

Understanding Consumer Usage of Product Magnitudes through  
Sorting Tasks

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Abstract

Magnitudes describing product attributes are basic elements used in decision making. Although several researchers have emphasized the need to understand how consumers categorize product attributes, empirical research on this issue is rare. As a first step in developing and evaluating methodologies to examine this issue, a sorting task methodology is introduced to study this problem. Hypotheses were generated to address important theoretical issues relating to how consumers use magnitudes describing product attributes and tested in two studies. The results suggest that the number of magnitudes used by consumers to think about product attributes (i) is higher for abstract when compared to concrete attributes, and (ii) is positively related to the number of magnitudes used in an overall evaluation of liking. Results also provided evidence to support the use of the sorting method.

Although consumer and marketing research has long emphasized the importance of how consumers store and use attribute information toward understanding judgment and choice processes (Alba & Hutchinson, 1987; Monroe, 1973; Park, 1978), empirical research on this issue is rare. Past research has focused on how consumers combine attribute information to evaluate and choose among brands and how consumer memory is organized around brands and attributes. There is comparatively little research that aims specifically at how consumers process magnitude information on product attributes, the basic input to decision making. There are also a limited number of methodologies that have been employed to study this question. Our goals are to examine the applicability of a sorting task to study this question by studying the relationship between the number of magnitudes used by consumers to think about product attributes and (i) the concreteness-abstractness of attributes, and (ii) the number of magnitudes used to think about overall liking for products. Following literature review and hypothesis development, two studies that use the sorting task to test hypotheses are presented.

#### **COGNITIVE REPRESENTATIONS OF PRODUCT MAGNITUDE INFORMATION**

Consumers cognitively represent or describe products internally, with the use of a variety of features and dimensions that vary from the concrete to the abstract (Johnson & Fornell, 1987). Consumer and marketing researchers typically employ a variety of scaling and analytical methods, from multidimensional scaling and clustering to factor and discriminant analysis, to help understand the underlying nature of these representations. Of particular interest is how consumers represent and use magnitude information when categorizing descriptive product

attributes (Park, 1978) which has a direct bearing on the outcome of judgment and choice processes.

In an early study, Park (1978) argued that consumers recode complex information along a dimension into chunks or categories, thereby conserving their capacity to process information (e.g., "unacceptable" if gas mileage < 15, "acceptable" if gas mileage is between 15 and 25, and "excellent" if gas mileage > 25). Park and Lessig (1981) also argue that consumers may categorize information along a dimension into categories (i.e., magnitudes) whose breadth may vary (referred to as perceptual category breadth). The number of magnitudes or categories used will depend on the amount of cognitive effort needed or desired to perform the task. Similarly, Viswanathan and Childers (1992) argue that consumers derive verbal-like categories from numerical information to conserve processing capacity in encoding and using attribute information.

The use of magnitudes or categories is directly related to the distinction in research on proximity judgments between features and dimensions (Tversky, 1977). Whereas features are dichotomous or categorical attributes that an object either has or does not have (e.g., sweet or not sweet), dimensions are attributes that vary as a matter of degree (e.g., a level of sweetness). Of particular interest in consumer research on this topic is how cognitive representations change with abstraction. Johnson and Fornell (1987) argue that the more abstract the attribute used to describe a product or service, the more dimensional the attribute or the greater the number of possible magnitude differences it contains. They report on three studies

which support the increased use of "dimensions" versus "features" for more abstract attributes. However, in a subsequent study, Johnson, Fornell, Lehmann, & Horne (1992) demonstrate that even though the more abstract attributes are inherently more continuous or dimensional, they are processed categorically as nested features.

The proximity judgment research certainly provides a theoretical basis to suggest that consumers should use a greater number of magnitudes to distinguish among products on an abstract when compared to a concrete attribute. Within a cost-benefit framework, information processing effort is expended until the costs of processing information exceed the benefits (Beach & Mitchell, 1978). This cost-benefit trade-off may be explicit or simply learned over time. Abstract attributes are inherently more dimensional or continuous because they integrate and summarize a larger number of concrete attributes (Johnson et al., 1992). Compared to concrete attributes, therefore, consumers should use a greater number of magnitude categories to process more informative abstract attributes. Johnson and Fornell (1987) used attributes from subordinate versus superordinate categories to operationalize concreteness versus abstractness to show support for their predictions. With the use of a similar line of reasoning, we hypothesize the following.

