

Connoted Quantity of Food-Label Modifier Terms

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ABSTRACT

This descriptive study examined a set of modifier terms (e.g., *reduced*, *enriched*) that might be used to indicate amounts of substances in food products. In the context of a mock shopping task, participants were asked to complete a survey that assessed the implied meaning of each of 55 terms, 28 connoting varying degrees of *decrease* and 27 connoting *increase*. For each set of modifier terms, participants estimated the amount that each term implied and the likelihood that they would purchase a food product with the term paired with substances that they were advised to consume or avoid. The results showed that the terms used in this study connoted a broad range of quantities. Several alternative terms not currently used or under consideration by the U.S. Food and Drug Administration may be effective in helping consumers make finer distinctions among products and, presumably, wiser purchase decisions. The results also suggest that caution be exercised when selecting modifier terms since some terms are less consistent in their connoted meaning than others. Thus, instead of arbitrarily selecting modifier terms and then initiating expensive, large-scale nutrition training programs to train the public, it is recommended that a limited number of modifier terms based on their extant meaning to a broad segment of the population should be used. Future research on developing an optimal set of modifier terms is discussed.

INTRODUCTION

Sweeping changes in lifestyles in the U.S. over the past few decades, including a dramatic increase in purchase of packaged foods, has led to heightened public interest in food labeling practices. Since 1973 when the first food labeling regulations were announced by the Food and Drug Administration (FDA), consumers have increasingly demanded that more and better nutrition information be made available on food 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 with respect to the amount of specific substances (e.g., sodium, cholesterol, fat, vitamins, calcium) contained in their products. Unfortunately, until recently, no precise definitions existed to control the use or meaning of modifier terms.

In response to these and other problems, government agencies such as the FDA and U.S. Department of Agriculture (USDA) initiated efforts to standardize food labeling practices, including the way in which *modifier* terms are used to convey quantity or amount of substances present in various foods. Specifically, the FDA has begun to give quantitative definitions to modifier terms associated with particular nutrient substances (e.g., Department of Health and Human Services, Part 2, 1990). Unfortunately, we do not know if consumers understand the absolute and relative quantities assigned to the terms. Moreover, terms approved for use by the FDA do not have consistent meaning across nutrient types. According to the FDA, when applied to sodium in food products, the term *free* means less than 5 milligrams of sodium per serving. In contrast, the term *free*, when applied to cholesterol (*cholesterol free*), means less than 2 milligrams per serving. Since, many people are unlikely to learn the quantitative definitions given to modifier terms, it is important to know whether terms express discernible and consistent quantities to consumers.

To reduce consumer confusion over the meaning of both established and proposed modifier terms, the FDA proposes to develop and implement large-scale educational programs (Kessler, 1991). Unfortunately, this is a formidable task which may be compounded by the existence of another problem; many of the terms chosen by the FDA

may not be optimal since the implied meaning for certain selected terms may differ substantially from person to person.

Only a few controlled studies have been conducted which examine the connotation of modifier terms. For example, Wogalter, Seipp, Jessen, and Kalsher (1991) demonstrated that perceptions of four terms, *reduced*, *low*, *free*, and *no*, fit the relative ordering of the FDA quantitative definitions reasonably well except for the terms *free* and *no*. People perceive *free* to connote somewhat less reduction than the term *no*. Currently, the FDA allows the terms *free* and *no* to be used interchangeably. These terms, and others that have or will be approved by the FDA, may convey quantities that are different than their assigned definition. In addition, the terms chosen for use may not adequately convey the range of values that people can discriminate and use to guide their decisions. Therefore, it is clear there exists a need for research aimed at identifying terms that cover a broad range of implied meaning and convey consistent meaning to consumers.

