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Abstract

The focus of this paper was on assessing the influence of different types of reference information in facilitating the usage of nutrition information. Reference information about a product attribute summarizing information on all available brands on a particular attribute, such as, say, the average fat content of all brands of ice-cream bars, is argued to provide a means for consumers to interpret brand information *relative to other brands* without spending effort in making several brand comparisons. Such interpretation is argued to be important to consumers while making a brand choice or judgment whereas reference information such as percent of USRDA provides a means of interpreting brand information *relative to recommended daily intake*. Three studies found support for hypotheses based on the rationale that reference information such as an average would facilitate greater usage of nutrition information. The findings point to the need for further research on the types of reference information that could be presented to facilitate the usage of nutrition information.

A consumer at the supermarket searching for an ice-cream bar with low fat content, finds a brand with fat content of 30g. per bar. Wishing to find out whether this level of fat content was too high for an ice-cream bar, s/he searched and found another brand with 24g. per bar. Not wanting to spend too much effort on the decision, the consumer proceeded to buy the second brand on the assumption that it had "low" fat content. Consumers often find detailed nutrition information on packages but are hard-pressed to interpret such information in a meaningful manner. In the example above, it was not clear to the consumer whether 24g. of fat per bar was high or low for the product category, ice-cream bars. An option available to the consumer was to compare several brands in order to get a better sense of magnitudes or values of fat content such as 24g. relative to the fat content of other available brands. Perhaps such comparisons would have made it evident that the average fat content among brands of ice-cream bars was about 15g. Therefore, while 24g. was lower than 30g., it still represented above average (perhaps, "high") fat content. However, such a comparison of fat content across several brands would have taken a high level of effort, particularly if the process had to be repeated for each important attribute of a product and for several products. In this situation, the consumer may have benefited from some reference or summary information about various brands on specific attributes, such as the average value or the range of values of available brands of ice-cream bars on fat content. Such reference information would have made it easier to interpret brand information such as 24g. of fat content *relative* to other brands.

The focus of this paper is on assessing whether the usage of nutrition information by consumers can be facilitated by the provision of certain types of reference information. While past research on nutrition information has focused on different formats that may facilitate the use of nutritional information (such as the use of matrices that facilitate comparisons of brands on attributes, (cf., Russo et al., 1986)), the emphasis in this paper is on examining types of summary information that would facilitate the interpretation of brand information *in isolation*, without necessitating comparisons with other brands. Consumers may often encounter situations where it may be less effortful to interpret brand information in isolation rather than make comparisons across several brands. For example, shopping involves searching for information one product at a

time since information is organized by products rather than by attributes. In such situations, reference information that summarizes information across all brands may be very useful in interpreting nutrition information about a particular brand. This paper examines types of reference information that can be used to facilitate the use of nutrition information by consumers across three studies.

REVIEW OF RELEVANT RESEARCH AND HYPOTHESES

Research and practice relevant to the use of types of reference information is briefly reviewed in this section and the importance of reference information for interpreting numerical information is emphasized. Using past research which suggests that numerical information requires reference information in order to be interpreted, hypotheses are generated and tested about the influence of reference information on the usage of nutrition information by consumers.

Review of Relevant Research and Practice

While research on nutrition information has focussed on ways to simplify processing on the part of consumers (cf., Russo et al., 1986; Muller, 1986; Levy et al., 1985), some research has focused on reference information. Moorman (1990) showed that the provision of reference information in the form of percent of USRDA led to greater ability to process as well as greater accuracy in comprehension than no reference information. Scammon (1977) compared nutrition information presented in the form of verbal adjectives versus percent of USRDA and found that the most nutritious brand was identified more accurately with verbal when compared to percentage information. The author argued that, verbal information, due to its evaluative nature, required less processing when compared to percentage information. Past research points to the use of appropriate formats, appropriate reference information (i.e., USRDA), or preprocessed information such as verbal information in facilitating the interpretation of nutrition information.

In practice, the interpretation of raw nutrition information that is presented on packages can be simplified though the use of several types of reference information. One example found in practice, the USRDA, relates the magnitude of a specific brand on an attribute (such as vitamin content) to the total recommended daily intake by expressing the magnitude as a percent of

USRDA. The USRDA format provides a means by which consumers can meaningfully relate the the amount of a particular ingredient in a brand to recommended daily intake. Therefore, the consumer is provided with a means of interpreting brand information *relative to recommended daily intake*. However, consumers often search for nutrition information with the goal of making a choice or judgment, tasks that require the interpretation of brand information *relative to other brands*. To assess a brand relative to other brands, percent of USRDA would have to be used similar to raw numerical information presented on packages. Although the USRDA provides a means of interpreting brand information relative to recommended daily intake, there is a need to assess alternate types of reference information that would facilitate usage of nutrition information by providing a means of interpreting brand information on an attribute relative to other brands. The research question in focus here relates to reference information that would provide a benchmark to interpret brand information without necessitating comparisons with other brands.

Importance of Reference Information

Reference information that summarizes a product category on an attribute would provide a means for consumers to assess the magnitude or value of a brand on an attribute *relative* to other brands. The processing of such reference information would not require individual comparisons between a brand being judged and various others brands but only one comparison with reference information in order to obtain a sense of the relative magnitude of a brand and make a judgment. Past research suggests that numerical information requires some form of reference information in order to be interpreted meaningfully, a conclusion especially important to nutrition information which is usually conveyed numerically. Research on nutritional information suggests that a number derives its meaning in comparison with other numerical information and does not have any meaning by itself (cf., Venkatesan et al. 1986). Further, research on the processing of numerical information brings out the importance of providing reference information that allows the meaningful interpretation of such information. Viswanathan and Childers (1992) hypothesized and found that numerical information describing a product attribute is likely to be recoded to a verbal-like form during a choice or judgment task in order to use the magnitude conveyed by it (i.e., a numerical label such as "200" calories may be recoded to a label like "high" calories) whereas

verbal information is likely to be interpreted without translation. Consistent with other research, an argument advanced by the authors was that numerical product information has to be compared to other information to derive its magnitude (cf., Venkatesan et al., 1986) whereas verbal information has an evaluative inference embedded in it (cf., Scammon, 1977; Huber, 1980). Other research on numbers (Hinrichs and Novick, 1982) also suggests that numerical information is encoded approximately rather than exactly in memory when the magnitude conveyed by it is emphasized, perhaps because the magnitude conveyed by a number is extracted and encoded in an approximate form. An implication of past research is that a *translation or recoding* process has to occur in order for meaning to be extracted from numerical information. While translation can be facilitated by brand comparisons, a simpler approach which does not necessitate comparisons across brands may be the provision of reference information.