**H1:** A larger number of magnitudes will be used for abstract attributes when compared to concrete attributes.

A second hypothesis relates magnitude representation along attributes to overall liking. The number of magnitudes a

consumer uses for any given attribute should also depend directly on the task being performed (Payne, 1982). Specifically, if consumers want to make a greater number of magnitude estimations in their overall liking or preference for a stimulus, then a greater number of magnitudes are required from the constituent attributes used to form the overall evaluation. Consumers may store and use magnitude information along product attributes with the use of a larger number of magnitudes if they tend to be more discriminating in terms of overall liking.

**H2:** The number of magnitudes used for an attribute will be positively related to the number of magnitudes used in overall liking.

## **SORTING TASK METHODOLOGY**

This article explores the applicability of a sorting task method to address these hypotheses. Aside from the scaling and analytical methods mentioned earlier, several more direct methods have been employed in past research. Johnson and Fornell (1987) used both third-party classifications of attributes as features or dimensions as well as similarity scaling results to infer feature dimensionality. Johnson *et al.* (1992) asked subjects to self-report attributes and rate them on whether they were features or dimensions. Viswanathan, Childers, and Nagaraj (1995) suggest eliciting magnitude estimates of products or their verbal descriptions along attributes, identifying clusters of magnitude estimates, and inferring the number of magnitude categories used. Park and Lessig (1981) used a 21-point scale to reflect the degree of satisfaction with various levels of

magnitudes on a dimension and computed the number of categories used by respondents.

A sorting task provides researchers with a valuable alternative to these methodologies. Traditionally, sorting tasks have been used to minimize the burdens placed on respondents as when compared to paired comparison proximity judgments (Rao & Katz, 1971). However, a sorting task has several characteristics that make it a very suitable alternative for examining how consumers think about product attributes, and specifically magnitude estimation. Foremost, a sorting task is a natural way of revealing a respondent's internal perceptions or knowledge base (DeSarbo, Jedidi, & Johnson, 1991). A sorting task is open-ended, and, unlike category scaling, does not impose a certain number of categories on the respondents. And unlike the methods described above, where magnitude representations are often inferred, a sorting task assesses the number of magnitudes consumers use to think about product attributes directly.

Sorting tasks have also been employed gainfully in a variety of psychological studies on breadth of categorization. Breadth of category has been defined as "the range of stimuli that are placed in the same class or category and share a common label" (Bruner & Tajfel, 1961, p. 231). A task used in breadth of categorization requires subjects to sort objects into categories or groups on a specified dimension (Block, Buss, Block, & Gjerde 1981). The number of categories or groups employed in sorting has been used as a measure of conceptual differentiation (Gardner & Schoen, 1962). The categorization of objects on a specified dimension provides a means of

understanding the number of groups used to think about a continuum. With the use of a similar approach for a product-attribute continuum, the sorting of products on specified attributes is used here.

## **METHOD**

### **Study 1–Procedures**

In past research that has employed the sorting task, subjects have been instructed to sort objects into groups that go together based on certain dimensions (Block *et al.*, 1981). A similar approach was employed here, wherein a particular attribute was specified and subjects were asked to sort products/brands into groups that go together. Subjects were instructed that they could use any number of groups that seemed appropriate to them. The instructions also emphasized that subjects should perform the sorting only along the specified attribute. In a pretest, subjects were required to sort brands of candy bars. Written descriptions of how subjects performed the sorting and responses to scales completed by subjects after each sorting task suggested that they were adhering to instructions and performing the task with relative ease.

The product categories (four in all; candy bars, snack foods, soft drinks, and beverages), the specific products (12 in each category), and the attributes used for each product category (three attributes for each product category for a total of 12 product-attribute combinations: crunchiness, chocolatey flavor, and caramel flavor for candy bars, sweetness, saltiness, and “how good a snack” for snack foods, sweetness, caffeine

content, and "how refreshing" for soft drinks, and sweetness, coldness, and "how refreshing" for beverages) were chosen from past research (Johnson *et al.*, 1992). Respondents elicited lists of attributes for each product in each product category, and the three most frequently elicited attributes for each category were selected for this study. The four categories consisted of two sets of subordinate-superordinate pairs, candy bars-snack foods, and soft drinks-beverages. Therefore, concrete versus abstract attributes were operationalized as attributes in subordinate versus superordinate categories, respectively.

