Influence of Food Label Quantifier Terms on Connoted Amount and Purchase Intention

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ABSTRACT

This research examined the influence of food label quantifier terms (e.g., Low, Reduced, and Free) on people's interpretation of implied quantity. Experiment 1 assessed people's perceptions (connotation) of eight terms to determine whether the terms convey distinct quantities. Results showed significant differences among the lowest quantity-connoting terms. Experiment 2 investigated the influence of three specific quantifier terms placed in the context of nutrient claims on product labels and measured their effect on purchase intentions before and after dietary health concerns were made explicit. Results showed that the quantifier terms influenced people's purchase intentions when health and diet concerns were made salient, but not when general purchase preferences were requested. Implications for consumer comprehension and interpretation of food label are discussed, and suggestions for future research are offered.

INTRODUCTION

Changes in lifestyles in the U.S. over the past few decades, including increased use of packaged foods, has led to heightened public interest in food labeling practices. Consumers are demanding that more and better nutrition information be made available on labels. Food manufacturers have capitalized on this demand by using common words such as Light, Low, or Enriched to promote their products and may have, in doing so, added to consumers' confusion (Kessler, 1991). Until recently, no precise definitions existed to control the use or meaning of quantifier terms.

The U.S. Congress mandated truthful and uniform food nutritional labeling on foods by passing the Nutritional Label and Education Act (NLEA) of 1990. This NLEA went into effect in May 1994. The act gives the FDA the legal foundation to expedite rulings on label policies (Podolsky, Roberts, Silver, and Mukenge, 1991). The NLEA also standardizes food labeling practices including the way in which quantifier terms are used to convey the amount of substances present in foods. Specifically, quantitative definitions have been assigned to certain terms associated with nutrients (U.S. Department of Health and Human Services, 1989, 1991). This means that terms such as Low and Reduced can now be used on food labels only when they conform to FDA mandated definitions (Reece, Sheffet, and Rifon, 1996). Some of the approved terms, however, do not have a consistent meaning across nutrients. For example, when applied to sodium, the term Free means less than 5 milligrams of sodium per serving. In contrast, this same term (Free), when applied to cholesterol (Cholesterol Free), means less than 2 milligrams per serving. In addition, the FDA has allowed for the substitution of certain terms assumed to be equivalent (e.g., the term No can be substituted for the term Free).

Although quantifiers need objective definitions to fix a standard and enable regulation by government and compliance by the food industry, it is unlikely that consumers know the assigned numerical definitions. Rather, consumers are likely to use a subjective interpretation of the verbal claims to guide their initial decisions of which product has more or less of a particular substance—before possibly looking at the more specific numbers in the nutrition label on the side or back panel (Szykman, Bloom, and Levy, 1996). So despite the implementation of objective definitions of food label terms, consumers may not fully understand their intended meaning. However, they might understand their relative ordering in terms of amount.

Other issues have been raised about the use of quantifier terms to convey nutrient quantities (U.S. DHHS, 1989; Mermelstein, 1990). Opponents of their use in nutrition claims argue that quantifier terms can cause consumer confusion. They contend that quantifier terms are unnecessary as more reliable, quantitative nutrition labels are now available. In contrast, proponents for their use argue that the terms can attract consumers' attention and could serve as a short cut for the information in the quantitative nutrition label. Moreover, the claims may motivate consumers to investigate the nutrition label to clarify their meaning (Szykman et al., 1996). Standardizing the terms can also force consistent use by manufacturers.

A survey sponsored by the Food Processors Association (Opinion Research Corporation, 1990) indicates the importance of understandable quantifier claims. In that study, 20% of consumers reported that they rarely or never read nutrition labels or ingredients for the foods they purchase, and approximately 40% reported reading this information only occasionally. Thirty-two percent of the respondents believed that Low Cholesterol meant low or less calories (which it does not). The survey also indicated that identical claims can produce different interpretations by different persons.

The present research examines the connoted meaning of a set of quantifier terms used to describe nutrient quantity on food labels. The research also investigates whether people's relative interpretation of the terms corresponds with the definitions put forth in the NLEA. Experiment 1 examines people's perceptions (connotation) of eight terms to determine whether the terms convey distinct quantities. Experiment 2 investigates the influence of three specific quantifier terms placed in the context of nutrient claims on product labels and measures their effect on purchase intentions before and after dietary health concerns are made explicit. It was expected that consideration of health using a scenario describing a diet-related disease that is controllable by reduced intake of nutrient would motivate participants to make greater use of nutrient claim. It was further expected that their product choices would be controlled by the perceived meaning of the quantifier terms. However, without explicit consideration of a diet-related disease, participants' use of the claims in their choice of food products would be much more limited.