At a theoretical level, the issue in focus here relates to the types of summary information about a continuum that would facilitate understanding of specific numerical values on that continuum. Several indicators of central tendency and variation could provide summary descriptions of the relative values or magnitudes of all brands in the marketplace on an attribute such as the median value and the range of values of various products in a category. As an example, the average sodium content among all breakfast cereals (say, 3.5 g) or the range on an attribute (say, 2-5g, the minimum and maximum values of all the brands in the marketplace) offers a means of interpreting the actual sodium content of a brand relative to other brands. The task of making a choice from among a set of brands by judging one or a few brands would be facilitated by providing summary information about a set of brands in a particular product category as the benchmark. Given the exploratory nature of this study, the impact of two types of reference information were assessed, namely the median and the range. The advantage of presenting the median as summary descriptor is that it identifies brands that are above or below it as being "high" or "low". The advantage of presenting the range is that it identifies the extreme points and therefore, could allow an inference of the highness and lowness based on proximity to the extremes. Verbal information was also studied here since it provides a baseline to compare numerical information which is particularly important in light of recent research on the use of

verbal labels to describe nutrition information (cf., Levy et al., 1991). Further, past research (Scammon, 1977) has found that verbal information, due to it preprocessed and evaluative nature, may be easier to process than numerical information.

Hypotheses

Several hypotheses were generated and tested across three studies to investigate the impact of reference information on the usage of nutrition information. The central issue assessed here was whether the provision of a median or a range would lead to greater usage of numerical nutrition information. Using a procedure where subjects were exposed to information on several attributes for several brands with instructions to judge the healthiness of each brand followed by a task requiring recall of brand information, the following hypotheses were tested.

H1: Provision of reference information will lead to larger differences in ratings of healthiness of healthy versus unhealthy brands than no reference information.

H2a: Provision of reference information will lead to more accurate recall of numerical nutrition information than no reference information.

H2b: Provision of reference information will lead to a higher proportion of recall of numerical information in a verbal form than no reference information.

The rationale for H1 is that, if reference information leads to greater usage of numerical nutrition information, it should be reflected in greater weightage being given to such information. Therefore, brands whose numerical nutrition information are relatively healthy (or unhealthy), would be rated as being more healthy (or less healthy) when presented with reference information than without reference information. H2a was based on the rationale that, if reference information facilitates the usage of numerical nutrition information, such usage would be reflected in more accurate subsequent recall of numerical information. Drawing on past research that suggests that usage of numerical information in a choice or judgment would be reflected in a greater translation of numerical information to a verbal form (cf. Viswanathan and Childers 1992), H2b was based on the rationale that, if reference information facilitates the usage of numerical nutrition information, such usage would be reflected in greater verbal recall of numerical information. These hypotheses were assessed across three studies. The first study was exploratory in nature and used a paper and pencil method to assess the hypotheses. Two more studies used more controlled experimental

settings to further assess the hypotheses.

STUDY 1

Overview

The first study assessed alternate types of reference information by manipulating reference information across three groups of subjects; a group with no reference information (referred to as the 'none' condition), a group where the median of values or magnitudes of all available brands on an attribute was provided (referred to as the 'average' condition), and a group where the maximum and minimum values of all available brands on an attribute was provided (referred to as the 'range' condition). Subjects were exposed to information for several fictitious brands for several attributes for each of two product categories with instructions to rate the healthiness of each brand (to test H1), and to subsequently recall brand information (to test H2a & H2b).

Stimulus Materials

Two product categories, breakfast cereals and ice-cream bars, with four attributes of breakfast cereals (calorie content, sodium content, fat content, and fiber content) and two attributes of ice-cream bars (fat content and calorie content) were chosen from Consumer Reports (1990). Information on cereals was presented verbally for two attributes (i.e., fiber content and sugar content) and numerically for the other two attributes (i.e., calorie content and sodium content). Therefore, the mode of presented information was manipulated within-subjects in order to provide comparisons between numerical and verbal information. Information on both attributes for the product category, ice-cream bars, was presented numerically. Four fictitious brands were used for each product category. For each attribute presented numerically, the highest value, lowest value, 75th percentile value, and 25th percentile value of all brands listed in Consumer Reports (1990) were chosen and assigned to each brand, in order to cover the range of possible values on each attribute and employ an equal number of brands that were above or below the average value of all brands in the market place. For the attributes presented verbally, the labels 'very low', 'low', 'high', and 'very high' were used.[1]

The relative healthiness of brand information presented in numerical (versus verbal) form

was manipulated within brands as a means to assess the weightage given to numerical (versus verbal) information in making overall judgments of the healthiness of brands to test H1. Above and below average values for healthiness was decided on the basis that higher fat content, higher sugar content, higher sodium content, and lower fiber content were desirable for healthiness and this was suggested in the instructions. The assignment of specific magnitudes or values to brands of breakfast cereals were such that, on two attributes presented numerically (calorie content and sodium content), two brands were below average on healthiness (i.e., Brands C & D which had above average calorie content and and above average sodium content) and two brands were above average on healthiness (i.e., Brands A & B; see Footnote 1). However, on the two attributes that were presented verbally (fat content and sugar content), the assignment was reversed so that two brands that were above average on healthiness on numerical attributes were below average on healthiness on verbal attributes (i.e., above average fat content and sugar content) and vice versa. Therefore, differences in ratings of overall healthiness of brands as a function of above average healthiness on numerical attributes (and below average healthiness on verbal attributes) versus below average healthiness on numerical attributes (and above average healthiness on verbal attributes) were used as indicators of the extent of weightage given to numerical (versus verbal) information.

Procedures

90 students at a midwestern university participated in the study with 30 students being assigned to each of the conditions based on the type of reference information. The experiment was administered using a questionnaire. Subjects were familiarized with the product category of breakfast cereals, and informed of attributes on which information would be presented and how information would be conveyed along those attributes. Subjects were also informed that the information presented was based on Consumer Reports and had a high degree of accuracy, to minimize discounting of information due to factors such as credibility. They were also instructed that "high fiber content, low sugar content, low sodium content and low calorie content are generally considered as being good for health" and familiarized with the fictitious brand names. For the groups in the 'average' or 'range' conditions, additional instructions describing these two

types of reference information were provided using gas mileage of automobiles as an example.

