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IDENTIFYING A REDUCED SET OF SALIENT ATTRIBUTES THAT INFLUENCE CONSUMERS' CHOICE AMONG WHOLE, LOW-FAT, AND SKIM MILK FOR BEVERAGE USE

by

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ABSTRACT

Fishbein's Theory of Reasoned Action models behavior as based on beliefs and evaluations on a small set of salient attributes. Two methods of reducing large sets of potentially salient attributes into a smaller set of salient attributes are proposed. The methods are based on expectancy valuation analysis and logistic regression analysis. When applied to consumer beliefs and evaluations on 59 attributes over three milk types (whole, low-fat, and skim milk), both methods identify reduced sets of attributes. The reduced attribute sets are then used to model whether or not respondents drink a particular milk type. Results indicate that the reduced models are statistically significant in explaining choice of milk type although there is some loss of information as compared to models with 59 attributes. Furthermore, the data indicate that statistically-imputed evaluation ratings differ from self-stated evaluation ratings.

(Key words: milk, preferences)

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INTRODUCTION

Many studies of consumer preferences and behavior have used models based on Fishbein and Ajzen's Theory of Reasoned Action. (This theory was proposed in Fishbein 1963 and described and extended in Fishbein & Ajzen 1975 and Ajzen & Fishbein 1980.) Such models have successfully predicted consumer behavior and have helped researchers better understand the basic underlying structure of consumer preferences. In these models, the strength of an individual's preference for a given product depends on a linear combination of product-specific beliefs weighted by importance evaluations, both measured on a set of salient attributes. To specify and apply such a model, the researcher must identify an appropriate set of salient attributes from among the vast number available.

In many applications of the Theory of Reasoned Action, salient attributes have been determined by the open-ended elicitation approach advocated by Ajzen and Fishbein (1980, pp. 63-64). This usually results in a relatively small set of salient attributes, which fits well with Ajzen and Fishbein's view that between five and nine attributes should be sufficient to define a person's attitude.[1] However, when other methods such as expert judgment, attribute importance scores, and previous research are also used to identify important attributes, the number of salient attributes can easily grow much larger. Most multi-attribute models reported in the early literature used 12 or fewer attributes (e.g., see overview in Wilkie and Pessemier 1973). The problem of how to analyze a larger set of attributes has only recently begun to be addressed in the literature.

Large sets of attributes appear to be arranged into a hierarchical structure. Urban and Hauser (1988) discuss the "House of Quality" which arranges attributes into a three-tier hierarchy. At the top and most important are consumers' strategic (primary) needs. These tend to be rather general and are more clearly defined by sets of tactical (secondary) needs. Tactical needs can in turn comprise large numbers of detailed (tertiary) needs. Louviere (1984) proposes a hierarchical information integration where attributes are grouped a priori into logical, functional or other subsets.

The problem of identifying a manageable set of salient attributes is compounded by the fact that different methods of assessing attribute importances can result in different conclusions about the attributes. Goldstein and Mitzel (1992) and Reilly and Doherty (1992) document a rich literature on the difference between self-stated subjective attribute importances and statistically-imputed attribute importances. Jaccard, Brinberg and Ackerman (1986) evaluated six different attribute importance measures (open ended elicitation, information search approach, direct ratings, conjoint measurements, indices based on Jaccard's subjective probability approach, and a paired comparison approach) and found only "relatively low levels of convergence among measures." Such conflicting results highlight the need for further research, in particular for a method of extracting a limited set of potentially salient attributes when a much larger set is initially available. This is an especially important consideration when secondary data are used.

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[1]Attitude as a determinant of behavior or preferences is discussed below.

Identifying a limited set of salient attributes is thus a critical step in multiattribute behavioral analyses. Our first objective is to describe two approaches to the problem of identifying a limited set of salient attributes influencing consumers' choice of competing products and to apply these attribute elimination approaches to a data set that includes 59 attributes of whole, low-fat, and skim milk. Our second objective is to take the identified reduced attribute sets and apply them within the Fishbein framework to model whether or not respondents drink a particular milk type.

EXPECTANCY VALUE THEORY

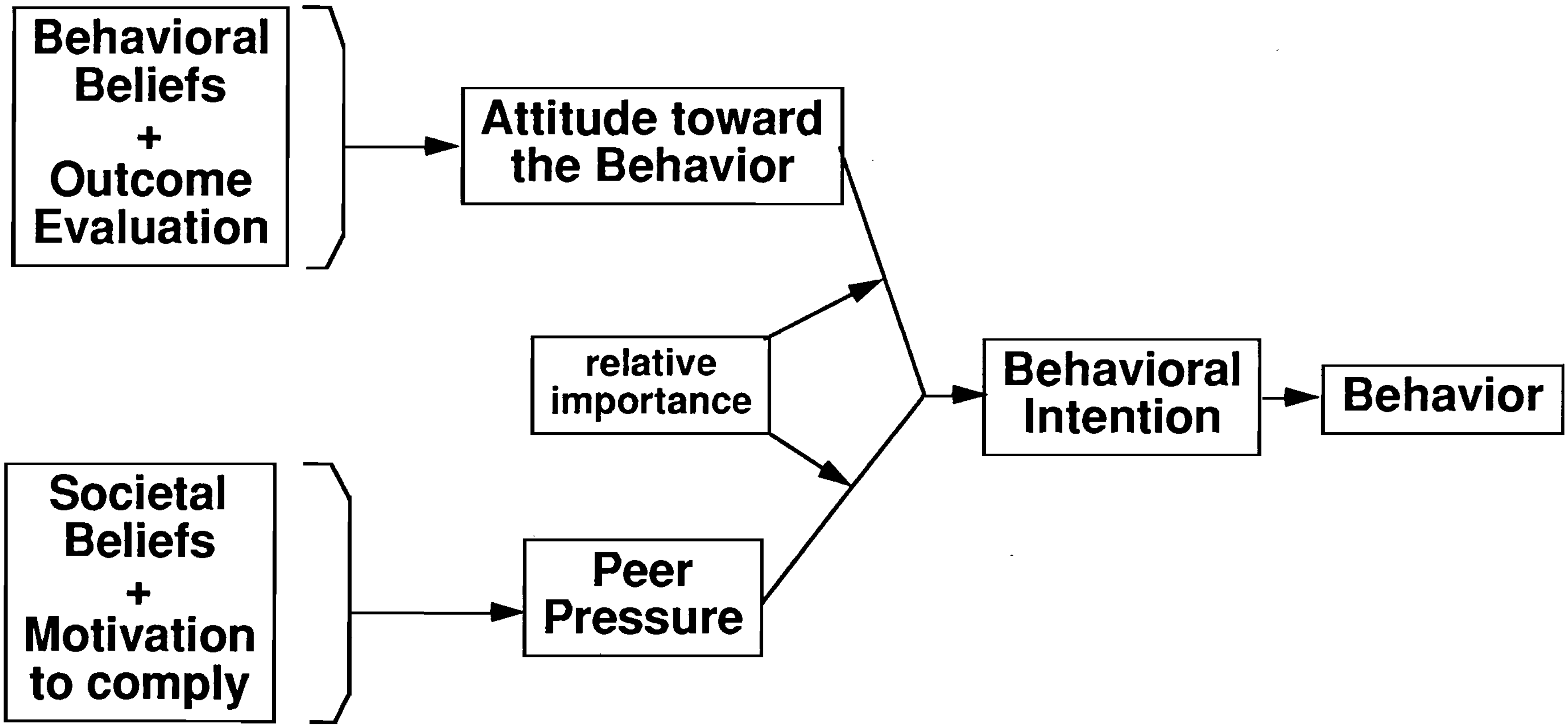
Expectancy value theory is a standard technique used to indicate attribute importances and to measure consumer preferences (Urban and Hauser 1980). In expectancy valuation, an individual's preference (P) for a specified product is defined as a linear combination of subjective product perceptions or beliefs (b_j) weighted by subjective importance evaluations (e_j), both measured on a set of salient attributes (indexed here by j):

$$P = \sum_{j=1}^{J} e_j b_j \tag{1}$$

Expectancy value models are an application of the Theory of Reasoned Action. In these models, both beliefs and importance evaluations influence consumer behavior. Close scrutiny of evaluations of and beliefs about each attribute can provide important insights into consumers' preferences. The Theory of Reasoned Action (Figure 1) postulates that behavior is a function of behavioral intention, which in turn is a function of attitude and peer pressure.[2] The relative importance of attitude and peer pressure is determined by the individual. Attitude is further influenced by behavioral beliefs and outcome evaluations, while peer pressure is influenced by societal beliefs and a motivation to comply with peer groups. Behavioral beliefs measure the individual's perceptions of attributes associated with a certain behavior. For example, if "refreshingness" is a potentially relevant product attribute, then an individual's strength of agreement or disagreement with a statement such as "drinking whole milk is refreshing", measured on a Likert or semantic differential scale, constitutes the behavioral belief rating for whole milk on this attribute. Evaluations measure the importance weight the individual attaches to attributes. For example, an individual's response to how "important or unimportant" refreshingness is to him or her in beverages, measured again on a Likert or semantic differential scale, constitutes the individual's importance evaluation for this attribute.