One hundred twenty students from a Midwestern university participated in the study. Each subject sorted each of the four different product stimulus sets (i.e., candy bars, snack foods, soft drinks, and beverages) on the basis of a specified attribute for each category (such as sweetness of soft drinks, caffeine content of beverages, etc.), with the attributes used for each product category being different across the three groups of subjects. One attribute for each category mentioned above was selected to form a set of four attributes, and three such sets were formed. Three groups of 40 subjects each completed a questionnaire corresponding to each set. The four categories consisted of two sets of subordinate-superordinate pairs. Therefore, the concreteness- abstractness of attributes was manipulated within subjects. A constraint in choosing attributes to comprise a set was that similar attributes were not included in the same set (e.g., sweetness of candy bars and sweetness of snack foods), to minimize lack of independence across sortings. The sequence of categories for sorting were counterbalanced within each set with the constraint that no two categories from a subordinate-superordinate pair were presented



in a consecutive sequence. On this basis, eight versions of the questionnaire were prepared for each set of 40 subjects, with 50 subjects being assigned to each version.

Subjects were presented with a list of 12 products and asked to indicate groups by writing names of products that belonged in a group and circling them. After each sorting, subjects wrote descriptions of how they performed the sorting task. Subjects then completed scales relating to the sorting task, and their knowledge about the category. Finally, subjects rated the importance of each of the three attributes in selecting a candy bar and also ranked them in the order of importance.

### **Study 1—Results**

The sorting task was assessed by examining the written descriptions provided by subjects and responses to scales after each sorting. Written descriptions suggested that subjects were adhering to the instructions in performing the sorting on the specified attribute. The average of the mean responses for each of several scales across the four sorting tasks were computed. Responses to scales suggested that subjects were adhering to instructions in performing the task by concentrating on the specified attribute (7.67 on a 10-point scale labeled "Not at all"—"Exclusively"), a central requirement in order to assess the number of groups used for a specific product attribute. Means for responses to several scales appeared to be satisfactory; subjects' confidence in completing the sorting task (7.00 on a 10-point scale labeled "Very low"—"Very high"), knowledge of the products sorted (7.24 on a 10-point scale

labeled "Very low"- "Very high"), experience with the products sorted (7.17 on a 10- point scale labeled "Very low"- "Very high"), motivation to perform the sorting task (5.66 on a 10- point scale labeled "Not at all motivated"- "Very motivated"), and ease in performing the sorting task (6.85 on a 10- point scale labeled "Very difficult"- "Very easy").

Past research in psychology using sorting tasks has demonstrated individual differences in breadth of categorization (cf. Block *et al.*, 1981). Similarly, individual differences may also exist in sorting products along attributes. Therefore, the sorting task was also assessed by treating the number of groups that subjects sorted products into for each of the four sortings as items in a multiple-item scale. Moderate intercorrelations between these items (average intercorrelation = 0.46) and a moderate reliability for the four-item scale (average coefficient alpha = 0.77) point to the existence of individual differences in sorting, consistent with past research.

The mean number of groups employed for each product-attribute combination was computed across subjects and ranged from 2.75 to 4.18 for the 12 product-attribute combinations (see Table 1). A 3 (sets of attributes; between subjects) by 2 (subordinate versus superordinate category level; within subjects) by 2 (replication of subordinate versus superordinate product category pairs, i.e., candy bars-snack foods and soft drinks-beverages; within subjects) factorial ANOVA was performed on the number of groups formed from sorting tasks. A significant main effect was obtained for category level  $CF(1,115) = 33.48; p < .001$ , with a higher mean for the superordinate categories

(mean for superordinate categories = 3.78; mean for subordinate categories = 3.27; Table 1). Such a pattern of results provides support for HI.