Subjects were exposed to information on a brand of breakfast cereal on the four attributes mentioned above and then asked to rate the brand on several scales which were presented on the bottom of the same page of the questionnaire. Subjects completed four 5 point scales for each brand relating to the healthiness (5 point scale end-anchored not at all healthy - very healthy), nutrition content (5 point scale end-anchored not at all nutritious- very nutritious), liking (5 point scale end-anchored not at all - very much), and likelihood of purchase (5 point scale end-anchored very low - very high) of the brand. This was followed by a similar procedure for the other three brands. At the bottom of each page, subjects were instructed not to turn to a previous page in order to prevent direct comparisons across brands. Next, subjects performed a free recall task where they were instructed to write down the information they remembered (i.e., brand name, attribute name, and value), and to write the value in any form in which it came to mind (i.e., in numerical or in verbal form). Such instructions allowing recall in any preferred form provide a test of the degree of recall of numerical information in numerical versus verbal forms (i.e., H2b). Next, subjects filled out scales which indicated the importance of each attribute in deciding how healthy a cereal is. The whole procedure was repeated for the product category, ice-cream bars. Finally, subjects filled out responses to open-ended questions regarding the usefulness of reference information in the form of an average and a range.

Results

Results of Ratings of Healthiness.

An ANOVA was performed on the difference in healthiness ratings between numerically 'healthy' and numerically 'unhealthy' brands of cereals. A non-significant main effect was obtained for healthiness ratings (means were -1.53, -0.98, and -1.50, respectively for the none, average, and range conditions; see Table 1). These results suggest that the numerically healthy (i.e., verbally unhealthy) brands were rated as being less healthy than the numerically unhealthy (i.e., verbally healthy) brands, perhaps because greater weightage may have been given to the verbally presented attributes. The results do not support H1 at a significant level with only directional support for the greater weightage being given to numerical information in the average

condition when compared to the none condition (since the difference was less negative (i.e., more positive) for the average condition when compared to the none condition).

Insert Table 1 about here

A similar ANOVA was performed for ice cream bars. A significant main effect was obtained for healthiness ratings ($F(2,87) = 7.33$; $p < .01$) with means being 2.07, 3.12, and 3.32, respectively for the none, average, and range conditions. The average condition had a significantly higher mean than the none condition ($F(1,87) = 8.97$; $p < .01$) as did the the range condition ($F(1,87) = 12.71$; $p < .001$), providing support for H1. For differences in ratings between numerically healthy versus unhealthy brands on nutrition content, liking and likelihood of purchase, the average, and range conditions had directionally or significantly higher means than the none condition.

Results of Recall .

Subjects in the recall task were instructed to recall information in any form they preferred leading to numerical and verbal recall of information that was numerical at exposure for both cereals and ice-cream bars, and verbal and numerical recall of information that was verbal at exposure, for cereals. The number of accurately recalled times for each of these forms of recall was computed for each subject. Accurate recall required a recalled item to be within one scale-point on either side of the original item based on a five point scale of the 0th, 25th, 50th, 75th, and 100th percentile value on an attribute (e.g., if sugar content for a brand was "low", then recall of this item as "very low" or "neither low nor high" was considered as being accurate; if if calorie content for a brand was "125" calories (i.e., the highest value), then recall of this item as "very high" or "high" was considered as being accurate). Such a criterion for accuracy was used to allow for some degree of individual differences in the manner in which subjects translate numerical labels and also to allow for approximate rather than exact recall. The recall data was examined to identify accurately recalled items and scores were assigned to each subject according to the number of accurately recalled items in each condition.

For cereals, a 3 (type of reference information; none, average, and range) by 2 (mode at recall; numerical versus verbal) factorial ANOVA was run on the recall scores for the information

presented numerically which led to a nonsignificant main effect for type of reference information. The proportion of accurate recall was directionally higher for the average condition when compared to the none condition, suggesting lack of support for H2a (means for the none, average, and range, conditions respectively were 0.58, 0.66, and 0.50; see Table 1). An ANOVA of the percentage of accurate recall of numerical information in a verbal form across none, average and range conditions led to a non-significant main effect. The percentage of verbal recall was directionally higher for the average condition when compared to the none condition, suggesting lack of support for H2b (means for the none, average, and range conditions respectively, were 63.4%, 82.0%, and 62.4%; see Table 1).

For ice-cream bars, a 3 (type of reference information; none, average, and range) by 2 (mode at recall; numerical versus verbal) factorial ANOVA was run on the recall scores which led to a marginally significant main effect for type of reference information ($F(2, 76) = 2.55$; $p < .09$). The proportion of accurate recall was significantly higher for the average condition ($F(1,76) = 4.96$; $p < .05$), and directionally higher for the range condition when compared to the none condition, providing partial support for H2a (means for the none, average, and range, conditions respectively were 0.74, 0.90, and 0.78; see Table 1). An ANOVA of the percentage of accurate recall of numerical information in a verbal form across none, average and range conditions led to a non-significant main effect. The percentage of verbal recall was directionally higher for the average and range conditions when compared to the none condition, providing only directional support for H2b (means for the none, average, and range, conditions respectively were 47.3%, 57.6%, and 61.9%; see Table 1).

Analysis of Open-ended Questions.

Responses to open-ended questions of 82 subjects about the usefulness of providing reference information in the form of an average and a range were coded in terms of whether they suggested that reference information was not useful, useful, or very useful. For the question about using the average as reference information, only 17.1% of response suggested that such reference information was not useful, whereas 36.6%, and 46.3% of responses suggested that such reference information was useful, and very useful, respectively. For the question about using the

range as reference information, 26.8%, 45.1%, and 28% of responses suggested that such reference information was not useful, useful, and very useful, respectively. Therefore, a majority of responses suggested that respondents found both forms of reference information either useful or very useful. Reference information in the form of an average appeared to be considered as being more useful than the range. The content of the responses reflected perceived benefits and concerns with these two types of information. The benefit of both types of reference information in providing standards of comparison was mentioned frequently. Concerns raised included the proper computation of the average and the range using a set of products that were sufficiently similar.

Discussion of Results.