[2]In the psychological terminology of Ajzen and Fishbein, this factor is called the subjective norm.

FIGURE 1
RELATIONSHIP BETWEEN BELIEFS AND BEHAVIOR



Source: adapted from Ajzen and Fishbein (1980)

A thorough discussion of issues associated with the Fishbein model and its use in marketing research is given by Wilkie and Pessemier (1973). Sheppard, Hartwick, and Warshaw (1988) conducted two meta-analyses to examine the effectiveness of the Fishbein and Ajzen model. They found that the model's predictive utility was strong even under circumstances not satisfying its conditions, such as prediction involving explicit choice among alternatives. This finding led us to base the present study on Fishbein and Ajzen's model.

In their model specification, Fishbein and Ajzen posited that only a limited number of attributes, those determined to be salient, should be included in the model. Intuitively this appears reasonable, for the inclusion of every possible attribute in a consumer's decision making process would consume prohibitive amounts of time and effort, resulting in severe cognitive strain. Several studies (Shepherd 1988; Thraen 1990; Tuorila 1987; Tuorila and Pangborn 1988) have investigated the impact of beliefs on milk consumption and choice of milk type, each of these contained thirteen or fewer attributes.

The literature provides little guidance on how to identify a limited set of salient attributes from a large set of potentially salient attributes. Olshavsky and Summers (1974) applied factor analysis to reduce a set of 80 attributes to 12 distinct belief groupings. Urban and Hauser (1980, p. 211) list several pitfalls of factor analysis. One danger is the temptation to ignore the information contained in attributes with low factor loadings when interpreting the results; the total impact of many such attributes can be substantial. Furthermore, observations on all attributes are still needed to compute factor scores (Krzanowski 1987). Alpert (1971) considered identifying "determinant attributes" by regression coefficient testing. After performing a multiple regression of overall preference on ratings for 37 attributes, each partial regression coefficient was tested to see whether it differed significantly from zero. Those attributes for which this partial t-test was significant were identified as determinant. This approach has great difficulty when two or more important attributes are multicollinear (Neter, Wasserman, and Kutner, 1990).

The methods proposing hierarchical attribute structures are limited in that hierarchies need to be determined through either group consensus by the analysts or a customer sort procedure (Griffin and Hauser 1993). Because the customer sort procedure requires personal interviews to collect additional data, the group consensus method is more typically used, though it is inferior because it does not depend on customer responses (Griffin and Hauser 1993).

In practice, attribute saliency is often determined through a combination of expert judgment, in-depth interviews, open-ended elicitation, correlation with preferences, and attribute evaluation scores. This process almost always requires compromises to resolve conflicting indications arising from its components.

DATA

The data used in this study were collected during November 1991 through 1,252 personal interviews conducted nationwide by Yankelovich Clancy Shulman, a market research firm employed by a consortium of dairy promotion organizations to conduct a beverage marketing study.[3] Respondents had been pre-recruited at central locations. The sample frame was chosen to include buyers of all milk types during the last month.

Each respondent was asked about two of the three milk types -- whole, low-fat, and skim milk -- as well as other beverages. Prior to the interviewing, 59 attributes had been identified as potentially salient. This was done in close consultation with dairy industry specialists and through the use of focus groups. Most of the attributes identified as pertinent to beverage consumption dwell on positive elements. The chosen attributes provide balanced coverage of taste, versatility, satisfaction, health and nutrition, and packaging components; less well represented are negative health elements, age and family, social pressure, and price components. Attribute importance evaluations relative to the beverage category are measured on a nine point "extremely desirable ... extremely undesirable" scale; product-specific beliefs are measured on a five point "does not describe this beverage at all ... describes this beverage completely" scale. Respondents were shown picture cards for each attribute for the belief and evaluation questions to help equalize associations and normalize responses. For instance, the belief "must be cold to taste good" was accompanied by a picture showing a polar bear floating on ice drifts in the arctic. Type of milk drunk was measured by asking for the number of glasses of each milk type out of the last ten glasses drunk. This question referred specifically to at home or residence use only. Our analysis includes only adults who drank milk during the pre-interview week. We rearranged attributes into contextual groupings to facilitate comparisons.

METHODS

Expectancy Value Analysis

For the expectancy value analysis, mean values for beliefs and evaluations were calculated over all respondents. Belief ratings are milk-type specific and independent of milk type consumed. Evaluation scores refer to beverages as a group. Evaluations (e_j) are normalized by using the formula:

$$e^{*}_{ij} = \frac{e_{ij}}{\sqrt{\sum_{j=1}^{J} e^{2}_{ij}}} \qquad (2)$$

where i indicates the respondent and j the attribute.

Normalization of importance evaluations addresses the issue of whether every respondent has equal importance in the model and the analysis, regardless of whether the respondent's overall tendency is to answer at or near the extremes of the measurement scale or more toward the center. To assign equal importance to every respondent, normalization is incorporated

[3]The lead organization was the United Dairy Industry Association. Also involved were the National Dairy Promotion and Research Board, the American Dairy Association and Dairy Council (New York), the California Milk Promotion Advisory Board, and the Wisconsin Milk Marketing Board.

into the attribute evaluations used here. These evaluations represent (for each respondent) the relative within-consumer weighting of attributes. In the words of Wilkie and Pessemier (1973, p. 434), "normalization is always appropriate and possibly essential when cross-sectional analysis is used."

For the analyses of variance, each respondent is classified as a user of the type of milk drunk most often, based on the last ten glasses. For instance, a respondent whose last ten glasses of milk consisted of five glasses of whole milk, three of low-fat, and two of skim was classified as a whole milk user. Respondents who could not be classified uniquely (e.g., five glasses of whole milk and five of low-fat milk) could not be used in analyses involving milk-type user groups. Table 1 indicates the number of respondents who were classified into the different milk-type user groups. The majority of respondents are either exclusive or partial low-fat drinkers, 41 percent and 65 percent respectively. Exclusive whole milk drinkers account for almost one quarter of all respondents. Respondents who drank whole milk along with other milk types accounted for 40 percent of respondents. Only 10 percent of respondents are exclusive skim milk drinkers. Respondents drinking skim milk and other milk types accounted for 23 percent of respondents.

Table 1. Number of milk drinking respondents by milk type user group.

Milk type(s) used	Number	Percent
Whole	219	24.1
Whole + low-fat	107	11.8
Low-fat	375	41.3
Low-fat + skim	76	8.4
Skim	92	10.1
Whole + skim	9	1.0
Whole + low-fat + skim	29	3.2
Total	907	100.0

Logistic Regression Analysis

As in the Fishbein model, our logistic regression analyses integrate beliefs and evaluations. Our model calculates difference values (D) for each respondent on each of the 59 attributes. Difference values measure how the product of beliefs (b) and normalized evaluations (e^*) differs between two milk types for any respondent on any specified attribute. The formula

(3) $$D_{k,l;i,j} = [(b_{ijk} - b_{ijl})\ e^*_{ij}]$$

measures the difference value between milk type k and milk type l for respondent i on attribute j. We rescale beliefs and evaluations to have a zero midpoint, thus setting up the responses for bipolar scoring.[4] Because each respondent was asked about two of the three milk types, only one set of 59 difference values can be calculated for each respondent. The evaluations are normalized by using the formula in equation (2) above.

The analysis we use to identify attributes salient in the choice of milk type consists of three pairwise comparisons: whole versus low-fat, whole versus skim, and low-fat versus skim milk. Each analysis employs a logistic regression procedure, using the all-possible-subsets option available in SAS. Iteratively weighted least squares is used to adjust the variance to reflect the fact that the composition of the last ten glasses of milk drunk (a number between zero and ten) is the dependent variable. For each number of predictor variables from one to ten, the ten best models are computed. Models are ranked based on score values calculated using the score test statistic (see Hosmer and Lemeshow 1989). Attribute prevalence in these models is used to determine saliency.

Each logistic regression analysis uses only those observations containing that complete set of belief evaluations on the two milk types being compared and those respondents whose last ten glasses of milk drunk are entirely comprised of the two milk types compared. Using the whole versus low-fat milk comparison as an example, only respondents who had answered belief questions about whole as well as low-fat (but not skim) milk and who's last ten glasses of milk drunk ranged from all whole milk, through a mixture of whole and low-fat milk, to all low-fat milk (but not skim milk) are used for this analysis. Other respondents (in this case skim milk drinkers) are not included in the whole versus low-fat milk comparison because it was felt that the choice between milk types, in this case whole and low-fat milk, could best be explained by actual consumers of these milk types.

RESULTS

Expectancy Value Analysis

A careful examination of beliefs about and evaluations of each attribute conveys detailed insights into the consumers' perceptions of advantages and disadvantages of each milk type. Mean absolute and normalized mean absolute evaluation scores for the 59 attributes are recorded on the right hand side of Figure 2. High mean absolute evaluation scores for positive attributes, such as 3.17 for the attribute "is always fresh" (1), indicate that most respondents consider this attribute at least "very desirable". A similar score for a negative attribute, e.g., the attribute "comes in a package that can have a bad effect on the flavor of the drink" (56), indicates that most respondents consider beverages that have these attributes "very undesirable". High mean absolute evaluation scores potentially indicate attribute saliency, but they must occur in combination with significant differences in belief ratings in order to affect choice of milk type. Low mean absolute evaluation scores, such as 1.27 for the attribute "is bubbly" (59), indicate that respondents as a group did not have strong feelings about these attributes. The evaluation scale midpoint was "neither desirable nor undesirable". Low mean absolute evaluation scores may suggest non-salience.