HI is also supported for each subordinate-superordinate pair. For candy bars-snack foods, a significant effect was obtained for category level  $CF(1,115) = 28.84$ ;  $p < .001$ ) with a higher mean for the superordinate category (mean for superordinate category of snack foods = 3.86; mean for subordinate category of candy bars = 3.28; Table 1). For soft drinks-beverages, a significant effect was obtained for category level  $CF(1,115) = 13.40$ ;  $p < .001$ ), with a higher mean for the superordinate category (mean for superordinate category of beverages = 3.71; mean for subordinate category of soft drinks = 3.27; Table 1). The results support the hypothesis that a larger number of magnitudes is used for abstract attributes (i.e., attributes of a superordinate product category) when compared to concrete attributes (i.e., attributes of a subordinate product category). Study 1 also provided evidence in support of the use of the sorting task in this context.

## **Study 2**

The aim of the second study was to test H2, that the number of groups used to sort products on specific attributes will be positively related to the number of groups used to sort products on the basis of overall liking. Two product categories were chosen from Study 1, candy bars and soft drinks, with three attributes each for candy bars (i.e., caramel flavor, chocolatey flavor, and crunchiness) and soft drinks (i.e., caffeine content, sweetness, and how refreshing a soft drink is).

One hundred and fifty undergraduate students at a Midwestern university completed a questionnaire. Subjects completed a sorting task based on overall liking for candy bars, where the instructions asked them to sort products "into groups that go together on the basis of how much you like them" to test H2 about overall liking. This was followed by three attribute sorting tasks where subjects sorted the candy bars on each of three attributes: caramel flavor, crunchiness, and chocolatey flavor. In Study 1, subjects were asked to sort products into groups that go together along specified attributes. However, in Study 2, subjects were asked to sort products on a specific attribute as they would if they were deciding how much they like each candy bar. This change was incorporated in the procedure in order to measure the number of groups used by respondents in the context of deciding how much they liked each brand. After each sorting task, subjects completed the same scales as in Study 1 and the procedure was then repeated for the product category, soft drinks.

As in Study 1, the sorting task was assessed by examining responses to scales, and was found to be satisfactory. As in Study 1, the sorting task was also assessed by treating the number of groups that subjects sorted products into for each of the six sortings as items in a multiple-item scale. Consistent with Study 1, moderate intercorrelations between these items (average intercorrelation = 0.45) and a moderate reliability for the six-item scale (average coefficient alpha = 0.83) point to the existence of individual differences in sorting.

The mean number of groups employed for each product-attribute combination was computed across subjects as in Study 1. Some of the means were significantly less than the means in Study 1 (Table 1), perhaps due to the use of a decision-making context in Study 2, that is, a more specific context.

H2 was assessed by computing correlations between the number of groups used in sorting along a specific attribute and sorting on the basis of overall liking. For candy bars, the correlations between overall liking and caramel flavor, crunchiness, and chocolatey flavor were 0.35, 0.39, and 0.40, respectively, all significant at the .01 level. For soft drinks, the correlations between overall liking and caffeine content, "how refreshing" a soft drink is, and sweetness, were 0.31, 0.45, and 0.49, respectively, all significant at the .01 level. Therefore, H2 was supported for all attributes.

### **Study 3**

The aim of Studies 3 and 4 was to test H2 with the use of a different set of product attributes when compared to Study 2. In Study 3, three product categories were chosen, namely, lunch products, snack foods, and beverages. Two attributes each were chosen for each product category: calorie content and sweetness. These two attributes were listed by respondents as being relevant for each of the three product categories; that is, lunch products, snack foods, and beverages, in past research (Johnson *et al.*, 1992). Ninety undergraduate students at a midwestern university completed a questionnaire. Subjects first completed sortings of lunch products on calorie content, sweetness, and overall liking with identical instructions as in

Study 2. After each sorting task, subjects completed some of the scales relating to the task that were used in earlier studies. The procedure was repeated for snack foods and then beverages.