In work on determining the connotation of signal words for implying level of hazard, Wogalter and Silver (1990) showed how to develop a set of useful terms for connoting a broad range of hazard, thus providing alternatives for the limited set of terms currently used: CAUTION, WARNING, and DANGER. Their research resulted in a list of 20 words that conveyed a broad range of hazard (e.g., NOTE or NOTICE to FATAL or DEADLY). These results suggest a potential procedure for developing effective modifier terms. Thus, the present study is descriptive research (scaling) aimed at identifying a larger set of appropriate modifier terms.

METHOD

Participants

Sixty-four (43 males and 21 females) Rensselaer Polytechnic Institute undergraduates and seventy-eight (29 males and 49 females) non-students who volunteered to complete the survey while shopping at a local mall served as study participants. Ages of the undergraduates ranged from 17 to 24 ($M = 18.7$, $s = 1.2$), whereas ages of the non-

students ranged from 20 to 72 ($M = 39.1, s = 14.5$).

Modifier terms

Two lists of words were constructed to determine their usefulness as modifier terms on food labels. Twenty-eight terms connoting *decrease* and 27 terms connoting *increase* were taken from the *Merriam-Webster Dictionary* (1974) and the *New American Roget's College Thesaurus* (1979). The terms were selected based on their simplicity and possible use in describing varying amounts of substances that may be present in food products.

Procedure

Participants were asked to complete a two-part survey designed to assess the implied meaning of each of the 55 modifier terms. One part of the survey focused on the list of terms connoting *decrease* and the second part focused on the list of terms connoting *increase*. For the list implying *decrease*, participants were asked to read the following vignette:

“Assume you are at a supermarket comparing food products on the shelf for their content of specific substances such as **sodium, cholesterol, fat or sugar** because your doctor has told you to *decrease* your intake of these substances to improve your health. For example, the product label might read **LOW Sodium or Fat FREE.**”

After they had read the vignette, participants were asked to estimate: (a) the percentage *decrease* (0% to 100%) that each term implies compared to the original product, and (b) the likelihood that they would purchase a food product that has the term paired with one of the substances (i.e., sodium, cholesterol, fat, sugar) along a 6-point Likert-type scale (0 = definitely not purchase, 1 = unlikely to purchase, 2 = somewhat unlikely to purchase, 3 = somewhat likely to purchase, 4 = likely to purchase, 5 = definitely purchase).

For the list implying *increase*, participants were asked to read the following vignette:

“Assume you are at a supermarket comparing food products on the shelf for their content of specific substances such as **calcium, fiber, vitamins or minerals** because your doctor has told you to *increase* your intake of these substances to improve your health. For example, the product label might read **Increased Calcium or More Fiber.**”

After they had read the vignette, participants were asked to estimate: (a) the percentage *increase* (0% to 100%) that each term implies compared to the original product, and (b) the likelihood that they would purchase a food product that has the term paired with one of the substances (i.e., calcium, fiber, vitamins, minerals) along the 6-point Likert-type scale described above.

Following completion of the survey, participants were told the purpose of the study and thanked for their time.

RESULTS

To verify the relationship between the two sets of responses given to each term, correlations between the percentage estimates and the respective purchase likelihood ratings were computed. The correlations obtained were exceptionally large for both sets of terms, $r = .97$ and $r = .98$ for the *decrease* and *increase* modifier terms, respectively.

Correlations between the mean percentage estimates were also computed to determine if the modifier terms connoted similar meaning to both student and non-student participants. The observed correlations were $r = .95$ and $r = .92$ for the *decrease* and *increase* terms, respectively, suggesting that the relative ordering of the terms was very consistent between participants in the student and non-student groups.

Table 1 presents a summary of participants' estimates of the percentage decrease in a substance implied by each of the modifier terms connoting *decrease*. Included in the table are the mean, standard error, lower and upper boundaries of a 95% confidence interval associated with each modifier

TABLE 1
Modifier Terms Connoting DECREASED Quantity of a Substance Compared to the Original Product.