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[4]See Sparks et. al. (1991) for an insightful discussion of the issues surrounding unipolar and bipolar scaling.

FIGURE 2
AVERAGE BELIEF RATINGS AND MEAN EVALUATION SCORES

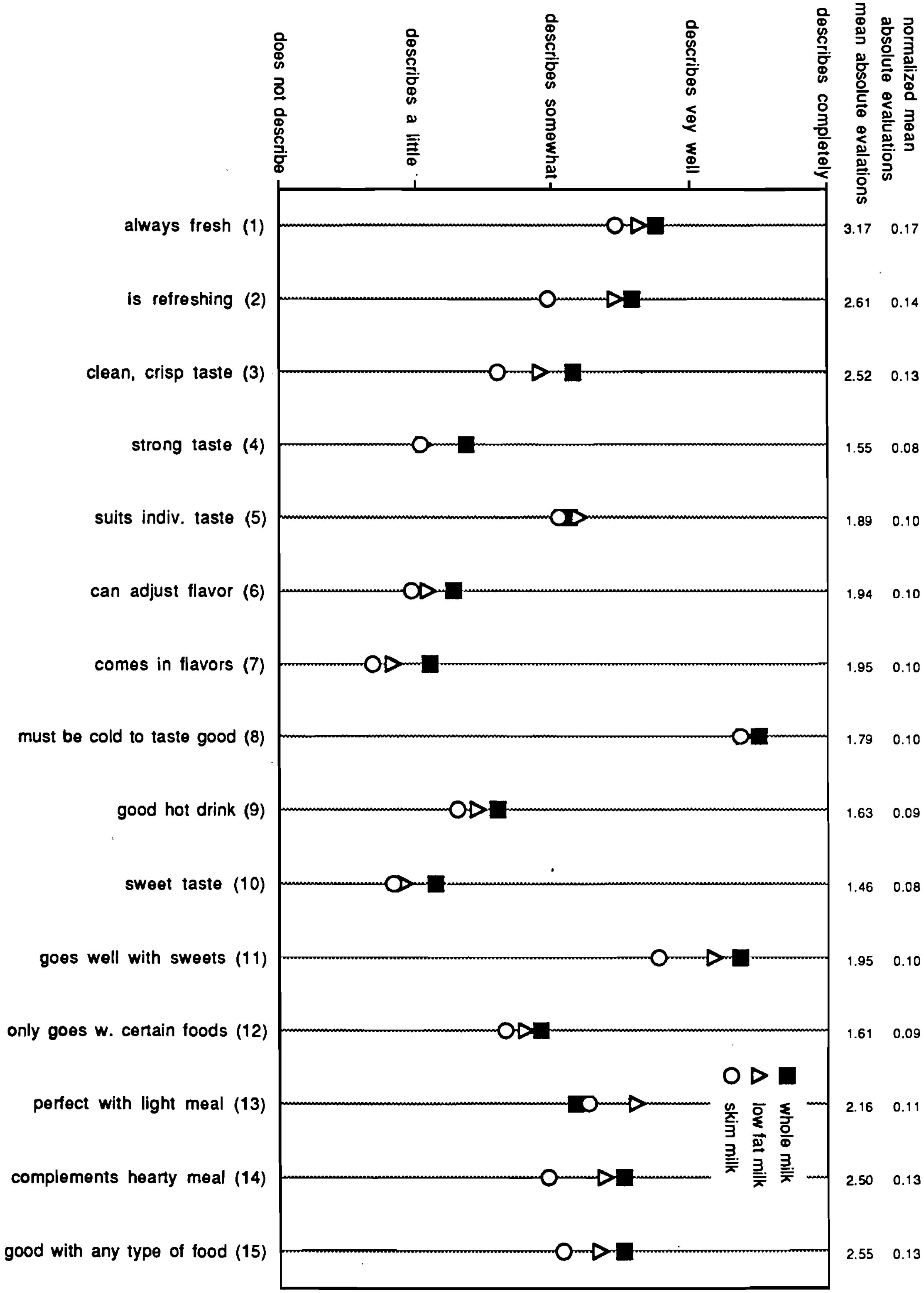
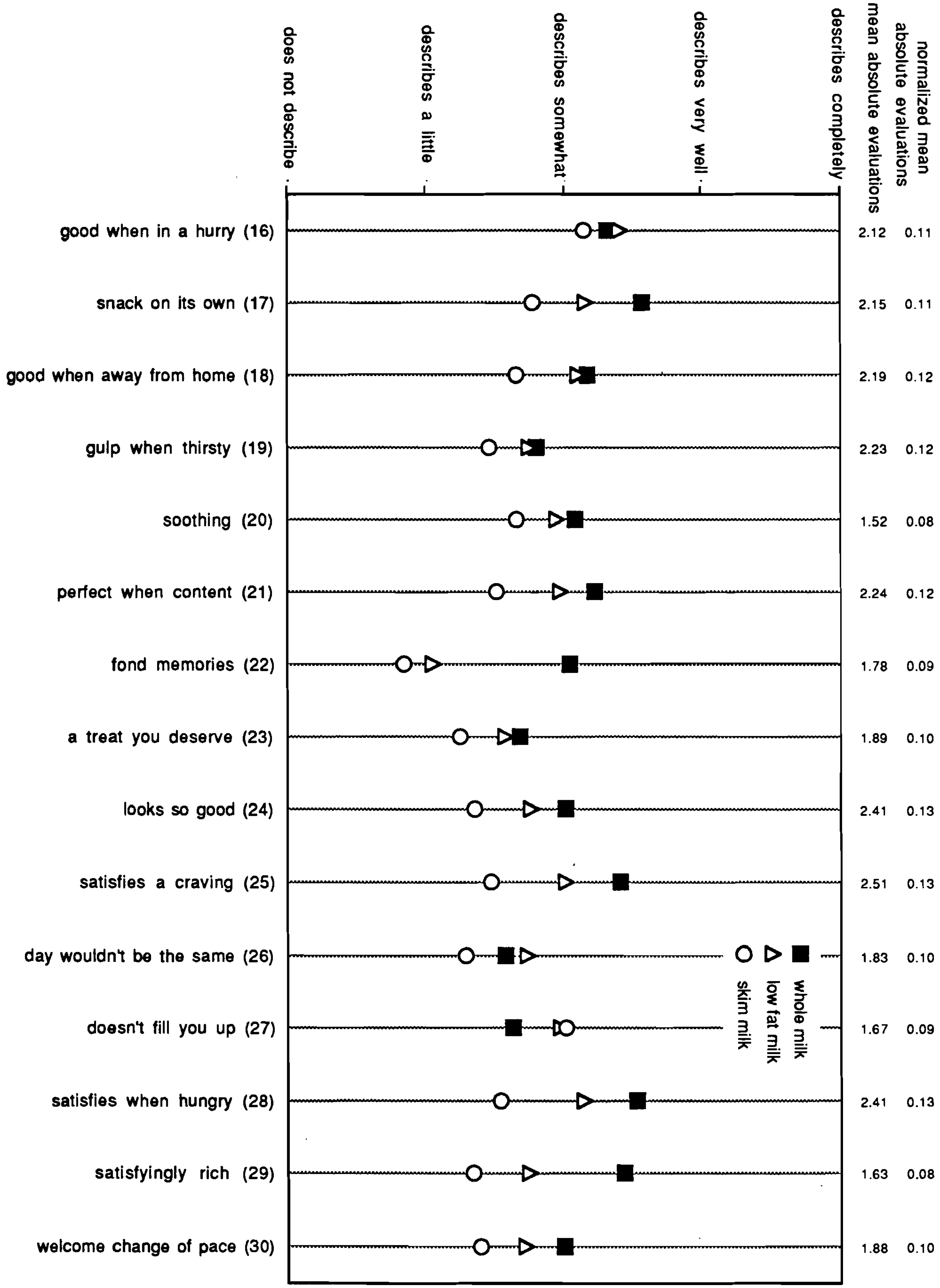