Table 1

Mean Ranks, Standard Deviations, and Medians of the Eight Quantifier Terms Tested in Experiment 1

Quantifier Terms	*Mean Rank*	*Standard Deviation*	*Median*
No[a]	1.15	.37	1.35
Free[b]	1.85	.37	1.85
Very Low[c]	3.45	1.40	3.40
Low[d]	4.35	.93	4.17
Lower[e]	5.60	1.19	5.38
Lowered[e,f]	6.25	1.33	6.33
Less[e,f]	6.45	1.15	6.33
Reduced[f]	6.90	1.29	7.21

Note. Quantifier terms with different subscript letters are statistically significant from one another ($p < .05$).

EXPERIMENT 1

Method

Participants. Twenty Rensselaer Polytechnic Institute (RPI) students and staff voluntarily participated. Their ages ranged from 18 to 50 ($M = 24.5$, $SD = 6.9$).

Materials and procedure. Participants were given a sheet containing eight randomly-ordered quantifier terms and asked to order them according to implied amount, from lowest to highest. The terms were Free, Less, Low, Lower, Lowered, No, Reduced, and Very Low. Participants were allowed to list together words perceived to have the same meaning.

Results

Ranks of 1 (lowest) to 8 (highest) were assigned. In cases of ties, the scores were based on the average of the displaced ranks.

Mean ranks, standard deviations, and medians are shown in Table 1. An overall analysis using the Friedman Test was significant, χ^2 (7, N = 20) = 110.68, $p < .0001$. Paired comparisons indicated that No, Free, Very Low, and Low were significantly different from one another and from the other four terms ($ps < .05$). Lower, Lowered, and Less did not differ from each other ($ps > .05$). The term Lower was significantly higher than Reduced ($p < .05$) but the terms Lowered and Less did not differ from Reduced ($ps > .05$).

Discussion

These results suggest that some of the quantifier terms investigated in this study effectively convey distinct levels of quantity; others do not. Significant differences were noted mainly for terms signifying the lowest quantities. The term Free was significantly lower than the term Low which is consistent with the FDA's objective definitions. The term Reduced is a relative/comparative term, and thus, has a more complex meaning than terms such as Free and Low (which signify absolute magnitudes). However, when placed on the same scale, as in the present study, the results indicate that Reduced connotes higher levels than all but two of the other terms. The term No, which the FDA allows as a substitute for the term Free, is apparently interpreted as indicating a quantity significantly lower than Free.

EXPERIMENT 2

Because the terms in Experiment 1 were tested in the absence of context, the findings may not generalize to their use in actual nutrient claims. In Experiment 2, three

quantifier terms (Free, Low, and Reduced) with FDA quantitative definitions that were shown to be significantly different from one another in the first experiment were reexamined in a more externally-valid context (i.e., on food package labels) to determine their effect on purchase intentions. In addition, the effect of emphasizing diet and health is examined.

Method

Participants. Sixty-four individuals participated. Half (19 males and 13 females) were RPI undergraduates, ranging in age from 18 to 24 (M = 21.5, SD = 1.2). The other half (8 males and 24 females) were permanent residents of Troy, NY, including homemakers, maintenance personnel, secretarial workers, and white collar professionals who volunteered when approached at local shopping areas. Their ages ranged from 20 to 66 (M= 38.3, SD = 11.1). Participants were assigned randomly to conditions.

Materials. An optical scanner was used to digitize the front labels of eight nationally-sold dry breakfast cereals. The images were manipulated by using graphics software. Any preexisting dietary claims were deleted from the original label images. For every product, 13 label images were produced. Twelve contained quantifier-nutrient claims that were produced by factorially pairing the three quantifier terms (Free, Low and Reduced) with four food nutrients (Sugar, Sodium, Fat and Cholesterol), e.g., Sodium Free or No Cholesterol. One image for each product lacked a quantifier/nutrient claim which served as a control. The terms were located in the same place as the labels' original nutrition claim (if there was one). If no nutrition claim was originally present, the quantifier-nutrient claim was located in the least cluttered area of the label. All quantifier-nutrient terms were in 24-point type in a font that resembled the other print on the label. A laser printer and photocopier were used to produce the final experimental materials.