The results of this study are mixed in terms of reference information leading to the facilitation of usage of nutrition information when compared to no reference information. For ice cream bars, support was found for H1, partial support was found for H2a (i.e., support was found for the 'average' condition), and directional support was found for H2b. These results suggest that greater weightage may have been given to brand information when it was provided with reference information in the form of a range or an average. Therefore, the provision of reference information appears to lead to a sharper discrimination between healthy and unhealthy brands, as well as higher subsequent recall and higher recall of numerical information in a verbal form. However, the results for breakfast cereals did not support the hypotheses with only directional support for H1, H2a, and H2b for reference information in the form of an average. It is possible that the usage of numerical information across all conditions may have been affected by the greater weightage being given to verbally presented attributes due to the higher importance attached to these attributes and/or the relative ease of using verbal information. Such a conclusion is consistent with the significantly higher importance ratings for verbally when compared to numerically presented attributes ($F(1,87) = 16.58$; $p < .001$) using a 3 (reference information) by 2 (mode) ANOVA of mean importance ratings. Finally, responses to open-ended questions about the usefulness of the average and the range suggested that a 82.9% and 73.2% of the respondents perceived the average and range, respectively, as being useful or very useful.

While the results provided some support for the higher usage of numerical nutrition information when provided with reference information, two problems with Study 1 were the use of a questionnaire to present information rather than a more controlled display of brand information using a computer and the between subject manipulation of information mode which may have led to greater weightage being given to verbally presented attributes for breakfast cereals. Two more studies were conducted to assess the hypotheses using computers to display brand information and manipulating information mode between groups of subjects.

STUDY 2

Overview and Procedures

The second study was similar to the first in several respects. However, one key difference was that it was conducted using Macintosh computers to allow for more controlled presentation of information. In addition to assessing H1, H2a, and H2b, the time spent by subjects for each condition as well as subsequent recognition of brand information was assessed in this study to gain exploratory insight into these variables. Further, only one product category was used, breakfast cereals, with three attributes. Four groups of subjects were used in this study with each being exposed to information about four brands of breakfast cereals on three attributes. Three groups were presented with numerical information with no reference information, numerical information with the average as reference information, and numerical information with the range as reference information, respectively. A fourth group was presented with verbal information.[2]

The sample consisted of 83 undergraduate students at a midwestern university. Approximately 20 subjects were assigned to each group. Subjects were provided with a short exercise on the use of the Macintosh computer, familiarized with the product category and attributes on which information would be presented, provided instructions for the task, and familiarized with the brand names. Subjects were then exposed to one piece of information at a time (i.e., a brand name, an attribute, and a magnitude) and self-paced their exposure to each piece of information. The sequence of information was brand-based with the order of attributes within each brand randomized across all subjects. Subjects had the option of exiting or viewing the

information again only at the end of a cycle of twelve pieces of information (to prevent differential exposure between pieces of information). This initial phase was followed by a distracter task for one minute where subjects were required to complete a partial line drawing of an object in order to remove the effects of short term memory.

After the distracter task, subjects evaluated each brand by filling out the same four scales used in Study 1 by using the mouse on a Macintosh computer to "click" on a chosen label on a five point verbally anchored scale. Subjects then completed a set of 7 five point scales relating to the brand information presented to them describing each attribute (i.e., satisfaction with information, believability of information, ease of understanding information, motivation to study information, ability to understand information, desire for additional information, and confusion due to information) and 3 five point scales about the brand judgments that they made (i.e., the certainty, confidence, and accuracy of their judgments). Next, subjects completed a recognition task consisting of 24 trials, the 12 pieces of information originally shown and 12 fillers (i.e., false information about each of the four brands along each of the attributes). Each trial consisted of exposure to a screen containing a brand name, an attribute label, and a magnitude. Subjects were required to provide a response (i.e., True or False) by clicking the mouse on the Macintosh computer on the appropriate button on the screen. Each trial was followed by a masked screen for 2 seconds to mark the end of the trial and alert subjects to the beginning of the next trial.

Results

Analysis of Healthiness Ratings.

ANOVAs was run on the difference in ratings of healthiness, nutrition content, liking, and likelihood of purchase for each subject between the "healthy" brands and the "unhealthy" brands. The ANOVA on healthiness ratings led to a significant main effect ($F(3,79) = 3.31$; $p < .05$). The verbal conditions had a significantly higher mean than the none condition ($F(1,79) = 9.66$; $p < .001$), with the average and range conditions being directionally higher than the none condition, providing only directional support for H1 (means for none, average, range, and verbal conditions, respectively, were 1.79, 2.18, 2.05 and 2.57, see Table 1 and Figure 1). For ratings on nutrition content, liking and likelihood of purchase, the average, range, and verbal conditions had

directionally or significantly higher means than the none condition.

Insert Figure 1 about here

Analysis of Recall Accuracy.

A 4 (type of reference information; none, average, range, and verbal) by 2 (mode at recall; numerical versus verbal) factorial ANOVA was run on recall scores which led to a significant main effect for type of reference information ($F(3,69) = 5.26$; $p < .01$). The proportion of accurate recall was directionally higher for the average condition, and significantly higher for the range ($F(1,69) = 4.43$; $p < .05$), and verbal ($F(1,69) = 15.28$; $p < .001$) conditions when compared to the none condition, providing partial support for H2a (means for the none, average, range, and verbal conditions respectively were 0.61, 0.71, 0.80, and 0.94; see Table 1 and Figure 2). An ANOVA of the percentage of accurate recall of numerical information in a verbal form across none, average and range conditions led to a significant main effect ($F(2,51) = 4.88$; $p < .05$). The percentage of verbal recall was significantly higher for the average ($F(1,51) = 8.61$; $p < .01$) and range ($F(1,51) = 6.24$; $p < .05$) conditions when compared to the none condition, providing support for H2b (means for the none, average, and range, conditions respectively were 39.1%, 86.1%, and 74.2%; see Table 1 and Figure 2).

Insert Figure 2 about here

Other Analyses.