Modifier Term	Mean	Standard Error	95% CI		Purchase Likelihood
			lower	upper	
No	98.0	0.6	96.9	99.1	4.3
Zero	97.1	1.0	95.1	99.1	4.4
Free	96.1	1.1	94.0	98.1	4.4
Removed	84.5	2.5	79.7	89.4	3.9
Very Low	68.4	2.1	64.4	72.4	3.2
Little	67.4	2.3	62.9	72.0	3.1
Minimum	67.2	2.4	62.6	71.9	3.0
Least	65.7	2.4	61.1	70.4	3.0
Minimal	61.6	2.6	56.5	66.7	2.9
Scant	61.5	2.7	56.2	66.7	2.5
Sparse	61.0	2.5	56.0	65.7	2.5
Slightest	60.6	2.8	55.0	66.2	2.6
Low	59.4	2.1	55.4	63.5	2.8
Slight	55.6	2.6	50.5	60.1	2.4
Fractional	53.5	2.7	48.2	58.8	2.3
Diminished	52.1	2.9	46.5	57.8	2.3
Limited	51.0	2.2	46.7	55.3	2.3
Not Much	49.2	2.4	44.6	53.9	1.9
Lower	47.6	2.1	43.5	51.7	2.6
Controlled	44.7	2.3	40.2	49.2	2.0
Fewer	43.1	2.1	39.0	47.3	2.3
Lowered	41.9	2.1	37.8	46.1	2.2
Decreased	40.8	2.2	36.5	45.1	1.9
Some	40.5	2.2	36.1	44.8	1.9
Reduced	40.3	2.0	36.3	44.2	2.2
Less	39.2	2.2	34.9	43.5	1.9
Smaller	34.9	2.2	30.7	39.2	1.7
Lessened	34.2	2.1	30.2	38.3	1.8

N=142

term, and mean estimated likelihood of purchasing a product when each term is paired with one of the substances described in the vignette (e.g., sodium, cholesterol, fat, sugar). Mean estimates of the percentage decrease (0% to 100%) that each term implies ranged from 34.2% for *lessened* to 98.0% for the term *no*.

Figure 1 provides a visual presentation of the means and confidence intervals shown in Table 1. The terms implying *decrease* covered a broad range of meaning. The terms *lessened* through *very low*, show a smooth progression of implied *decrease*. Interesting was the noticeable break between the terms *very low* (68.4%) and *removed* (84.5%), and between *removed* and the terms *free*, *zero*, and *no* (96.1, 97.1, and 98.0, respectively). Also noteworthy were the differences in variability associated

with each term. The greatest variability was observed for the terms *diminished*, *slightest*, *fractional*, and *scant*, whereas the least variability was observed for *no*, *zero*, and *free*. The latter three terms were at the upper-most end of the scale and the variability restriction was probably due to being near ceiling.

Table 2 summarizes participants' estimates of the percentage increase in a substance implied by each of the modifier terms connoting *increase*, when each term is paired with a substance described in the vignette (calcium, fiber, vitamins, and minerals). Included in the table are the same descriptive statistics as Table 1. Mean estimates of the percentage increase implied by the terms ranged from 31.2% for *additional* to 76.8% for the term *maximum*.

Figure 2 presents graphically the means and confidence intervals shown in Table 2. The figure shows that the range of meaning conveyed by the *increase* terms was somewhat more constrained than the terms implying *decrease*, suggesting we were not successful in selecting terms that covered the full range of the scale. Additional terms which were not included in the sample of terms evaluated (e.g., *total* and *complete*) might have covered the empty areas connoting minimum and maximum increases relative to the original product. The greatest variability was observed for the terms *optimal* and *surplus*. However, overall the variability differences among the *increase* terms were not large. Noteworthy is the relatively steady increase in connoted meaning among the modifier terms implying *increase*. Thus, these data suggest that the terms covered the range of the nutrient *increase* dimension, at least within the limits of the terms evaluated.

