot}01$ for 7, $Ps < 0{\cdot}05$ for 4.

Preferences and Reported Salt Habits, Health Concern and Intake

Factor analysis of the assessors' responses to Maller *et al.*'s (1982) questionnaire yielded four principal components after rotation. Four of the five questions about the effects of salt on health loaded most highly (0·59–0·77) on the first factor (42·2% of variance): so the sum of the responses to these items (numbers 4, 6, 7 and 9) was used as a "salt and health" score. Four of the five questions about habits of salt usage (numbers 2, 3, 5 and 10) loaded most highly (0·52–0·78) on the second factor (30·9%): their sum was used as a "salting habits" score. As these scores were derived from orthogonal factors, their inter-correlation was of course low (Table 2).

Individual's preference function parameters did not correlate significantly with either their habits or health scores (Table 2). (Correlations were still lower with the sums of all five of each type of question.)

Only a preliminary interpretation of the food frequency questionnaire responses is available at the time of writing (Thompson *et al.*, Note 2). The resulting absolute estimates of salt intake are currently being validated. However, the estimates are likely to be ordinally valid and so correlations with the other dietary salt preference assessments are presented in Table 2. There were no significant correlations but the highest correlation coefficient was between salt intake rank and the salting habits score: this was consistent with the finding by Maller *et al.* (1982) that responses to the question "Do you salt food before tasting?" (number 2) correlated significantly with salt intake at test lunches.

It would perhaps be unreasonable to expect a preference for high salt levels in one food (or several foods), or an intolerance of deviations from ideal, to correlate with average daily salt intake. Sodium intake depends on a great variety of sodium salt-containing foods, and sodium ions make little or no contribution to the taste of some of them (e.g., milk). In the event, only soup ideals showed the slightest correlation with salt intake (Table 2). Therefore the individual's reported intake frequency of bread in particular was correlated with the difference between his bread salt ideal value and the usual salt level in sliced white bread on the market. Although either a contextual effect of normal diet on test ideal (Riskey, Parducci, & Beauchamp, 1979) or an effect of ideal on the amount of bread eaten (Pangborn & Pecore, 1982) is likely to be blurred by effects of salt in the spreads normally eaten on bread, a marginally significant correlation was obtained ($r = 0{\cdot}36$, $df = 28$, $p = 0{\cdot}05$).

Discussion

Robust linear functions of ideal-relative saltiness on the logarithm of concentration of salt in bread and a soup were obtained from a remarkably small number of simple taste and rating tests. This can be taken to vindicate the theoretical considerations on the basis of which the procedure had been designed.

Our results also indicate that the distance ratings in any one direction from ideal could prove to be an interval scale with a true zero (the ideal point), i.e., ratings possessing full ratio and difference properties under these conditions of minimised bias. When the scales below and above ideal are identical, as appears to be the present case, the ratings may in addition measure a unitary perceptual dimension with real positivity and negativity (although it may be arbitrary which side of that psychological scale is assigned to positive).

This determination of an individual's preference function for a factor requires the testing of samples varying in known amounts of the factor, unconfounded with any labelling (a psychophysical design). Yet the procedure may prove to be sufficiently robust to test variations of a food product without well-spaced factor levels, so long as the levels are approximately balanced around ideal and not too far from it. In contrast to the usual assumptions in psychophysics, the precision of the results probably depends on testing familiar foods, i.e., factor variations in complex media, not simple aqueous solutions. Of course, the inclusion of additional factors (whether physical characteristics or contextual attributes) in samples for ratings or behavioural tests is liable to interact with the influence of salt per se. Two- or three-factor designs using the same rating procedure in a multivariate mode would permit equally robust tests of multidimensional preference models.

The relation of the ideal salt levels to everyday food selection behaviour remains to be tested. Possibly both the ideal point (or intercept) and the slope of an individual's regression line for relative strength of a factor could be simply scaled onto the equivalent function derived from realistic tests of choices between versions of a product varying in factor level: the two functions might be identical, in ideal point even if not slope. The slope of the rating could differ from the slope of the choice behaviour because of explicable differences between the two tasks (Blamires, 1981; Fishbein & Ajzen, 1976). Both the behavioural and the symbolic preference slopes are likely to differ from the slopes of the log-linear saltiness intensity functions. Teghtsoonian and Teghtsoonian (1982) have presented evidence that individual variation in the slopes of memory-free intensity functions is very small. Indeed, the between-individual variabilities of ideal points and of tolerance slopes in Table 1 here are sufficiently greater than the variability of comparable category ratings of intensity in McBride (1983 b), for example, to suggest that we are measuring preference variations on top of any perceptual variations. If this hypothesis were supported by data of both types provided by the same group of assessors, that would further confirm the potential relevance of our assessment procedure for better quantified collection of consumer-preference data to be aggregated in order to predict market response to a product (cp., Silk & Urban, 1978).

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Received 29 June, 1983; revision 13 September, 1983