An ANOVA of the mean time spent on each piece of information for each subject led to a non-significant main effect for the type of reference information. The means for the none, average, range, and verbal conditions were 7.57s, 8.24s, 7.50s, and 8.16s, respectively, with no significant differences between means. In order to uncover effects that may have been hidden due to outliers, data for subjects whose mean encoding times were more than 2 standard deviations from the mean were deleted (i.e., 4 subjects out of 82 who had means greater than 2 standard deviations from the mean). The means for the none, average, range, and verbal conditions were 6.65s, 8.24s, 6.96s, and 7.01s, respectively with the average condition having a marginally higher mean than the none condition ($1,74) = 3.31$; $p < .08$). These results provide indirect evidence of

the greater usage of information in the average and verbal conditions based on directionally higher time spent on information in these conditions. An ANOVA of the mean accuracy of recognition for each subject led to a significant main effect for the type of reference information ($F(3,79) = 15.03$; $p < .001$). The mean proportion of accurate responses for the none, average, range, and verbal conditions were 0.73, 0.72, 0.74, and 0.92, respectively. The verbal condition had significantly higher recognition accuracy than the other three conditions. Perhaps, the translation of numerical information may have led to the lower accuracy of recognizing it in its original (i.e., numerical) form.

The 7 scales relating to subjects ratings of the information provided (i.e., satisfaction with information, etc.) were combined to form a 7 point scale referred to as the 'quality of information' measure (Coefficient alpha = 0.69). The items of this measure were scored such that higher satisfaction with information, higher believability of information, higher ease of understanding information, higher motivation to study information, higher ability to understand information, less desire for additional information, and less confusion due to information would lead to higher scores on the quality of information measure. An ANOVA was run on the mean for each subject on the 7 item scale of 'quality of information' which led to a non-significant main effect. The means for the none, average, range, and verbal conditions were 3.30, 3.59, 3.68, and 3.55, respectively. Only the verbal condition had a significantly higher mean than the none condition ($F(1,79) = 6.66$; $p < .01$), with the average and range being directionally higher than the none condition. The 3 scales relating to subjects ratings of their judgments provided (certainty of judgments, etc.) were combined to form a 3 point scale referred to as the 'quality of judgments' measure such that more certainty, higher confidence, and higher accuracy of judgments would lead to higher score on the 'quality of judgments' measure (Coefficient alpha = 0.91). An ANOVA was run on the mean for each subject on the 3 item measure of 'quality of judgments' which led to a non-significant main effect. The means for the none, average, range, and verbal conditions were 3.33, 3.62, 3.44 and 3.54, respectively. The provision of reference information appeared to lead to directionally higher scores on both the quality of information and quality of judgment measures.

Discussion of Results.

Study 2 provided directional support for H1, partial support for H2a (i.e, support for the range condition), and support for H2b. Further, the provision of reference information in the form of an average appeared to lead to directionally higher time being spent on brand information when provided with no reference information. The provision of reference information also led to directionally higher scores on both the quality of information and quality of judgment measures. The verbal condition appeared to lead to a significantly higher difference in healthiness ratings for healthy versus unhealthy brands, significantly higher accurate recall and recognition, more time being spent on brand information, and higher scores on quality of information and quality of judgment measures, than the none condition. While support at a significant level was not found for all three hypotheses, stronger support was found here when compared to Study 1. A third study was conducted to attempt to replicate the results using a format of presentation of information that was closer to the availability of nutrition information in packages in everyday life.

STUDY 3

The third study was similar to the second in most respects except that all the information on a brand was shown on one screen similar to the display of package information (see Figure 3), rather than using a sequentially display of each piece of brand information as in Study 2. The experiments were conducted using Macintosh computers. The sample consisted of 50 undergraduate students at a midwestern university. Approximately 12 subjects were assigned to each of 4 groups. Instructions were provided similar to the instructions in Study 2. As mentioned earlier, subjects were exposed to information on all three attributes of a brand in one screen and could spend as much time as they needed to on the information. This was followed by the set of 4 scales used in Studies 1 and 2 to rate the healthiness, nutrition content, liking and likelihood of purchase of the brand. Next, information on the next brand was presented and so on. In order to control for order effects due to the valence of information presented for the first brand, the ordering of information assigned to each brand (i.e., A, B, C, and D) was counterbalanced across two set of an equal approximately number of subjects in each condition. After rating all four brands, subjects filled out the scales of quality of information and quality of judgment used in Study 2, and

then performed the recall, and recognition tasks.

Insert Figure 3 about here

Analysis of Healthiness Ratings.

An ANOVA was run on the difference in healthiness ratings for each subject between the "healthy" brands and the "unhealthy" brands which led to a significant main effect ($F(3,46) = 8.55$; $p < .001$). The means for the none, average, range, and verbal conditions were 1.58, 2.42, 2.00, and 3.08, respectively. The verbal ($F(1,46) = 23.49$; $p < .001$) and average ($F(1,46) = 7.03$; $p < .05$) conditions had significantly higher means than the none condition while the range condition had a directionally higher mean than the none condition, providing partial support for H1 (means for the none, average, range, and verbal conditions, respectively, were 1.58, 2.42, 2.00, and 3.08; see Table 1 and Figure 1). For ratings on nutrition content, liking, and likelihood of purchase, the average, range, and verbal conditions had directionally or significantly higher means than the none condition.

Analysis of Recall Accuracy.

A 4 (type of reference information; none, average, range, and verbal) by 2 (mode at recall; numerical versus verbal) factorial ANOVA was run on the recall scores which led to a significant main effect for type of reference information ($F(3,39) = 3.15$; $p < .05$). The proportion of accurate recall was significantly higher for the average ($F(1,39) = 5.31$; $p < .05$), range ($F(1,39) = 5.47$; $p < .05$), and verbal ($F(1,39) = 8.20$; $p < .01$) conditions when compared to the none condition, providing support for H2a (means for the none, average, range, and verbal conditions, respectively, were 0.63, 0.86, 0.85, and 0.91; see Table 1 and Figure 2). An ANOVA of the percentage of accurate recall of numerical information in a verbal form across none, average, and range conditions led to a significant main effect ($F(2,30) = 8.65$; $p < .01$). The percentage of verbal recall was significantly higher for the average ($F(1,30) = 15.04$; $p < .001$), and range ($F(1,30) = 10.32$; $p < .01$) conditions when compared to the none condition, providing support for H2b and replicating the results of Study 2 (means for the none, average, and range, conditions respectively were 34.8%, 86.1%, and 74.2%; see Table 1 and Figure 2).

Other Analyses.