FIGURE 2 (CON'T)
AVERAGE BELIEF RATINGS AND MEAN EVALUATION SCORES



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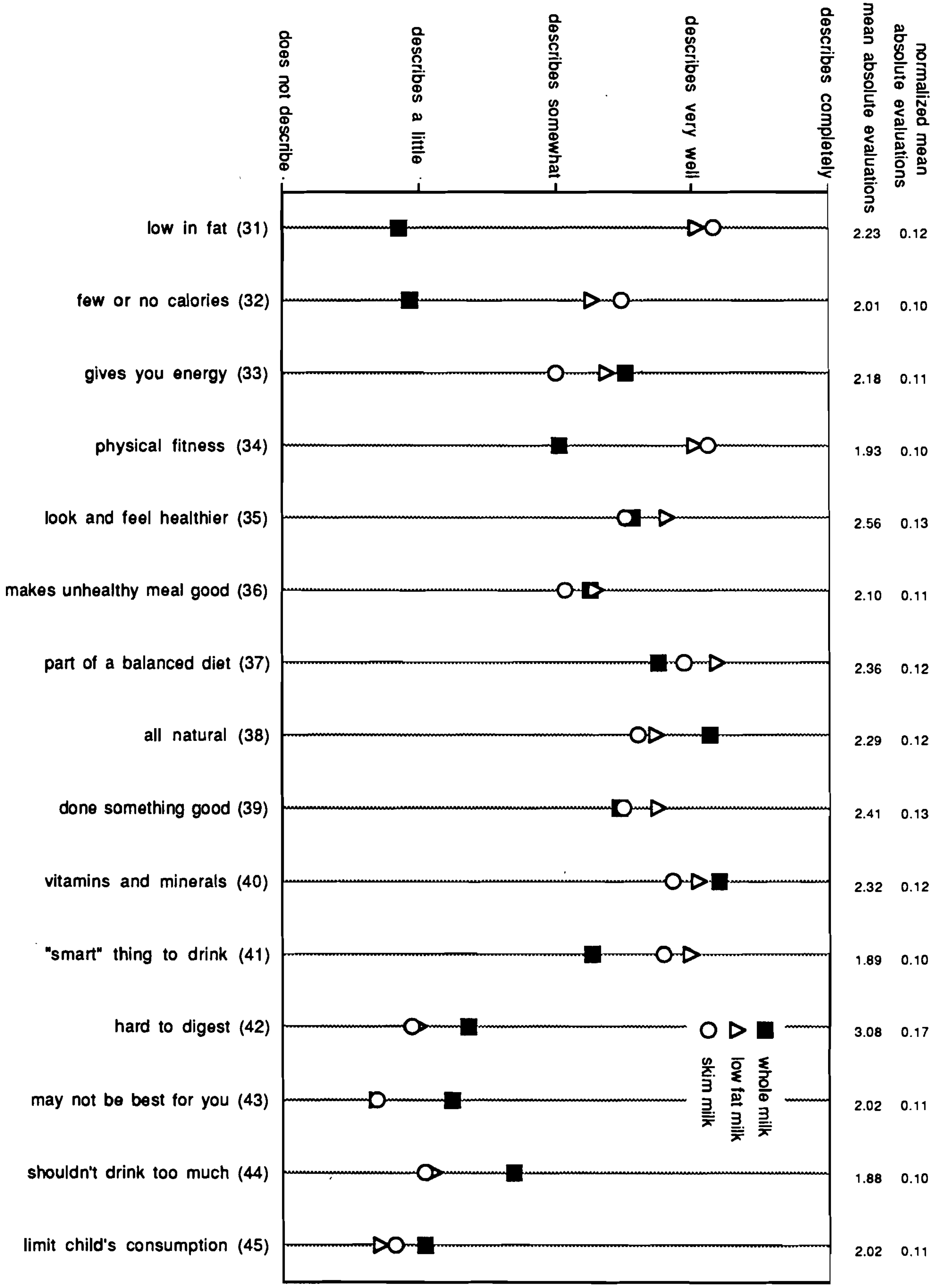

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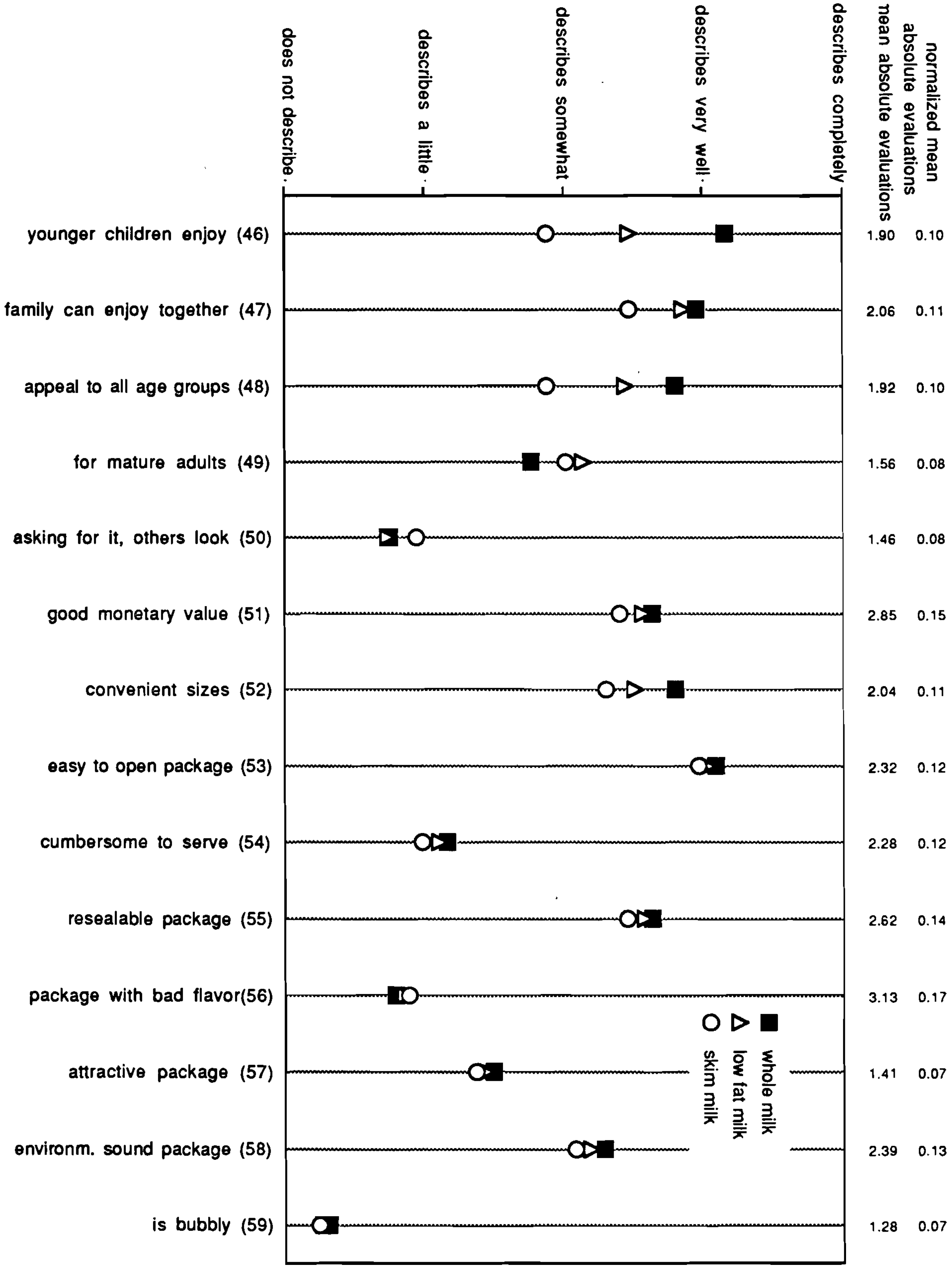

Table 2 shows a frequency distribution of mean absolute evaluation scores for the 59 attributes included in this study. Because there is no clear differentiation of these attributes into a salient and a non-salient group, any decision on a cut-off point would be arbitrary. We therefore decided to examine whether evaluation scores differed between milk-type user groups. Attribute importance or the degree of saliency is likely to differ across individuals and to be reflected in their choice of milk type. Probability values (p-values) associated with analyses of variance testing for statistical difference in evaluation scores by milk type (Table 3) indicate that 13 of the 59 attributes differ at the 5% level.[6] These attributes are: "must be cold to taste good" (8), "makes a good hot drink" (9), "has a sweet taste" (10), "is good with any type of food" (15), "is satisfyingly rich" (29), "is low in fat" (31), "has few or no calories" (32), "is for people who are into physical fitness" (34), "is part of a balanced diet" (37), "is all natural" (38), "you feel you shouldn't drink too much of" (44), "you feel you have to limit a child's consumption of" (45), and "comes in an environmentally sound package" (58). These predominantly taste and health and nutrition related attributes are all promising as potentially salient influences in the consumer's milk type choice.

Table 2. Frequency of absolute evaluation scores for 59 attributes.

Evaluation Range	Frequency
1.25-1.49	4
1.50-1.74	5
1.75-1.99	16
2.00-2.24	14
2.25-2.49	11
2.50-2.74	5
2.75-2.94	1
3.00-3.24	3
Sum	59

[6] i.e., $p=Pr[|\text{randomly drawn value}| > |\text{observed value } T|] < 0.05$ under H_0

Table 3. Analysis of variance for attributes included in study.