As in earlier studies, analyses of responses to scales that assessed the sorting task provided support for the use of this method. H2 was assessed by computing correlations between the number of groups used in sorting along a specific attribute versus overall liking, as in Study 2. For lunch products, the correlations between overall liking, and calorie content, and sweetness, were 0.15 and 0.34, respectively, with only the latter correlation being significant at the .01 level. For snack foods, the correlations between overall liking and calorie content, and sweetness, were 0.14 and 0.26, respectively, with only the latter correlation being significant at the .05 level. For beverages, the correlations between overall liking and calorie content, and sweetness, were 0.45 and 0.46, respectively, both significant at the .01 level. Therefore, H2 was supported at a significant level and/or in terms of directionality for all attributes. The correlation for mean number of groups for sortings across six product attributes and sortings based on overall liking across three product categories was 0.42, significant at the .01 level. This pattern of results suggests that consumers who are more discriminating about product attributes may also tend to be more discriminating in overall judgments. The mean number of groups used in sorting products on overall liking are presented in Table 2.

#### **Study 4**

In Study 4, the same three product categories were chosen as in Study 3, namely, lunch products, snack foods, and beverages. Two attributes each were chosen for each product category: fat content and healthiness. Forty undergraduate students at a Midwestern university completed a questionnaire. Subjects first completed sortings of lunch products on fat content, healthiness, and overall liking with identical instructions as in Study 2. After each sorting task, subjects completed scales on the sorting task as in Study 3. The procedure was repeated for snack foods and then beverages. Next, subjects rated the importance of each of the attributes in selecting lunch products, snack foods, and beverages.

As in earlier studies, analyses of responses to scales that assessed the sorting task provided support for the use of this method. H2 was assessed as in Studies 2 and 3 by computing correlations between the number of groups used in sorting along a specific attribute versus overall liking. For lunch products, the correlations between overall liking and fat content, and sweetness, were 0.35 ( $p < .05$ ) and 0.41 ( $p < .01$ ). For snack foods, the correlations between overall liking and calorie content, and sweetness, were 0.54 and 0.46, respectively, both significant at the .01 level. For beverages, the correlations between overall liking and calorie content, and sweetness, were 0.72 and 0.82, respectively, both significant at the .01 level. Therefore, H2 was supported at a significant level for all attributes. The correlation for mean number of groups for sortings across six product attributes and sortings based on overall liking across three product categories was 0.83, significant at the .01 level. These results suggest that consumers who are more discriminating about product attributes

may also be more discriminating in overall judgments. The mean number of groups used in sorting products on overall liking are presented in Table 2.

## **GENERAL DISCUSSION**

Although several researchers have emphasized the need to understand how consumers categorize product attributes, empirical research on this issue is rare. As a first step in developing and evaluating methodologies to examine this issue, this study used a sorting methodology to assess two hypotheses. These hypotheses address important theoretical issues about how consumers use magnitudes describing product attributes and were tested in four studies. In terms of substantive predictions, the number of magnitudes used by consumers to think about product attributes was found to be higher for abstract when compared to concrete attributes. The number of magnitudes used by consumers to think about product attributes was also found to be positively related to the number of magnitudes used in overall liking. Results of all studies also provided evidence supporting the use of the sorting method.

In terms of a theoretical framework that explains the pattern of findings, past research reviewed earlier provides several insights. Researchers have emphasized the importance of conserving processing capacity in dealing with complex information along a dimension by recoding it into chunks or categories (Park, 1978), in using fewer categories to avoid attaching utility to a larger number of categories (Park & Lessig, 1981), in the use of features versus dimensions (Johnson & Fornell, 1987), and in deriving verbal-like categories from



more discriminating numerical information (Viswanathan & Childers, 1992). The findings in terms of the use of a larger number of categories for abstract when compared to concrete attributes is consistent with the rationale in terms of conserving processing capacity. In an error-effort framework, because there is more information contained in an abstract attribute, which integrates and summarizes a larger number of concrete attributes, a greater number of magnitudes may be used to distinguish among products on an abstract attribute. The finding that consumers who are more discriminating in terms of overall liking are more discriminating at the attribute level is also consistent with the rationale in terms of processing capacity. If consumers desire less discrimination in terms of overall liking, then fewer magnitudes may be used along constituent attributes.