An ANOVA of the mean times spent on a screen containing brand information led to a significant main effect for the type of reference information ($F(3,46) = 3.92$; $p < .05$). The means for the none, average, range, and verbal conditions were 8.61s, 10.49s, 12.77s, and 11.40s, respectively. The verbal ($F(1,46) = 5.00$; $p < .05$) and range ($F(1,46) = 11.15$; $p < .01$) conditions had significantly higher times than the none condition with difference between the average and none conditions not reaching significance. These results suggest the greater usage of information in the average, range, and verbal conditions when compared to the none condition based on significantly or directionally higher time spent on information in these conditions. An ANOVA of the mean accuracy of recognition for each subject led to a significant main effect for the type of reference information ($F(3,46) = 6.08$; $p < .01$). The mean proportion of accurate responses for the none, average, range, and verbal conditions were 0.69, 0.73, 0.71, and 0.88, respectively. The verbal condition had significantly higher recognition accuracy than the other three conditions, as in Study 2.

An ANOVA was run on the mean for each subject on the 7 item scale of 'quality of information' (Coefficient alpha = 0.78) which led to a non-significant main effect. The means for the none, average, range, and verbal conditions were 3.25, 3.86, 3.64, and 3.57, respectively. Only the average condition had a significantly higher mean than the none condition ($F(1,46) = 5.27$; $p < .05$), with directionally higher means for the range and verbal conditions. An ANOVA was run on the mean for each subject on the 3 item scale of 'quality of judgments' (Coefficient alpha = 0.88) which led to a non-significant main effect. The means for the none, average, range, and verbal conditions were 3.25, 3.75, 3.92 and 3.80, respectively. Only the range condition had a significantly higher mean than the none condition ($F(1,46) = 4.48$; $p < .05$), with directionally higher means for the average and verbal conditions. The pattern of results suggest that the provision of reference information leads to directionally or significantly higher scores on these two measures than no reference information.

Discussion of Results.

Study 3 provided partial support for H1 (i.e., support for the average condition), and support for H2a and H2b. Further, the provision of reference information appeared to lead to

more time being spent on brand information when provided with reference information and also led to directionally higher scores on both the quality of information and quality of judgment measures. The verbal condition appeared to lead to a significantly higher difference in healthiness ratings for healthy versus unhealthy brands, significantly higher accurate recall and recognition, more time being spent on brand information, and higher scores on quality of information and quality of judgment measures, than the none condition. These results provide support at a significant level for all hypotheses except the range condition for H1.

GENERAL DISCUSSION

The focus of this paper was on assessing the influence of different types of reference information in facilitating the usage of nutrition information. Arguing that reference information that summarize the magnitudes of available brands on an attribute provide a means for consumers to interpret nutrition information for a brand *relative* to other brands without making several specific brand comparisons, hypotheses were generated about the impact of such reference information on the usage of nutrition information. Three studies assessed these hypotheses and also provided exploratory insight into several variables that may be impacted by the type of reference information. While the hypotheses were not consistently support at a significant level across studies, the pattern of results suggest that the provision of reference information leads to several advantages in terms of weightage given to brand information in making judgments of healthiness, as well as judgments of nutrition content, liking, and purchase likelihood. Further, subsequent recall of information as well as recall of numerical information in a verbal form (which is suggestive of an understanding of the meaning conveyed as well as usage of numerical information (cf., Viswanathan and Childers, 1992)) appears to be facilitated with the provision of reference information. Responses to open-ended questions also suggested that reference information in the form of an average or a range is perceived as being useful by a majority of respondents.

Further, the findings suggest that verbal information, which may be considered as preprocessed information (cf., Scammon, 1977) which does not require a point of reference in

order to be interpreted, has several advantages over numerical nutrition information. The pattern of results suggest that the provision of nutrition information in a verbal form leads to several advantages in terms of weightage given to brand information in making judgments of healthiness, as well as judgments of nutrition content, liking, and purchase likelihood. Further, subsequent recall and recognition of information appears to be facilitated by the verbal presentation of nutrition information.

These findings point to the potential importance of types of reference information in facilitating interpretation of nutrition information. Such reference information could provide consumers with an ability to interpret nutrition information with a relatively low degree of effort and also a means of learning about a product category with a low degree of effort, both important concerns in designing public policy. Several avenues of future research can be pursued to further understand the impact of reference information. One line of research should focus on comparative studies of different presentations of statistical summaries of brand information on an attribute such as the average, the range, or the average and the range, in terms of their impact on variables such as processing effort, and usage in a choice. While several types of summary information are available, it is not clear as to how consumers would use such information during decision making. Given the importance of reference information in interpreting numerical information, investigation of alternate types of reference information may be a promising avenue of research. Another line of research should focus on influence of reference information on the development of consumer knowledge about a product category. Reference information may be an efficient means of educating consumers about a product category. In conclusion, the study of reference information in the context of nutrition information provides a promising avenue of improving consumer decision making and knowledge.

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Footnotes

[1] The brand names for breakfast cereals along with the chosen values on the attributes, calorie content, fiber content, sugar content, and sodium content, respectively, were as follows: (i) 'A' - 96 calories, Very Low, High, and 2 mg., (ii) 'B' - 53 calories, Low, Very High, and 79 mg., (iii) 'C' - 125 calories, High, Very Low, and 230 mg., and (iv) 'D' - 110 calories, Very High, Low, and 320 mg.. The brand names for ice-cream bars along with the chosen values on the attributes, calorie content, and fat content, respectively, were as follows: (i) 'W' - 319 calories, and 30 g., (ii) 'X' - 439 calories, and 20 g., (iii) 'Y' - 111 calories, and 12 g., and (iv) 'Z' - 190 calories, and 8 g..

[2] The brand names for breakfast cereals along with the chosen values on the attributes, calorie content, sodium content, and fiber content, respectively, were as follows: (i) 'A' - 96 calories, 2 mg., and 5 g., (ii) 'B' - 53 calories, 79 mg., and 4 g., (iii) 'C' - 125 calories, 230 mg., and 3 g., and (iv) 'D' - 110 calories, 320 mg., and 2 g. For the condition where only verbal information was presented, the chosen values on the attributes, calorie content, sodium content, and fiber content, respectively, were as follows: (i) 'A' - Low, Very low, and Very High, (ii) 'B' - Very low, Low, and High, (iii) 'C' - Very high, High, and Low, and (iv) 'D' - High, Very high, and Very low.