	Pr>|T| Evaluations	Pr>|T| Beliefs
Taste		
is always fresh (1)	0.5352	0.0008
is refreshing (2)	0.1273	0.0001
has a clean, crisp taste (3)	0.4299	0.0001
has a strong taste (4)	0.0698	0.0001
suits your own individual taste - is not something for everyone (5)	0.9963	0.2015
can adjust flavor to suit my personal taste (6)	0.4340	0.0003
comes in flavors (7)	0.7755	0.0001
must be cold to taste good (8)	***0.0052***	0.0759
makes a good hot drink (9)	***0.0256***	0.0027
has a sweet taste (10)	***0.0083***	0.0001
Versatility		
goes well with sweets like cookies and desert (11)	0.3008	0.0001
only goes with certain foods (12)	0.5550	0.0093
is perfect with a light meal (13)	0.0949	0.0001
is the perfect complement to a hearty meal (14)	0.6986	0.0001
is good with any type of food (15)	***0.0016***	0.0001
is good when you are in a hurry (16)	0.5381	0.0043
can be a snack all on its own (17)	0.2540	0.0001
is a good beverage when I'm eating away from home (18)	0.0879	0.0001
Satisfaction		
is something you gulp when you are really thirsty (19)	0.3075	0.0001
is soothing, a way to wind down (20)	0.1971	0.0001
perfect for when you feel really content (21)	0.1276	0.0001
brings back fond memories (22)	0.5449	0.0001
is a treat or an indulgence you deserve (23)	0.2006	0.0001
looks so good that you can't wait to drink it (24)	0.3005	0.0001
satisfies a craving (25)	0.8960	0.0001
your day wouldn't be the same without it (26)	0.3862	0.0001
doesn't fill you up, so you can have other things you like (27)	0.0585	0.0001
satisfies you when you are hungry (28)	0.1836	0.0001
is satisfyingly rich (29)	***0.0080***	0.0001
is a welcome change of pace (30)	0.6914	0.0001

Table 3 (con't).

	Pr>|T| Evaluations	Pr>|T| Beliefs
Health & Nutrition		
is low in fat (31)	***0.0001***	0.0001
has few or no calories (32)	***0.0001***	0.0001
gives you energy to make it through the day (33)	0.3494	0.0001
is for people who are into physical fitness (34)	***0.0306***	0.0001
makes you look and feel healthier (35)	0.1369	0.0001
makes an unhealthy meal good for you (36)	0.7062	0.0168
is part of a balanced diet (37)	***0.0002***	0.0001
is all natural (38)	***0.0481***	0.0001
makes you feel like you've done something good for yourself (39)	0.1274	0.0003
is full of vitamins and minerals that I need (40)	0.0663	0.0001
is the "smart" thing to drink (41)	0.7719	0.0001
Negative Health Elements		
is hard to digest, or can upset your stomach (42)	0.1002	0.0001
may not be the best for you (43)	0.0809	0.0001
you feel you shouldn't drink too much of (44)	***0.0219***	0.0001
you feel you have to limit a child's consumption of(45)	***0.0142***	0.0001
Age & Family		
younger children enjoy (46)	0.6595	0.0001
a family can enjoy together (47)	0.5362	0.0001
appeals to all age groups (48)	0.0762	0.0001
is for mature adults (49)	0.5445	0.0001
Social Pressure		
if you ask for it, others might look at you funny (50)	0.1327	0.0028
Price		
is a good value for the money (51)	0.2565	0.0028
Packaging		
comes in a range of convenient sizes - from family to child size (52)	0.1655	0.0001
comes in an easy to open package (53)	0.2157	<u>0.1404</u>
is cumbersome to get out, serve, put away, etc. (54)	0.1588	<u>0.0595</u>
comes in resealable packaging so that it stays fresh for a long time (55)	0.2915	<u>0.0808</u>
comes in a package that can have a bad effect on the flavor of the drink (56)	0.0606	<u>0.3773</u>
comes in an attractive package (57)	0.1197	<u>0.2399</u>
comes in an environmentally sound package (58)	***0.0007***	0.0386
Miscellaneous		
is bubbly (59)	0.0526	<u>0.3183</u>

Average belief ratings on whole, low-fat, and skim milk, over all respondents, are shown in the body of Figure 2. Recall that each respondent reported belief ratings for only two of the three milk types. The farther apart the mean belief ratings for whole, low-fat, and skim milk, the more different respondents believe the three milk types to be and the more likely it is that this attribute is salient in the choice of milk type. For instance, the attribute "has a clean crisp taste" (3) indicates that respondents believe whole milk to have a cleaner, crisper taste than low-fat and skim milk. Low-fat milk is also believed to have a cleaner, crisper taste than skim milk. In contrast, for the attribute "suits your own individual taste" (5), respondents indicate no noticeable difference in their beliefs over the three milk types. This attribute is therefore unlikely to matter in the choice of milk type.

Table 3 shows the p-values associated with one-way analyses of variance testing for statistical differences in the belief means for the three milk types. Beliefs differ significantly on 51 attributes ($p<0.05$) and do not differ on 8 others ($p \geq 0.05$). The eight attributes that do not appear salient are: "suits your own individual taste/is not something for everyone" (5), "must be cold to taste good" (8), "comes in an easy to open package" (53), "is cumbersome to get out, serve, put away, etc" (54), "comes in resealable packaging so that it stays fresh for a long time" (55), "comes in a package that can have a bad effect on the flavor of the drink" (56), "comes in an attractive package" (57), and "is bubbly" (59). It is interesting to note that respondents perceive the three milk types along all but two packaging attributes as indistinguishable. This suggests that packaging attributes, except for size and environmentally sound packaging, are not salient factors in an individual's choice of milk type. Since all three milk types are sold in the same types of packages, this may not be surprising. However, evaluation scores vary widely for these packaging attributes, suggesting that mean evaluation scores by themselves are not a sufficient indicator of salience.

When products have identical tangible attribute levels, subjective product beliefs may reflect this sameness or may differ. Belief responses for almost all packaging attributes indicate that respondents perceive the three milk types as indistinguishable. However, for the attributes "is always fresh" (1) and "is full of vitamins and minerals that I need" (40), beliefs differ despite the fact that the three milk types are virtually identical in these attributes. This indicates that objective physical characteristics may not translate directly into subjective attribute beliefs, and that perceptual attributes rather than, or in addition to, objective characteristics may significantly influence product preferences.

Conversely, for attributes on which the three milk types exhibit tangible differences, these differences are reflected in respondents' subjective product beliefs. "Is low in fat" (31), "has few or no calories" (32), and "comes in a range of convenient sizes" (52) all have mean belief ratings that differ by milk type.

Attributes with statistically nonsignificant belief differences ($p \geq 0.05$) are "suits your individual taste - is not something for everyone" (5), "must be cold to taste good" (8), and "is bubbly" (59). These attributes do not appear to hold much promise as explanatory variables in future analyses that address milk type choice.

While belief responses did not differ across milk types for "must be cold to taste good" (8), evaluation scores on this attribute did differ. We believe this attribute may prove useful for further analysis.

An interesting observation can be drawn from these data regarding the issue of normalizing importance evaluations. Close scrutiny of the two right-hand columns in Figure 2 indicates that mean absolute evaluations and normalized mean absolute evaluations are very highly correlated. In fact, the Pearson correlation coefficient for this set of 59 attributes is 0.99. A possible explanation for this high correlation may be the use of a picture book in the data collection process to normalize respondents' attribute associations.

Using the expectancy value approach in combination with analyses of variance on beliefs and evaluations leads to somewhat ambiguous conclusions. While the analyses of variance on the evaluations identify 13 attributes as potentially salient, the analyses of variance on the beliefs indicate that 51 attributes are potentially salient. One could combine the results of both sets of analyses of variances and argue that the 12 attributes identified as salient in both sets of analyses belong to the set of salient attributes that affect the choice of milk type and that the 7 attributes that fail to indicate saliency based on analyses of variance on beliefs as well as evaluations should not belong to this set of salient attributes. The question that remains is what to do with the 40 attributes that were classified as salient in one but not both of the analyses. Including them in the set of salient attributes would not reduce the number of attributes substantially. Excluding them may discard some unknown amount of information but would leave a set of 12 attributes, a size consistent with other reported studies. It appears then that selecting attributes based on analyses of variance on both beliefs and evaluations provides a set of salient attributes that can be used in a Fishbein model.

Logistic Regression Analysis

Based on each attribute's prevalence in the logistic regression analyses, we classified the 59 attributes included in this study as strong, weak, or absent (Table 4). A strong classification indicates that this attribute is salient because of its repeated and dominant appearance in the best models specified; a weak classification indicates that this attribute is potentially salient because of its repeated but not dominant appearance in the best models specified; an absent classification indicates no suggestion of salience because of the attribute's near or complete failure to appear in the best models specified. Thus, "is refreshing" (2) was classified as strong, based on the analysis involving whole and low-fat milk drinkers. The attribute failed to indicate saliency in the choice of milk type between low-fat and skim milk drinkers, but was weakly suggestive of saliency in the whole versus skim milk drinker analysis. The highest salience rating of each of the three comparisons determines overall saliency, which for the attribute "is refreshing" (2) results in a strong rating.

Table 4. Salience Ratings for attributes included in study.