This study has important substantive and methodological implications for research in marketing. The sorting task appears to be a method with some promise in examining how consumers think about and use magnitudes along product attributes. Future research should examine different methods, including the sorting task that can be used to study how consumers think about magnitudes along product attributes. In this regard, the degree of convergence between different methods in terms of substantive findings needs to be assessed. Characteristics of different methods, including the sorting task, need to be examined to assess potential biases. In this regard, different methods may be suitable for different types of attributes. As mentioned earlier, some possible methods include magnitude estimation scaling (Viswanathan *et al.*, 1995), and similarity judgments (Johnson & Fornell, 1987). Another method worth examining may be

the elicitation of verbal labels used by consumers in thinking about specific attribute magnitudes. A similar method has been used by Zimmer (1984) to assess verbal labels to characterize expressions of uncertainty. Viswanathan and Childers (1994) have suggested the use of the comparative judgment task to examine magnitude representations. This task involves pairwise comparisons of brands along attributes. By manipulating the magnitudes of brands along attributes (i.e, the distances between brands along attributes), clusters of response times and accuracies of comparisons could be used to identify the number of magnitudes used by consumers to characterize an attribute. Another approach may be to use category scales to measure attribute ratings and assess the degree to which different response categories are used by respondents as an indicator of the number of magnitudes used by respondents to think about an attribute. Park and Lessig (1981) use a similar line of reasoning to infer the number of magnitudes used by consumers. However, a potential problem with this method is that scale characteristics, such as the number of response categories, may influence responses provided by consumers in terms of the degree of discrimination.

In terms of substantive implications, this study attempted to relate how consumers think about product attributes to characteristics of attributes. Such an approach may be useful in understanding the implications of properties of attributes such as attribute importance, and codability. The importance of an attribute directly relates to a multiattribute decision. As the importance of an attribute increases, consumers may store it in a more precise form. Consumers may be willing to spend more storage and processing capacity for more important attributes.

Such storage would allow finer discrimination along more important attributes. This is in line with the notion that consumers make a trade-off based on costs and benefits. Such storage may facilitate certain choice strategies, such as a lexicographic strategy, where consumers discriminate between products along the most important attribute and, if no differences are found, move to the next important attribute.

Another property of attributes that may be of relevance is codability. Kunda and Nisbett (1986) define codability as "the ease with which events may be unitized and given a score characterizing them in clear and readily interpretable terms." They suggest that sports events and academic performance represent highly codable events whereas social behavior does not. They argue that codable events may facilitate better perception of magnitudes. Interesting parallels can be drawn with product attributes wherein codable attributes, such as price and calorie content, may be more codable than other attributes. Attributes such as calorie content, which are available in numerical forms in the marketing environment, may be more codable than other attributes such as sweetness, that is, easier to unitize and be given a score "characterizing them in clear and readily interpretable terms" (Kunda & Nisbett, 1986). Codable attributes may be more likely to be stored by consumers with a larger number of magnitude categories.

Another property of attributes that may of relevance may be decomposability. Schneider and Bissett (1988) present a fundamental distinction between continua on the basis of decomposability, that is, the extent to which a continuum can be

decomposed or thought of in terms of smaller units. For example, length is a dimension that can be decomposed into smaller units, whereas decomposition may be unnatural or impossible for a dimension such as loudness. Continua may be more decomposable due to the experience that people have in looking at smaller units. Product attributes may also vary on decomposability, and more decomposable attributes may be processed and used by consumers with a larger number of magnitude categories.

The findings about sorting at the attribute level versus sorting in terms of overall liking link magnitude usage at the attribute level to brand-level decisions. Essentially, individuals who are more discriminating at the brand level appear to be more discriminating at the attribute level. An implication for research is the importance of understanding the nature of storage of attribute magnitudes in order to predict decision making. If consumers primarily store magnitude information in a particular fashion, and utilize it in decision making, then it is crucial to understand the nature of storage of this information. Assessment of storage of magnitudes provides a valid basis for inferring choice, as well as for the measurement of consumer perceptions.

In conclusion, this research presents some key findings that link how consumers think about attribute magnitudes to properties of attributes and to product evaluations. Furthermore, the sorting task appears to be a method that is well suited to examine how consumers store and use magnitudes describing product attributes. This research provides a basis for theory development and empirical work in understanding how

consumers process and use magnitudes describing product attributes.