Thirty-two booklets were formed each containing labels of all eight products. Every booklet presented each quantifier term twice in connection with one nutrient term. Except for the control labels which had no nutrient claim, all labels of a booklet referred to a single nutrient term (i.e., only cholesterol or only sodium). Across the 32 booklets, all quantifiers were paired an equal number of times with all products and nutrients. A Latin Square was used to systematically rotate the labels and quantifiers through the booklet orders.

Procedure. Participants were given one of the booklets that contained the following request: "Please rate each product according to the likelihood that you would purchase it if you were to see the product on a grocery store shelf." Participants responded using a six-point Likert-type scale from (0) definitely would not purchase to (5) definitely would purchase.

After completing their ratings to the first question, participants were given one of four medical-dietary scenarios in which they were told to assume the following: "Your doctor has told you that you have a medical condition which requires that you minimize your intake of _____." The blank was replaced with the specific nutrients that corresponded with their booklet assignment. Participants then evaluated each of the products using the same purchase-intention question and scale given earlier.

Results

The two questions were analyzed separately. Table 2 shows the means and standard deviations for the general and dietary concern ratings as a function of conditions.

General purchase intentions. A one-way repeated-measures ANOVA for the general purchase intention ratings failed to show a significant effect, $F(3, 189) < 1.0$. Exploratory analyses were conducted using several additional independent variables: gender, participant group (student vs. nonstudent), age group (two groups formed from a median split), and nutrient. These variables were added individually (or in pairs where the cell sizes were not grossly unequal) to ANOVAs that also included quantifier as an independent variable. Only two significant effects were noted. One was a main effect of nutrient, $F(3, 56) = 3.19$, $p < .05$). Comparisons showed that products with sugar claims (M = 1.63) produced significantly lower purchase intentions than

Table 2

Mean Purchase Intention Ratings for General Preference and Dietary Concern Conditions as a Function of Quantifier Term Conditions in Experiment 2

	Quantifier Term Conditions			
Purchase Intention	*Free*	*Low*	*Reduced*	*No Quantifier (Control)*
General:				
Mean	2.23[a]	2.29[b]	2.19[c]	2.42[d]
SD	1.33	1.30	1.16	1.19
Dietary Concern:				
Mean	3.23[a]	2.86[b]	2.55[b]	2.09[c]
SD	1.40	1.37	1.19	1.20

Note. Quantifier terms with different subscript letters are statistically significant from one another ($p < .05$).

the other three nutrients (*M*s = 2.37, 2.45, and 2.50, for sodium, fat, and cholesterol, respectively).

Another analysis showed a significant interaction between participant group and nutrient, $F(3, 56) = 4.29, p < .01$. Simple effects analysis indicated that nonstudents had higher purchase intentions for cholesterol reduction claims ($M = 3.11$) than students ($M = 1.86$).

Purchase intention with dietary concern. For the second set of ratings, a one-way repeated-measures ANOVA showed a significant effect, $F(3, 189) = 15.62, p < .0001$. Comparisons showed that all differences among the quantifiers were significant (*p*s < .05) except between the terms Low and Reduced ($p > .05$).

Additional analyses showed a significant main effect of nutrient, $F(3, 56) = 2.83, p < .05$. Fat claims produced significantly higher purchase intentions ($M = 3.03$) than sugar claims ($M = 2.10$), $p < .05$.

Discussion

Although the first general purchase intention question did not show an effect of quantifier, when a dietary-health concern was subsequently made salient, differences among the terms were evident. This suggests that diet and health are relevant contributing factors to whether quantifiers affect people's purchase intentions.

Participants had lower purchase intentions for claims of lowered sugar, suggesting that it is a nutrient that consumers consider to be less important as a dietary risk relative to the other nutrients. The general purchase intention results indicated that nonstudents preferred cholesterol reduction claims more than students. This result may be due to recently publicized health concerns and information in food advertisements (Reese et al., 1996) about cholesterol in older individuals (represented here by the nonstudents). However, age cannot be the only reason for the difference because there was no evidence of an age by nutrient interaction. Thus the difference found between the groups is probably due to some other variable that cannot be determined by the demographic data collected.

The failure to find an interaction of quantifier and nutrient or of quantifier and participant group suggests that quantifier perceptions are consistent across nutrients and that the results may generalize to other consumer populations.