Attribute	Salience Ratings		
	W vs L	L vs S	W vs S
Taste			
is always fresh (1)		weak	
is refreshing (2)	strong		weak
has a clean, crisp taste (3)	weak		
has a strong taste (4)			
suits your own individual taste - is not something for everyone (5)			weak
can adjust flavor to suit my personal taste (6)	strong		strong
comes in flavors (7)			
must be cold to taste good (8)		strong	strong
makes a good hot drink (9)			strong
has a sweet taste (10)			
Versatility			
goes well with sweets like cookies and desert (11)			weak
only goes with certain foods (12)		strong	weak
is perfect with a light meal (13)	weak	weak	
is the perfect complement to a hearty meal (14)			
is good with any type of food (15)			
is good when you are in a hurry (16)		strong	
can be a snack all on its own (17)		weak	
is a good beverage for when I'm eating away from home (18)	strong	weak	
Satisfaction			
is something you gulp when you are really thirsty (19)	strong	strong	
is soothing, a way to wind down (20)			weak
perfect for when you feel really content (21)	strong		strong
brings back fond memories (22)			weak
is a treat or an indulgence you deserve (23)			
looks so good that you can't wait to drink it (24)	weak	weak	strong
satisfies a craving (25)			weak
your day wouldn't be the same without it (26)	strong	weak	strong
doesn't fill you up, so you can have other things you like (27)			
satisfies you when you are hungry (28)	strong		strong
is satisfyingly rich (29)	strong	strong	
is a welcome change of pace (30)			
Health & Nutrition			
is low in fat (31)			strong
has few or no calories (32)			
gives you energy to make it through the day (33)	weak		
is for people who are into physical fitness (34)			strong
makes you look and feel healthier (35)		strong	weak

Table 4 (con't).

Attribute	Salience Ratings W vs L	L vs S	W vs S
Health & Nutrition			
makes an unhealthy meal good for you (36)			
is part of a balanced diet (37)		strong	
is all natural (38)			weak
makes you feel like you've done something good for yourself (39)			
is full of vitamins and minerals that I need (40)		strong	
is the "smart" thing to drink (41)	weak		weak
Negative Health Elements			
is hard to digest, or can upset your stomach (42)	weak		
may not be the best for you (43)			
you feel you shouldn't drink too much of (44)	weak		weak
you feel you have to limit a child's consumption of (45)	weak		
Age & Family			
younger children enjoy (46)		weak	
a family can enjoy together (47)			
appeals to all age groups (48)			
is for mature adults (49)			
Social Pressure			
if you ask for it, others might look at you funny (50)			
Price			
is a good value for the money (51)			
Packaging			
comes in a range of convenient sizes - from family to child size (52)	strong		
comes in an easy to open package (53)			weak
is cumbersome to get out, serve, put away, etc.(54)			
comes in resealable packaging so that it stays fresh for a long time (55)			
comes in a package that can have a bad effect on the flavor of the drink (56)		weak	
comes in an attractive package (57)	weak	weak	
comes in an environmentally sound package (58)			
Other			
is bubbly (59)		weak	

W=whole milk, L=low-fat milk, S=skim milk.
strong=strong indication of saliency, weak=weak indication of saliency, blanks=no indication of saliency.

At first glance the salience ratings in Table 4 do not appear to show much of a pattern; however, closer scrutiny reveals that the taste, versatility, satisfaction, and health and nutrition groupings contain all but one of the attributes classified as strongly salient. The negative health elements and packaging groupings contain only weakly salient attributes, the exception being "comes in a range of convenient sizes - from family to child size" (52). Age and family, social pressure, and price basically fail to indicate saliency. This last point may be caused by an underrepresentation of these attributes in their contextual groupings. Thus it appears that the taste, versatility, satisfaction, and health and nutrition groupings contain most of the explanatory variation and will likely constitute the perceptual dimensions that influence the choice of milk type.

The results of the logistic regression analyses indicate that 19 attributes are strongly suggestive of being salient, 20 others are weakly suggestive of being salient, and the remaining 20 fail to suggest salience. Although the literature indicates that most multiattribute studies have used 12 or fewer attributes, some studies have used larger attribute sets. The fact that the logistic regression analysis still identifies a large number of attributes may be a result of the data requiring us to apply this analysis to three bivariate, rather than one trivariate, comparison. However, the logistic regression analyses reduces the number of attributes sufficiently for a Fishbein model to be applied. It is also possible to do a principal components factor analysis (or some similar analysis) on the set of 19 salient attributes. In fact, such an analysis would be more reasonable on statistical grounds than an analysis including the full set of 59 attributes. The set of 39 strongly and weakly salient attributes contains many attributes of groupings already represented in the smaller set; the additional attributes may enhance the existing factors or remain statistically nonsignificant.

Most physical attributes whose underlying physical characteristics are essentially identical across milk types fail to indicate strong saliency. The attributes "is always fresh" (1), "comes in an easy to open package" (53), "comes in a package that can have a bad effect on the flavor of the drink" (56), "comes in an attractive package" (57), and "is bubbly" (59) are all weakly indicative of saliency. However, the attributes "is cumbersome to get out, serve, put away, etc." (54), "comes in resealable packaging so that it stays fresh for a long time" (55), and "comes in an environmentally sound package" (58) completely fail to indicate saliency.

Attributes with underlying physical characteristics that vary across milk types are much more likely to reflect their differences in the attribute salience ratings. "Is low in fat" (31) and "comes in a range of convenient sizes - from family to child size" (52) are both strongly indicative of saliency. However, "has few or no calories" (32) fails to indicate saliency.

APPLYING THE REDUCED ATTRIBUTE DATA SETS WITHIN THE FISHBEIN FRAMEWORK

In this section we use the two reduced attribute sets, identified in the previous section, within the Fishbein framework to predict individuals' decisions of whether or not to drink a particular milk type. We then compare these results to a Fishbein model with the full set of 59 attributes. Our objectives are to 1) assess the two reduced attribute sets as predictors of milk type use and 2) compare self-stated and statistically-imputed importance evaluations as predictors of milk type use.

For our analysis we estimate separate logistical regressions for each milk type - whole, low-fat, and skim. For each regression the dependent variable is whether or not the respondent drank a particular milk type during the pre-interview week.[6]

For the models using self-stated importance evaluations we enter each respondent's belief and normalized evaluation ratings into equation (1) to estimate separate preference values (P_{jk}) for each respondent (j) on each milk type (k). This preference value variable is then used as a single regressor for the dependent variable measuring use or non use of milk type k. For the models using statistically-imputed importance evaluations we regress the use or non use of milk type k on 12, 19 and 59 belief ratings for milk type k. If statistically-imputed importance evaluations are equal to self-stated importance evaluations, then the coefficient estimate for the preference value variable will be one; if the two importance evaluations are completely different this coefficient estimate will be zero.

The Theory of Reasoned Action provides a reasonable framework through which the choice of milk type can be explained. All models reported in tables 5-7 are statistically significant at the P = 0.0011 level or better as indicated by their likelihood ratio tests.

The results presented in tables 5-7 show that models for all three milk types contain numerous variables which are statistically insignificant. This is especially evident in the models based on the full set of 59 attributes. This result supports the notion that only a limited number of "salient" attributes should be considered when modeling individual behavior.

In interpreting the coefficient estimates it is important to bear in mind that respondents' belief and evaluation ratings are all measured on bipolar scales. Thus for instance, the coefficient estimate for BELIEF34 on whole milk (0.2680) implies that respondents who feel that this attribute describes the beverage completely have an increased likelihood of drinking whole milk whereas respondents who feel this attribute does not describe this beverage at all have a decreased likelihood of drinking whole milk.

Not surprisingly, the reduced attribute models based on statistically-imputed evaluation ratings display less explanatory power than models using 59 attributes. The likelihood ratio test indicates difference in - 2 log likelihood values between models with 19 and 59 attributes of 72.8 for whole, 61.0 for low-fat, and 52.7 for skim milk. The chi-square value associated with 40 degrees of freedom and alpha = 0.05 is 55.8, indicating that the 19 attribute whole and low-fat, but not skim milk, models are statistically

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[6]It is important to note that the data set contains only respondents who are actual milk drinkers. In models including individuals who don't drink milk, the set of attributes may also need to reflect milk allergy and lactose intolerance concerns.

different from their 59 attribute counterpart. For the 12 versus 59 attribute models, the - 2 log likelihood differences are 85.0 for whole, 70.2 for low-fat, and 77.8 for skim milk, all greater than the chi-square value of 65.0 at alpha = 0.05 and 47 degrees of freedom. However, for models using self-stated evaluation ratings, those with reduced attribute sets outperform those with all 59 attributes.

The results in tables 5-7 also indicate that the models based on the reduced set of 19 attributes describe the data slightly better than models based on the reduced set of 12 attributes. With the exception of the skim milk models with self-stated evaluation ratings, the models using 19 attributes perform slightly better in terms of the concordance of predicted and actual values of their dependent variable than do the models using 12 attributes.

A comparison between the models with statistically-imputed evaluations and self-stated evaluations reveals that the two are different. If self-stated evaluations were identical to statistically-imputed evaluations, the parameter estimates for preferences (P) would equal one because the statistical model is nested in the self-stated model. The closer the preference parameter estimates are to zero, the greater the difference between self-stated and statistically-imputed evaluations. The results in Tables 8-10 reveal preference parameter estimates of between 0.24 (whole milk, 59 attributes) and 0.70 (skim milk, 12 attributes). Most of the preference parameter estimates are between 0.3 and 0.4 which suggests that self-stated and statistically-imputed evaluations differ substantially.