**Table 1. Number of Categories Used in Sorting—Studies 1 and 2**

Product Attribute	Number of Categories Employed						Mean	SD	Importance Ratings (10 pt. scale)
	1	2	3	4	5	>5			
<b>Study 1</b>									
<b>Percent of respondents</b>									
Superordinate category									
Candy bars									
Chocolatey flavor	2.5	15.0	35.0	32.5	10.0	5.0	3.50	1.18	7.2
Caramel flavor	0.0	45.0	37.5	15.0	2.5	0.0	2.75	0.81	5.4
Crunchiness	0.0	5.1	56.4	17.9	15.4	5.1	3.59	0.99	6.4
Superordinate category									
Snack foods									
Saltiness	0.0	20.5	33.3	25.6	12.8	7.7	3.54	1.19	6.8
Sweetness	0.0	0.0	47.5	32.5	15.0	5.0	3.83	1.04	6.8
How good a snack	0.0	0.0	32.5	35.0	22.5	10.0	4.18	1.17	7.7
Subordinate category									
Soft drinks									
Caffeine content	2.6	35.9	33.3	20.5	7.7	0.0	2.95	1.00	6.4
How refreshing	2.5	17.5	47.5	22.5	5.0	5.0	3.25	1.06	8.0
Sweetness	0.0	15.0	37.5	30.0	10.0	7.5	3.60	1.17	7.0
Superordinate category									
Beverages									
Coldness	0.0	12.5	55.0	12.5	17.5	2.5	3.45	1.09	8.1
How refreshing	2.5	20.0	27.5	22.5	25.0	2.5	3.55	1.22	8.3
Sweetness	2.6	7.7	25.6	30.8	17.9	15.4	4.13	1.53	6.4
<b>Study 2</b>									
<b>Percent of respondents</b>									
Candy bars									
Chocolatey flavor	2.0	34.5	44.6	16.2	2.7	0.0	2.83	0.82	7.4
Caramel flavor	0.7	34.0	51.0	12.9	1.4	0.0	2.80	0.72	5.9
Crunchiness	0.7	13.5	58.8	20.3	6.8	0.0	3.19	0.78	5.7
Overall liking	0.0	6.7	61.7	25.5	4.7	1.3	3.32	0.73	—
Soft drinks									
Caffeine content	2.1	30.3	48.3	17.2	2.1	0.0	2.85	0.83	5.4
How refreshing	2.7	26.2	47.7	18.8	3.4	1.4	2.99	0.93	8.4
Sweetness	0.0	22.6	52.1	17.8	6.2	1.4	3.10	0.93	6.8
Overall liking	0.0	8.8	57.8	23.1	8.2	2.0	3.37	0.84	—

**Table 2. Number of Categories Used in Sorting—Studies 3 and 4**

Product Attribute	Number of Categories Employed						Mean	SD	Importance Ratings (10 pt. scale)
	1	2	3	4	5	>5			
<b>Study 3</b>									
<b>Percent of respondents</b>									
<b>Lunch products</b>									
Calories content	1.1	10.0	47.8	32.2	5.6	3.3	3.43	0.99	5.9
Sweetness	2.2	14.4	47.8	27.8	5.6	2.2	3.30	1.05	5.3
Overall liking	3.3	15.6	50.0	24.4	3.3	2.2	3.12	0.98	—
<b>Snack foods</b>									
Calories content	1.1	14.4	53.3	25.6	2.2	3.3	3.27	1.04	5.8
Sweetness	2.2	14.4	54.4	25.6	2.2	1.1	3.14	0.82	5.3
Overall liking	3.3	15.6	45.6	27.8	6.7	1.1	3.22	0.95	—
<b>Beverages</b>									
Calories content	0.0	10.0	38.9	35.6	12.2	3.3	3.60	0.95	4.7
Sweetness	1.1	15.6	37.8	23.3	16.7	5.6	3.56	1.14	5.5
Overall liking	2.2	16.9	42.7	24.7	7.9	5.6	3.36	1.15	—
<b>Study 4</b>									
<b>Percent of respondents</b>									
<b>Lunch products</b>									
Fat content	2.5	20.0	57.5	15.0	2.5	2.5	3.05	0.99	7.3
Healthiness	2.5	20.0	60.0	10.0	0.0	7.5	3.08	1.05	7.4
Overall liking	2.5	25.0	55.0	12.5	2.5	2.5	2.95	0.90	—
<b>Snack foods</b>									
Fat content	2.5	22.5	50.0	17.5	2.5	5.0	3.15	1.21	7.3
Healthiness	2.5	32.5	47.5	7.5	5.0	5.0	3.00	1.26	7.3
Overall liking	5.0	37.5	40.0	12.5	5.0	0.0	2.75	0.93	—
<b>Beverages</b>									
Fat content	2.5	27.5	42.5	25.0	0.0	2.5	3.00	0.93	6.1
Healthiness	2.6	23.1	53.8	15.4	2.6	2.6	3.05	1.12	6.6
Overall liking	5.0	20.0	52.5	12.5	7.5	2.5	3.05	1.04	—