GENERAL DISCUSSION

The present research examined the influence of quantifier terms used on food labels to indicate various degrees of nutrient quantity, such as No, Free, Low, etc. Experiment 1 showed most of the eight tested terms connote different meanings. Experiment 2 tested three specific quantifiers in a more ecologically valid context and produced effects that were generally in accord with Experiment 1 (except the comparison between Low and Reduced). However, in Experiment 2 differences were shown only when individuals were made aware of a dietary health condition that could be controlled by nutrient intake. The terms had no effect when health problems were not explicitly stated. Thus, while quantifiers terms appear to be potentially useful in conveying relative amounts of nutritional substances, these terms, by themselves, may not influence purchase intentions without the nutrient claim being considered *relevant* to individuals. This concurs with results showing that persons with diet-related diseases are more likely to to develop positive attitudes towards good nutrition than healthy consumers (Russo, Staelin, and Nolan, 1986). Nevertheless, it is interesting to note that several studies have found little or no evidence for a relation between disease status and search for nutrition information (Moorman and Matulich, 1993; Szykman et al., 1996). Feick, Hermann, and Warland (1986) found that poor health increased the search for nutrition information from books, pamphlets, and health care providers, but not food labels.

Although this research shows that the relative ordering of some of the terms (e.g., Free and Low) correspond with the ordering in FDA's quantitative definitions, other findings are less consistent. First, while the FDA allows the substitution of No with the term Free, Experiment 1 showed that these terms are perceived somewhat differently: No is interpreted as a lower quantity than Free. One explanation is that Free is an ambiguous term that has many meanings—only one of which is the absence of something. Another meaning is "gratis"(free of charge). It is therefore possible that individuals who do not have a broad knowledge of English could misinterpret statements such as Sugar Free or Caffeine Free by believing that the product possesses additional sugar or caffeine as a bonus! The term No is clear, as it lacks alternative definitions.

Second, an inconsistency was shown between experiments. In Experiment 1, the terms Reduced and Low differed, but in Experiment 2 they did not. As mentioned earlier, Reduced is a relative term whereas Low refers to a direct numerical (absolute) quantity. Using the FDA's criteria, it is possible for a nutrient claim to be matched with both terms but actually be in the same or opposite direction with respect to actual quantity. Thus, the amount conveyed between the terms is ambiguous and this might partly account for the reason a difference was found between experiments.

Consumers will only benefit from quantifier terms if they understand them. Given the potential ambiguities mentioned above, a relevant issue is how to remove consumer misperceptions. One method is to educate the public. Through the mandate of the NLEA, the FDA and others have

developed large-scale educational programs to reduce confusion and increase comprehension of nutrition information (Foulke, 1992; Kessler, 1991). Experimental research (e.g., Jessen and Wogalter, 1992) has shown that such programs can be successful in helping people to make better decisions between similar foods differing in nutrient quantities. However, a better, less formidable, way to facilitate correct interpretation is to use terms that people already know and understand. Large-scale measurement studies on the connoted meanings of alternative terms (Herbert, Kalsher, and Wogalter, 1993; Kalsher, Wogalter, and Gilbert, 1992) document a broad range of well-known terms not currently included on FDA lists. These scaling studies are much less costly than training substantial numbers of consumers on what they are supposed to mean. In fact, if terms are evaluated and then selected for understandability beforehand, education of the population could be less costly in terms of expense, time and effort, and where education is still needed, it could be allocated to more restricted venues.

Three limitations of this research should be noted. First, the current study concerned products that contained only one nutrient claim. Consumers are frequently confronted with labels that simultaneously make more than one claim, and thus, future studies should examine multi-claim judgments. Second, this study focused on purchase intentions and not behavior. Thus, well-designed quasi-experimental field studies are needed to determine the impact of food claims on actual purchase behavior and how they might differentially affect various consumer groups. Third, the manipulation of presence versus absence of dietary concern was confounded with order. However, counterbalancing the order of the two purchase intention conditions would have produced another kind of carryover effect that we wished to avoid. If participants were cued to consider a dietary concern first, it would be difficult to remove this mental orientation for the general (or absent dietary concern) purchase intention condition. Therefore it made sense to have participants make judgments without mention of dietary concern first, and then afterwards, elicit an interest in a concern for nutrition and diet. Future studies incorporating scenarios should consider using a between-subjects design instead.

Finally, this research adds to the rather minimal empirical work on quantifier terms (Lowrey, Gallay, and Shrum, 1996), and provides a basis from which future standards for food labeling can be established The goal is to ensure that nutrition information is clearly conveyed to facilitate proper purchase decisions by consumers. This is particularly important for certain populations who need to limit intake of certain dietary substances—where misinterpretations could produce health risk consequences (Earl et al., 1990).

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