In summary, it appears that models based on the reduced set of attributes, identified either through the logistic regression analysis or the expectancy value approach, are significantly different from models based on all 59 attributes. Further, statistically imputed importance evaluations differ substantially from self-stated importance evaluations.

Table 5. Parameter Estimates of Models Predicting Likelihood of Whole Milk Use (statistically imputed evaluation ratings)*

	12 attributes		19 Attributes		59 Attributes	
Variable	Parameter Estimate	Pr > Chi-Square	Parameter Estimate	Pr > Chi-Square	Parameter Estimate	Pr > Chi-Square
INTERCPT	-0.1976	0.3161	0.0056	0.9805	-0.1914	0.5934
WHOLEB1					-0.2118	0.0428
WHOLEB2			0.0300	0.7707	0.0640	0.6005
WHOLEB3					-0.1309	0.1848
WHOLEB4					-0.2171	0.0177
WHOLEB5					0.0333	0.7122
WHOLEB6			-0.0456	0.5366	-0.0056	0.9489
WHOLEB7					0.0317	0.7234
WHOLEB8			-0.1815	0.0937	-0.1184	0.3270
WHOLEB9	0.1076	0.0970	0.0978	0.1499	0.0836	0.2945
WHOLEB10	0.1001	0.2044			0.1222	0.2011
WHOLEB11					0.3640	0.0148
WHOLEB12			0.0764	0.2871	0.0952	0.2687
WHOLEB13					0.1595	0.1440
WHOLEB14					-0.0037	0.9736
WHOLEB15	-0.1262	0.1531			-0.3674	0.0033
WHOLEB16			0.0035	0.9710	0.0506	0.6668
WHOLEB17					-0.1179	0.2677
WHOLEB18			-0.1474	0.1287	-0.1999	0.0731
WHOLEB19			0.0671	0.4457	0.0023	0.9826
WHOLEB20					0.1064	0.3081
WHOLEB21			0.0495	0.6257	0.0442	0.7204
WHOLEB22					-0.0992	0.2396
WHOLEB23					0.1590	0.1356
WHOLEB24			0.1257	0.1867	0.1907	0.0988
WHOLEB25					-0.0092	0.9386
WHOLEB26			0.3550	0.0001	0.3751	0.0007
WHOLEB27					-0.0924	0.3836
WHOLEB28			-0.0715	0.4452	-0.1306	0.2735
WHOLEB29	0.1689	0.0286	0.0079	0.9232	0.0989	0.3337
WHOLEB30					-0.1372	0.2514
WHOLEB31	0.0990	0.3287	0.0320	0.7276	0.0733	0.5525
WHOLEB32	0.1695	0.0928			0.0180	0.8822
WHOLEB33					-0.1500	0.2114
WHOLEB34	0.2680	0.0005	0.1859	0.0182	0.1227	0.1859
WHOLEB35			0.1470	0.1268	0.1773	0.1566
WHOLEB36					-0.1039	0.2627
WHOLEB37	0.1623	0.0652	0.1531	0.0898	0.0495	0.6451
WHOLEB38	-0.1239	0.1680			-0.0617	0.5793
WHOLEB39					0.0748	0.5777
WHOLEB40			-0.0599	0.5816	-0.1025	0.4561
WHOLEB41					0.2064	0.0738
WHOLEB42					-0.1035	0.2646

Table 5 (con't).

Variable	12 attributes Parameter Estimate	12 attributes Pr > Chi-Square	19 Attributes Parameter Estimate	19 Attributes Pr > Chi-Square	59 Attributes Parameter Estimate	59 Attributes Pr > Chi-Square
WHOLEB43					-0.1032	0.2877
WHOLEB44	-0.1575	0.0390			-0.0034	0.9721
WHOLEB45	-0.1457	0.0834			-0.0429	0.6720
WHOLEB46					-0.0294	0.8258
WHOLEB47					0.2279	0.0734
WHOLEB48					0.0961	0.4016
WHOLEB49					0.1611	0.0572
WHOLEB50					-0.2048	0.0583
WHOLEB51					-0.0492	0.6985
WHOLEB52			-0.0750	0.3846	-0.0205	0.8386
WHOLEB53					-0.1565	0.1939
WHOLEB54					0.0232	0.7899
WHOLEB55					-0.0290	0.7554
WHOLEB56					0.1055	0.3399
WHOLEB57					0.0382	0.7112
WHOLEB58	-0.0538	0.4633			0.0062	0.9465
WHOLEB59					0.0849	0.5913

	12 attributes	19 Attributes	59 Attributes
-2 log likelihood			
intercept	702.3	702.3	702.3
int + covariates	626.8	614.6	541.8
Chi-Sq. Covariates	75.5	87.7	160.5
covariates	12	19	59
Pr>Chi-Sq.	0.0001	0.0001	0.0001
observations	520	520	520
concordant/	72.4%	73.1%	80.4%
discordant	27.3%	26.7%	19.4%

* The numbers in the variable names in this table correspond to the numbers of the beliefs in tables 3 and 4.

Table 6. Parameter Estimates of Models Predicting Likelihood of Low-Fat Milk Use (statistically-imputed evaluation ratings)*

Variable	12 attributes		19 Attributes		59 Attributes	
	Parameter Estimate	Pr > Chi-Square	Parameter Estimate	Pr > Chi-Square	Parameter Estimate	Pr > Chi-Square
INTERCPT	0.4975	0.0237	0.3334	0.1181	0.4467	0.2518
LFB1					-0.1787	0.0858
LFB2			0.0549	0.5797	0.0291	0.8000
LFB3					0.0475	0.6299
LFB4					0.0805	0.4491
LFB5					0.1732	0.0651
LFB6			0.0655	0.4170	0.1154	0.2354
LFB7					-0.0201	0.8413
LFB8			0.1464	0.1477	0.2320	0.0568
LFB9	0.1392	0.0429	0.0625	0.3756	0.0791	0.3571
LFB10	-0.0211	0.8260			0.0693	0.5515
LFB11					0.0677	0.5885
LFB12			-0.0841	0.2634	-0.0837	0.3409
LFB13					0.2070	0.0615
LFB14					-0.0022	0.9854
LFB15	0.1576	0.0563			-0.0326	0.7832
LFB16			-0.0930	0.3440	-0.1412	0.2360
LFB17					0.0987	0.3145
LFB18			0.0313	0.7356	0.0817	0.4553
LFB19			-0.1146	0.2067	-0.1298	0.2140
LFB20					-0.0489	0.6498
LFB21			-0.0233	0.8238	0.0445	0.7154
LFB22					-0.2096	0.0396
LFB23					0.0783	0.4759
LFB24			0.1400	0.1528	0.2174	0.0636
LFB25					-0.0263	0.8165
LFB26			0.0990	0.2497	0.1302	0.2004
LFB27					-0.0554	0.6034
LFB28			0.2490	0.0061	0.1640	0.1349
LFB29	0.0481	0.5470	-0.0375	0.6647	-0.0165	0.8720
LFB30					-0.1586	0.1473
LFB31	0.0210	0.8298	-0.0301	0.7544	0.0414	0.7199
LFB32	-0.1101	0.2041			-0.0685	0.5044
LFB33					-0.1213	0.3121
LFB34	0.0918	0.3190	0.0296	0.7538	0.0977	0.3931
LFB35			0.0423	0.6625	0.0997	0.4280
LFB36					-0.0095	0.9161
LFB37	0.2653	0.0102	0.1852	0.0951	0.2447	0.0772
LFB38	0.0903	0.2752			0.0316	0.7543
LFB39					0.1345	0.2922
LFB40			-0.0268	0.8065	-0.1716	0.2290
LFB41					0.1136	0.3871
LFB42					-0.0003	0.9980

Table 6 (con't).

Variable	12 attributes		19 Attributes		59 Attributes	
	Parameter Estimate	Pr > Chi-Square	Parameter Estimate	Pr > Chi-Square	Parameter Estimate	Pr > Chi-Square
LFB43					-0.0830	0.4707
LFB44	0.0054	0.9508			0.1342	0.1917
LFB45	0.1624	0.1161			0.2206	0.0724
LFB46					0.2259	0.0321
LFB47					-0.0640	0.5814
LFB48					0.0565	0.5665
LFB49					-0.2332	0.0087
LFB50					-0.1532	0.1258
LFB51					-0.0192	0.8777
LFB52			0.0499	0.5240	0.0441	0.6210
LFB53					-0.1793	0.1477
LFB54					0.0213	0.8195
LFB55					-0.1991	0.0295
LFB56					-0.0397	0.6856
LFB57					0.0795	0.4502
LFB58	-0.1893	0.0110			-0.2034	0.0282
LFB59					0.0343	0.8515

	12 attributes	19 Attributes	59 Attributes
-2 log likelihood			
intercept	633.9	633.9	633.9
int + covariates	599.4	590.2	529.2
Chi-Sq. Covariates	34.5	43.6	104.6
covariates	12	19	59
Pr>Chi-Sq.	0.0006	0.0011	0.0002
observations	493	493	493
concordant/	64.5%	67.0%	76.5%
discordant	35.0%	32.7%	23.3%

* The numbers in the variable names in this table correspond to the numbers of the beliefs in tables 3 and 4.