TABLE 1

Summary of Results

Type of Reference Information	None	Average	Range	Verbal
Healthiness ratings (H1).				
Study 1 - Cereals	-1.53	-0.98	-1.50	
Study 1 - Ice cream bars	2.07	3.12	3.32	
Study 2	1.79	2.18	2.05	2.57
Study 3	1.58	2.42	2.00	3.08
Recall accuracy (H2a).				
Study 1 - Cereals	0.58	0.66	0.50	
Study 1 - Ice cream bars	0.74	0.90	0.78	
Study 2	0.61	0.71	0.80	0.94
Study 3	0.63	0.86	0.85	0.91
Percentage of verbal recall (H2b).				
Study 1 - Cereals	63.4	82.0	62.4	
Study 1 - Ice cream bars	47.3	57.6	61.9	
Study 2	39.1	74.8	70.9	
Study 3	34.8	86.1	74.2	
Recognition accuracy.				
Study 2	0.73	0.72	0.74	0.92
Study 3	0.69	0.73	0.71	0.88
Encoding time (in seconds).				
Study 2	7.57	8.24	7.50	8.16
Study 3	8.61	10.49	12.77	11.40

FIGURE 1A

RESULTS OF HEALTHINESS RATINGS - STUDY 2

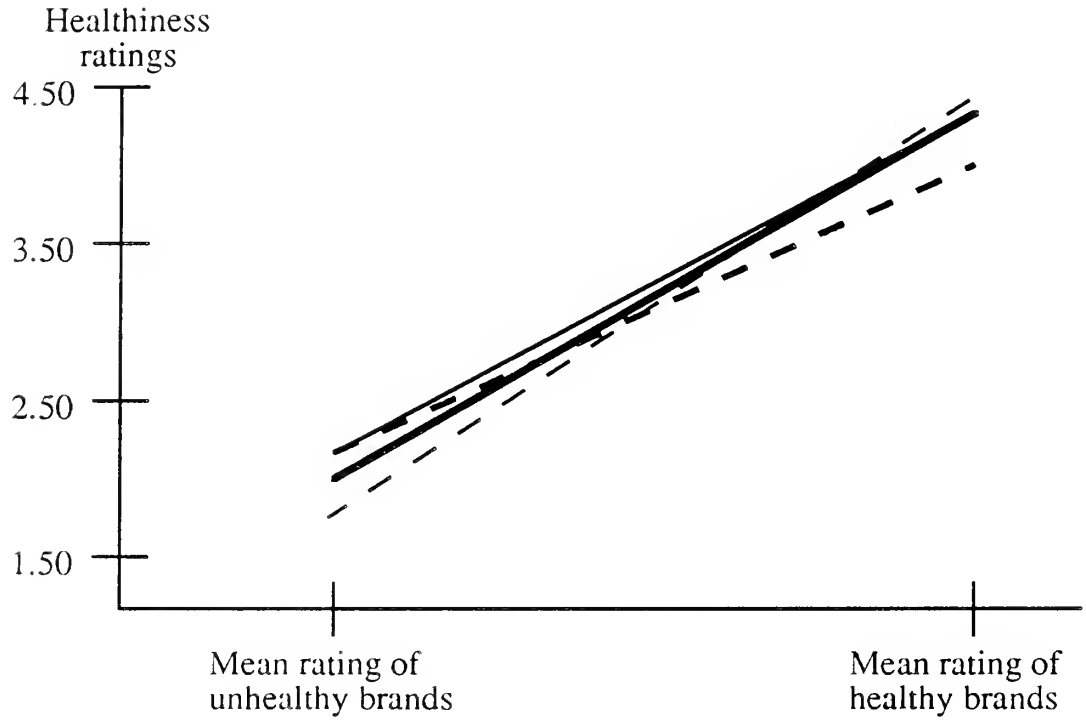
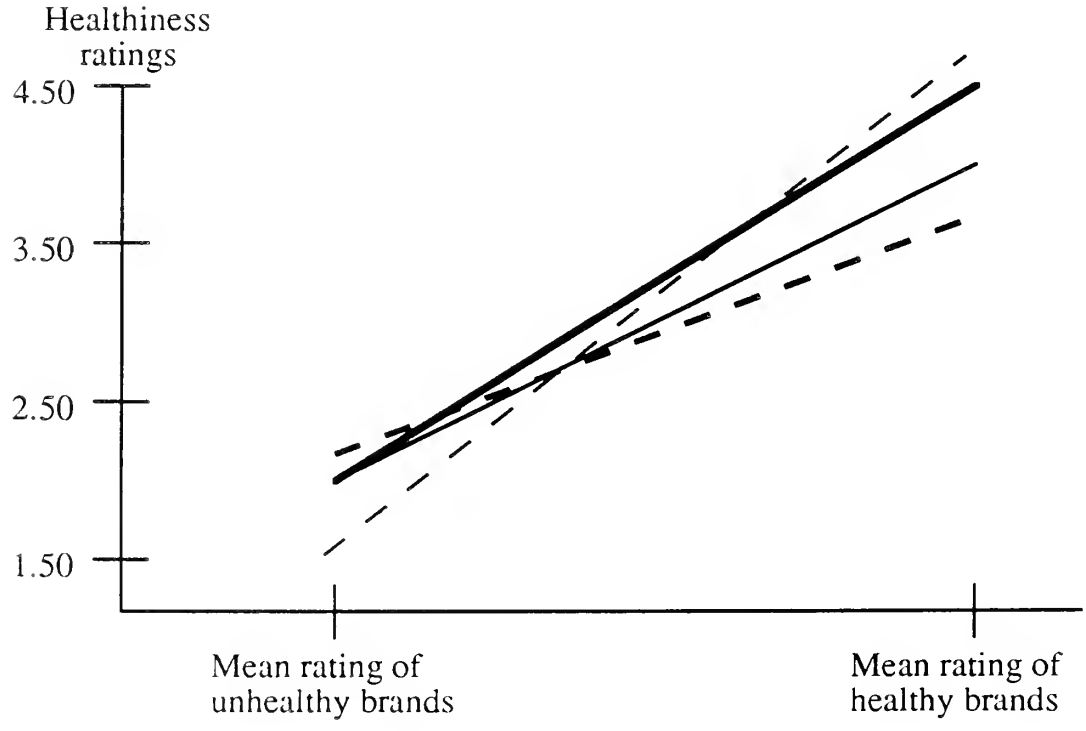