DISCUSSION

This exploratory study described the quantitative connotation of a large number of possible food-substance modifier terms. The most important outcome of this study was the identification of a set of modifier terms that span a broad range of connoted meaning, although the overlap of the confidence intervals show that many terms convey very similar quantities. Thus, future research should be conducted to confirm the relative ordering of terms identified in this study, so that a shorter set of terms at varying levels of connoted meaning can be selected and subjected to additional criteria, including meaning across a broader range of people (e.g., persons who have limited use of English). Although not conclusive, the strong observed relation between percentage estimates of student and non-student participants suggests that the relative ordering of the terms was the same for both groups, indicating consistent interpretation of quantities implied by the terms for both populations.

Development of a modifier term *scale* could serve many purposes. Given the increasing number of food products available, modifier terms could be used to capture consumers' attention and thereby reduce the amount of time necessary to identify product brands with the desired levels of specific substances (e.g., sodium, fat, calcium). This strategy could also simplify consumers' task of making comparisons among similar products which make claims using different modifier terms.

This research, as well as more comprehensive studies of this type, may also be instructive for various groups and organizations interested in nutrition. They may be useful to the FDA to help make decisions on relative meaning of modifier terms. This study clearly showed that terms not

TABLE 2

Modifier Terms Connoting INCREASED Quantity of a Substance Compared to the Original Product.

Modifier Term	Mean	Standard Error	95% CI		Purchase Likelihood
			lower	upper	
Maximum	76.8	2.4	72.1	81.6	3.9
Highest	76.1	2.3	71.5	80.7	3.9
Greatest	75.4	2.3	70.8	80.0	3.8
Most	74.6	2.4	69.9	79.4	3.8
Superior	72.6	2.4	68.0	77.3	3.5
Very High	67.9	1.9	64.2	71.6	3.6
Optimal	62.9	2.8	57.4	68.4	3.5
High	57.7	2.3	53.3	62.1	3.2
Fortified	55.6	2.2	51.3	59.8	3.4
Enriched	52.1	2.1	47.9	56.3	3.1
Much More	49.2	2.0	45.4	53.1	2.8
Surplus	49.0	2.7	43.7	54.4	2.7
Larger	42.6	2.0	38.6	46.5	2.6
Improved	41.2	2.1	37.1	45.3	2.5
Higher	39.7	2.1	35.5	43.8	2.4
Greater	39.0	2.1	34.8	43.1	2.4
Reinforced	38.0	2.0	34.0	41.9	2.2
Enhanced	37.8	2.0	33.9	41.8	2.4
Amplified	37.5	2.1	33.5	41.5	2.0
Bolstered	36.8	2.2	32.4	41.1	2.0
Elevated	36.7	2.1	32.6	40.8	2.2
Increased	37.4	1.9	33.7	41.2	2.5
Extra	34.8	2.1	30.7	38.8	2.3
Added	34.4	2.1	30.4	38.4	2.2
More	34.3	2.0	30.4	38.2	2.2
Raised	32.0	2.0	28.1	35.9	2.1
Additional	31.2	2.0	27.4	35.1	2.1

N=142

Figure 1. Estimated percentage DECREASE in a substance conveyed by selected modifier terms.