Table 7. Parameter Estimates of Models Predicting Likelihood of Skim Milk Use (statistically-imputed evaluation ratings)*

Variable	12 attributes Parameter Estimate	12 attributes Pr > Chi-Square	19 Attributes Parameter Estimate	19 Attributes Pr > Chi-Square	59 Attributes Parameter Estimate	59 Attributes Pr > Chi-Square
INTERCPT	-1.5200	0.0001	-1.2773	0.0001	-1.4634	0.0001
SKIMB1					0.0968	0.4115
SKIMB2			-0.0232	0.8350	-0.0966	0.4599
SKIMB3					-0.0545	0.6381
SKIMB4					-0.0106	0.9273
SKIMB5					0.2548	0.0116
SKIMB6			-0.0492	0.6075	-0.0228	0.8449
SKIMB7					-0.0495	0.6842
SKIMB8			-0.1097	0.3480	-0.0699	0.6097
SKIMB9	-0.1813	0.0218	-0.2333	0.0063	-0.2133	0.0293
SKIMB10	-0.0054	0.9592			0.0551	0.6910
SKIMB11					0.3074	0.0479
SKIMB12			0.2037	0.0133	0.2844	0.0056
SKIMB13					0.1051	0.3852
SKIMB14					-0.0231	0.8607
SKIMB15	0.2572	0.0033			0.1860	0.1281
SKIMB16			-0.1160	0.2862	-0.0832	0.5237
SKIMB17					-0.1360	0.2188
SKIMB18			0.0619	0.5643	0.0376	0.7578
SKIMB19			-0.0330	0.7497	-0.0530	0.6580
SKIMB20					0.0989	0.4364
SKIMB21			0.0332	0.7642	-0.0699	0.5909
SKIMB22					0.2480	0.0435
SKIMB23					-0.0677	0.6183
SKIMB24			0.1105	0.3059	0.1099	0.3992
SKIMB25					0.0034	0.9784
SKIMB26			0.4375	0.0001	0.4629	0.0001
SKIMB27					-0.1108	0.3591
SKIMB28			0.0954	0.3670	0.0890	0.4877
SKIMB29	0.0451	0.6068	-0.1101	0.2678	-0.1227	0.3014
SKIMB30					-0.1704	0.1908
SKIMB31	-0.0188	0.8685	-0.0917	0.4207	-0.0622	0.6453
SKIMB32	-0.1018	0.2618			-0.1174	0.2954
SKIMB33					-0.2523	0.0500
SKIMB34	0.1849	0.1089	0.1525	0.2174	0.1295	0.3892
SKIMB35			0.0443	0.6855	-0.0162	0.9057
SKIMB36					-0.0382	0.7002
SKIMB37	0.2042	0.0883	0.1517	0.2385	0.1077	0.4919
SKIMB38	0.1146	0.2168			0.0893	0.4218
SKIMB39					0.1605	0.2331
SKIMB40			0.1506	0.2040	0.1186	0.3905
SKIMB41					-0.0281	0.8326
SKIMB42					-0.3168	0.0087

Table 7 (con't).

Variable	12 attributes Parameter Estimate	12 attributes Pr > Chi-Square	19 Attributes Parameter Estimate	19 Attributes Pr > Chi-Square	59 Attributes Parameter Estimate	59 Attributes Pr > Chi-Square
SKIMB43					0.0519	0.6895
SKIMB44	0.1069	0.2537			0.1151	0.3249
SKIMB45	0.1088	0.2484			0.0978	0.4161
SKIMB46					0.0555	0.6097
SKIMB47					-0.0571	0.6519
SKIMB48					-0.0197	0.8540
SKIMB49					-0.0789	0.4043
SKIMB50					-0.0717	0.5138
SKIMB51					0.1077	0.4305
SKIMB52			0.0405	0.6457	-0.0298	0.7721
SKIMB53					0.0673	0.6119
SKIMB54					-0.0318	0.7682
SKIMB55					-0.1734	0.0995
SKIMB56					-0.0560	0.6060
SKIMB57					0.0004	0.9971
SKIMB58	0.0805	0.3231			0.0492	0.6277
SKIMB59					0.2364	0.2383

	12 attributes	19 Attributes	59 Attributes
-2 log likelihood			
intercept	570.8	570.8	570.8
int + covariates	525.9	500.8	448.1
Chi-Sq. Covariates	44.9	70.0	122.7
covariates	12	19	59
Pr>Chi-Sq.	0.0001	0.0001	0.0001
observations	511	511	511
concordant/	69.1%	73.7%	80.9%
discordant	30.5%	25.9%	18.9%

* The numbers in the variable names in this table correspond to the numbers of the beliefs in tables 3 and 4.

Table 8. Parameter Estimates of Models Predicting Likelihood of Whole Milk Use (self-stated evaluation ratings)

Variable	12 attributes Parameter Estimate	12 attributes Pr > Chi-Square	19 Attributes Parameter Estimate	19 Attributes Pr > Chi-Square	59 Attributes Parameter Estimate	59 Attributes Pr > Chi-Square
intercept	-0.5144	0.0968	-0.6633	0.1062	-0.9195	0.2799
P(WHOLE)	0.5603	0.0001	0.4146	0.0001	0.2373	0.0404
-2 log likelihood						
intercept		702.3		702.3		702.3
int + covariates		678.6		659.2		698.1
Chi-Sq. Covariates		23.7		43.1		4.2
covariates		1		1		1
Pr>Chi-Sq.		0.0001		0.0001		0.0001
observations		520		520		520
concordant/		62.9%		66.5%		54.5%
discordant		36.5%		33.2%		44.3%

Table 9. Parameter Estimates of Models Predicting Likelihood of Low-Fat Milk Use (self-stated evaluation ratings)

Variable	12 attributes Parameter Estimate	12 attributes Pr > Chi-Square	19 Attributes Parameter Estimate	19 Attributes Pr > Chi-Square	59 Attributes Parameter Estimate	59 Attributes Pr > Chi-Square
intercept	0.4869	0.1141	0.4291	0.1048	1.5130	0.3082
P(LOW-FAT)	0.2983	0.0128	0.3409	0.0001	-0.3730	0.0028
-2 log likelihood						
intercept		633.9		633.9		633.9
int + covariates		627.6		606.1		624.8
Chi-Sq. Covariates		6.3		27.8		9.1
covariates		1		1		1
Pr>Chi-Sq.		0.0122		0.0001		0.0026
observations		493		493		493
concordant/		57.2%		62.9%		57.4%
discordant		41.8%		36.6%		41.8%

Table 10. Parameter Estimates of Models Predicting Likelihood of Skim Milk Use (self-stated evaluation ratings)

	12 attributes		19 Attributes		59 Attributes	
Variable	Parameter Estimate	Pr > Chi-Square	Parameter Estimate	Pr > Chi-Square	Parameter Estimate	Pr > Chi-Square
intercept	-1.5738	0.1471	-1.2388	0.1121	-0.3928	0.3223
P(SKIM)	0.7044	0.0001	0.3076	0.0001	-0.3006	0.0201
-2 log likelihood						
intercept	570.8		570.8		570.8	
int + covariates	540.3		550.3		565.3	
Chi-Sq. Covariates	30.5		20.5		5.5	
covariates	1		1		1	
Pr>Chi-Sq.	0.0001		0.0001		0.0192	
observations	511		511		511	
concordant/	65.8%		63.3%		56.6%	
discordant	33.7%		36.1%		42.2%	

CONCLUSIONS

The objective of this study was to identify a method for selecting salient attributes from a large pool of candidates and then to use the salient attributes in a Fishbein model. Psychological and statistical theories suggest that the number of salient attributes should not be too large, because the presence of too many attributes increases both the cognitive complexity for the consumer and the level of random error or statistical noise in the analysis. Our results confirm this notion; most attributes in a full model show no statistical significance. The results of our expectancy value analysis indicate that analyses of variance on beliefs and on evaluations may be a better method than simply using mean belief values and mean evaluation scores. Together, the analyses of variance identify 12 attributes as salient, a set size consistent with most previously reported applications of the Fishbein model. The results of our logistic regression analyses suggest strongly that 19 attributes are salient, more than are usually used in most applications of the Fishbein model.

The attribute sets identified as salient by the two methods differ somewhat. Of the 12 attributes identified as salient in the expectancy valuation approach, only five were suggested strongly as salient in the logistic regression approach. Attributes in the health and nutrition groupings were among the most likely to be selected by both methods. The expectancy value approach identifies two additional salient attributes from the taste and negative health elements groupings, and one each from the versatility, satisfaction, and packaging groupings. The logistic regression analyses identifies six additional salient attributes from the satisfaction grouping, four from the taste grouping, three from the versatility grouping, and one from the packaging grouping. In this application, the logistic regression approach favors satisfaction more than the expectancy value approach. That different sets of salient attributes are identified by different methods is consistent with the literature.

Although the decision to look at a reduced attribute set necessarily entails some loss of information, we believe this approach is justifiable. Considering the full set of 59 attributes when modelling consumers' milk type choices is simply unrealistic. Both the expectancy value and logistic regression approaches are useful in paring the attribute set to a more manageable and realistic size. When applied to the Theory of Reasoned Action, both reduced sets of attributes provide meaningful results.

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