FIGURE 1B

RESULTS OF HEALTHINESS RATINGS - STUDY 3



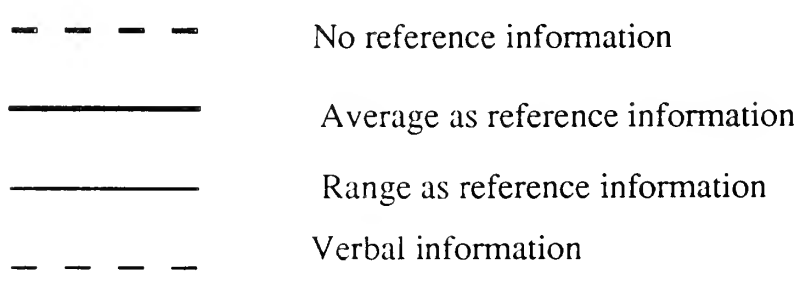


FIGURE 2A

RESULTS OF RECALL - STUDY 2

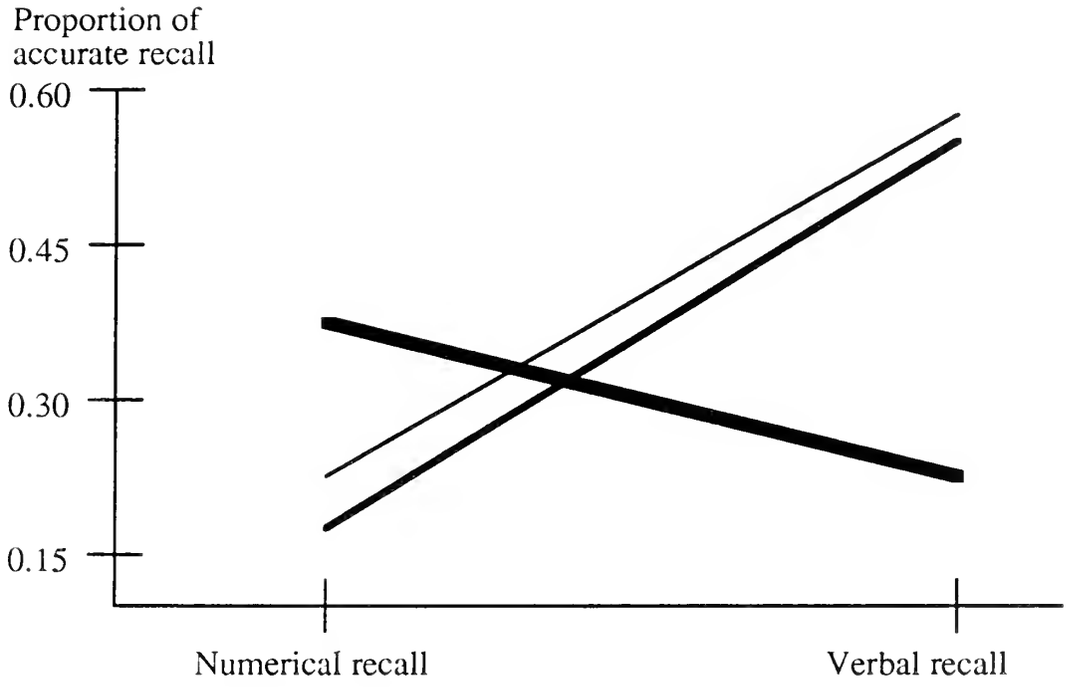
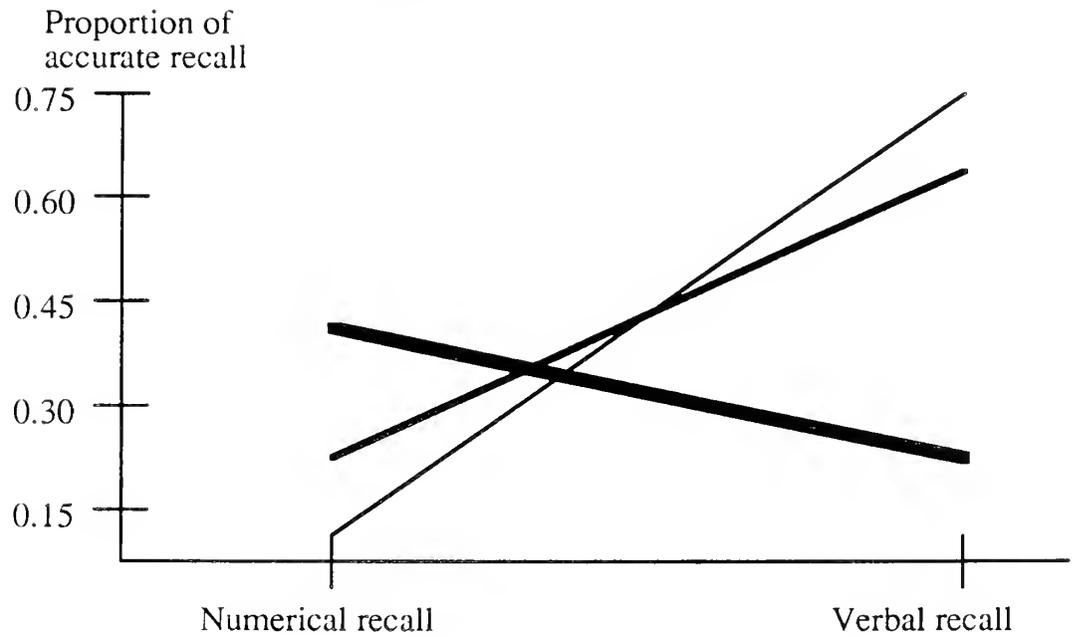


FIGURE 2B

RESULTS OF RECALL - STUDY 3



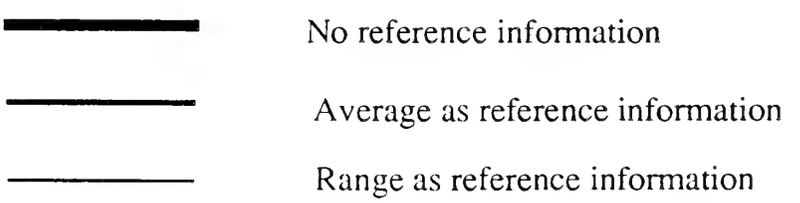


FIGURE 3

PRESENTATION OF BRAND INFORMATION IN STUDY 3

BREAKFAST CEREAL "C"

NUTRITION INFORMATION PER SERVING	
Serving Size: 1 oz	
	Cereal
Calories	125
Sodium	230 mg
Fiber	3 g