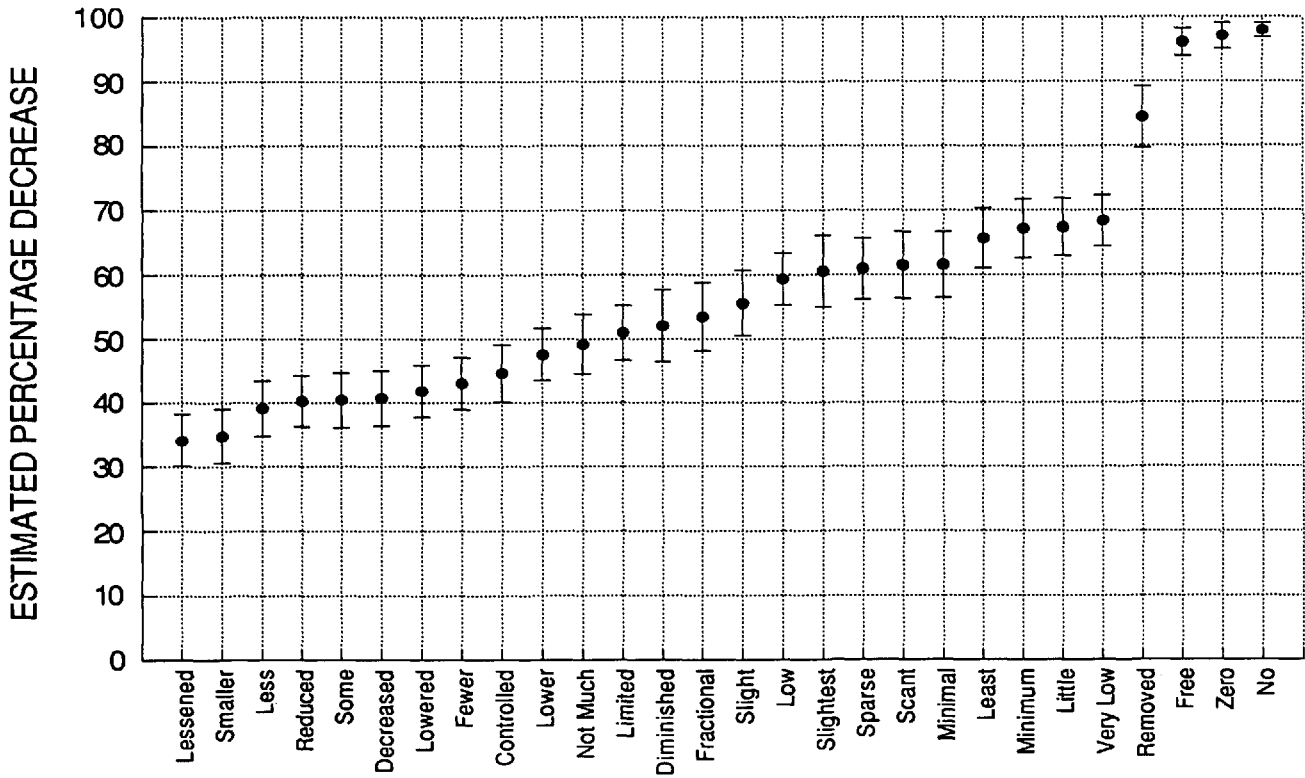
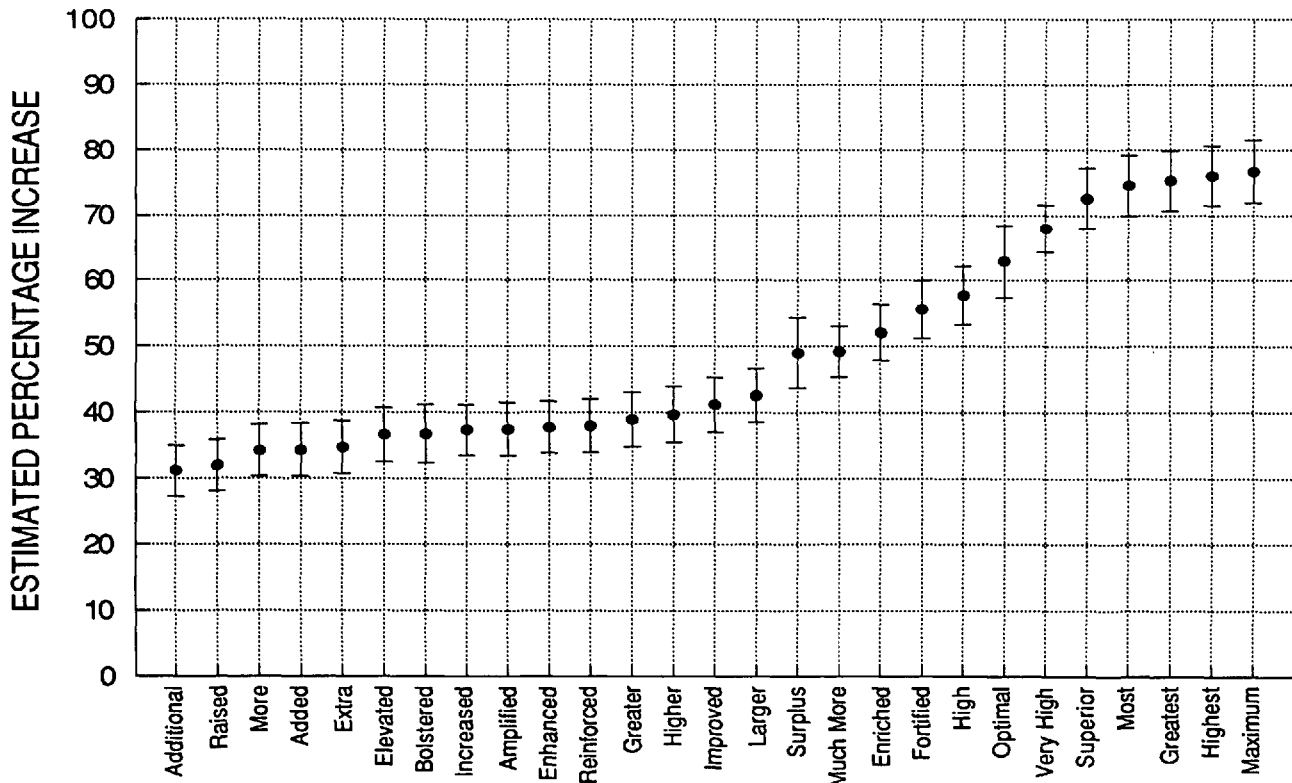