## References

- Alba, J., & Hutchinson, W. (1987). Dimensions of consumer expertise. *Journal of Consumer Research*, 13, 411-454.
- Beach, L. R., & Mitchell, T. R. (1978). A contingency model for the selection of decision strategies. *Academy of Management Review*, 3, 439-449.
- Block, J., Buss, D. M., Block, J. H., & Gjerde, P. F. (1981). The cognitive style of breadth of categorization: Longitudinal consistency of personality correlates. *Journal of Personality and Social Psychology*, 40, 770-779.
- Bruner, J. S., & Tajfel, H. (1961). Cognitive risk and environmental change. *Journal of Abnormal and Social Psychology*, 62, 231-241.
- DeSarbo, W. S., Jedidi, K., & Johnson, M. D. (1991). A new clustering methodology for the analysis of sorted or categorized stimuli. *Marketing Letters*, 2, 267-279.
- Gardner, R. W., & Schoen, R. A. (1962). Differentiation and abstraction in concept formation. *Psychological Monographs*, 76 (41, Whole No. 560).
- Johnson, M. D., & Fornell, C. (1987). The nature and methodological implications of the cognitive representation of products. *Journal of Consumer Research*, 14, 214-228.
- Johnson, M. D., Fornell, C., Lehmann, D. R., & Horne, D. R. (1992). Attribute abstraction, feature-dimensionality, and the scaling of product similarities. *International Journal of Research in Marketing*, 9, 131-147.

- Kunda, Z., & Nisbett, R. E. (1986). The psychometrics of everyday life. *Cognitive Psychology*, 18, 195-224.
- Monroe, K. B. (1973). Buyer's subjective perceptions of price. *Journal of Marketing Research*, 10, 70-80.
- Park, C. W. (1978). A conflict resolution choice model. *Journal of Consumer Research*, 5, 124-137.
- Park, C. W., & Lessig, V. P. (1981). Familiarity and its impact on consumer decision biases and heuristics. *Journal of Consumer Research*, 8, 223-230.
- Payne, J. (1982). Contingent decision behavior: A review and discussion of issues. *Psychological Bulletin*, 92, 382-402.
- Rao, V. R., & Katz, R. (1971). Alternative multidimensional scaling methods for large stimulus sets. *Journal of Marketing Research*, 8, 488-494.
- Schneider, B., & Bissett, R. (1988). 'Ratio' and 'Difference' judgments for length, area, and volume: Are there two classes of sensory continua. *Journal of Experimental Psychology: Human Perception and Performance*, 14(3), 503-512.
- Tversky, A. (1977). Features of similarity. *Psychological Review*, 84, 327-352.
- Viswanathan, M., & Childers, T. (1992). The encoding and utilization of magnitudes of product attributes: An investigation using numerical and verbal information (Faculty Working Paper No. 92-0105). Urbana-Champaign: University of Illinois, Bureau of Economic and Business Research.
- Viswanathan, M., Childers, T., & Nagaraj, S. (1995). Using magnitude estimation scaling in marketing research: An



application to understand how consumers think about product attributes. In: Proceedings, American Marketing Association Winter Educators' Conference (Vol. 6, pp. 483-489). Chicago, IL: American Marketing Association.

Viswanathan, M., & Narayanan, S. (1994). Comparative judgments of numerical and verbal attribute labels. *Journal of Consumer Psychology*, 3, 79-101.

Zimmer, A. C. (1984). A model for the interpretation of verbal predictions. *International Journal of Man-Machine Studies*, 20, 121-134.