Figure 2. Estimated percentage INCREASE in a substance conveyed by selected modifier terms.



currently adopted or under consideration by the FDA may be effective in helping consumers make finer distinctions among products and, presumably, better purchase decisions. They may also be important for persons on health restricted diets where misinterpretation could lead to incorrect decisions and possibly serious illness. Thus, instead of arbitrarily selecting modifier terms and then initiating expensive, large-scale nutrition training programs to train the public, the FDA could begin by first selecting modifier terms based on their extant meaning to a broad segment of the population. Clearly, the best terms to use on food labels are ones that people already know.

These data may also be instructive to manufacturers by increasing their awareness of the meaning that modifier terms convey to their customers, thereby providing the opportunity to help customers make wiser food purchases. The strong correlations observed between the percentage estimates and the respective purchase likelihood ratings for the *decrease* and *increase* terms should also be of interest to manufacturers. These results suggest that consumers may be more likely to buy products that most closely match their health needs. Indeed, Wogalter, Seipp, Jessen and Kalsher (1991) found that people selected cereal products based on the quantitative meaning of modifier terms, especially when the modifier terms enabled them to make appropriate food-purchase decisions given the presence of a specific health problem.

Future studies in this area might consider developing a shorter list of terms for standard use on food products. This revised list of *increase* and *decrease* terms should then be verified on a larger and more representative sample of people. Additional criteria for selection of modifier terms

should also be systematically developed, including both indirect and direct measures. Understandability of modifier terms could be assessed indirectly by measures of variability. Specifically, persons not understanding the terms are likely to give evaluations that are more random, thereby increasing variability. Other more direct measures of understandability could be employed in subsequent research, including word comprehension measures. Research assessing comprehension of modifier terms is especially critical to low socioeconomic groups and "at risk" groups, including individuals with health problems and the elderly. Future studies should also examine whether implied meaning for these terms is consistent across food products. The ultimate goal of this research, of course, should be the development of distinguishable and consistently understood modifier terms that are useful in aiding people to make better decisions about food products.

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