Research Articles

Determinants of Nutrition Label Use Among College Students

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ABSTRACT

The purpose of this research was to assess the frequency of nutrition label use among college students and its relationship to nutrition and label knowledge, attitudes, and beliefs regarding diet-disease relationships, and to determine factors predictive of frequent or infrequent label use. This study utilized a cross-sectional design. Volunteer participants included a convenience sample of 1,294 students from a large university in Texas. A 57-item survey instrument was used to assess nutrition label knowledge, attitudes, behaviors, and beliefs about diet-disease relationships. Open-ended items were included to capture reasons for frequent/infrequent label use. Statistical analyses included frequency distributions, Pearson's correlations, independent sample t-tests, and binary logistic regression. Label users had greater knowledge, more favorable attitudes, and more accurate perceptions of diet-disease relationships than nonusers. Females exhibited greater knowledge, more favorable attitudes, and more frequent label use than males. Health reasons, looking for specific information, weight control, and knowledge predicted frequent label use. Desire for certain foods, time constraints, and "don't care" attitudes predicted infrequent use. These predictors of frequent/infrequent use suggest important points of intervention for increasing label use among selected groups of college students.

Beginning in 1994, the U.S. Food and Drug Administration (FDA) began to require standardized labeling of most packaged foods, under the Nutrition Labeling and Education Act (NLEA) of 1990.[1–3] This policy was designed to provide a consistent and reliable source of nutrition information and promote healthy food choices.[1, 4] It was believed that providing such information to consumers would facilitate adoption of healthier nutrition practices.[1, 5] Such a concept has been supported empirically[1, 6, 7] and suggests that availability of nutrition labeling could lead to a decrease in the incidences of certain nutrition-related conditions.[1]

In Healthy People 2010, proper use of nutrition labels is one of the topics considered essential in nutrition education,[8] and given the theoretical link between nutrition label use and improved health, several researchers have focused attention on factors related to label-reading behavior. A 1995 study found that both gender and educational level of respondents influence label-reading behavior.[9] An additional study reported that label use among a sample of college students differed by gender.[10] For males, beliefs in the trustworthiness of nutrition label information and diet-disease relationship (between fiber and cancer) differed between label users and non-users.[10]

Another study examining knowledge, attitudes, and self-reported behaviors of college students regarding the NLEA showed prior nutrition education increased nutrition knowledge, and knowledge was positively associated with attitudes and label-reading behaviors.[11] Although knowledge and attitudes associated with reading labels did not differ by gender, female college students were significantly more likely to use nutrition labels than males.[11] However, no study exists that provides a comprehensive examination of college students' attitudes, knowledge, beliefs on diet-disease relation-

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ship, and label-reading behavior.

In light of this, the past four years of *American Journal of Health Education* (*AJHE*) issues (Volume 33, Issue 3; Volume 37, Issue 2) were examined for all nutrition-related articles. A total of nine research articles[12–20] and seven teaching ideas[21–27] were identified. None of the research articles focused specifically on label use, in spite of a recommendation by the Committee on Use of Dietary Reference Intakes in Nutrition Labeling that additional research focus on consumer use of nutrition labeling.[3] Instead, *AJHE* topics included disordered eating,[14,15,19] intuitive eating,[16,17] and other nutrition subjects such as emotional eating,[12] interventions,[13,18] and dietary patterns.[20] For the most part, articles focused on very specific areas of nutrition research rather than on general label-reading behaviors. This is of particular interest due to the foci of several teaching articles. Of the seven teaching ideas, four were related to facilitating proper nutrition label use[21,24–26] (three of which focused on specific nutrients[24–26]). This discrepancy between the focus of current research articles and the teaching articles may be indicative of a need for researchers to better address topics that practitioners face on regular basis, such as nutrition label use.

The purpose of this research was to assess the frequency of nutrition label usage among college students and determine if label users differed from non-users in terms of their knowledge of nutrition labels and basic nutrition information, attitudes toward nutrition labels, and beliefs about diet-disease relationships (specifically, fat and heart disease, fiber and cancer, and calcium and osteoporosis). In addition, factors associated with label use versus non-use were also examined.

Four research questions guided this study: (1) What percentage of college students use nutrition labels when purchasing foods? (2) Do label users differ from non-users in terms of nutrition label knowledge, attitudes toward nutrition labels, and beliefs about diet-disease relationships? (3) Is there a gender difference in knowledge, attitudes, beliefs about diet-disease relationships, and label reading behavior? (4) What factors predict the use of nutrition labels?

METHODS

Design

Following approval from the Institutional Review Board for the Protection of Human Subjects, 16 instructors teaching a total of 88 physical education activity program classes consented to allotting class time for data collection from students. A research representative visited each class to discuss the project, answer questions, and distribute and collect informed consent forms and surveys. Surveys contained questions about demographic characteristics, nutrition label use, knowledge, attitudes, and beliefs regarding diet-disease relationships. Survey completion took approximately eight minutes, and students were not compensated for participation. The informed consent forms and surveys were separated immediately upon receipt in order to preserve anonymity.

Sample

Using a cross-sectional research design, a convenience sample of 1,294 students at a large university in Texas comprised the sample for this study. Students aged 18 years and over were recruited from 88 physical education activity program courses for voluntary participation. These classes are part of general course requirements for all university students and hence provided the best representation of a university-wide student undergraduate population; they are not specific to health, physical education, or kinesiology majors. Of an estimated 2,756 eligible participants (estimated due to the fact that participating instructors did not provide actual attendance counts for the days of survey distribution), 1,294 students completed surveys, yielding a response rate of approximately 47%. It is possible that response rate was low due to the students' option of leaving class early or completing the survey.

Measures

The 57-item survey instrument was modified from an instrument used in previous research.[7,8] The 39-item instrument used by Marietta and colleagues that examined nutrition label knowledge, attitudes, and behaviors of college students (Cronbach's alpha = 0.80) was used as the foundation for the current study.[11]

The original instrument[11] was modified through the addition of three knowledge questions (regarding trans fatty acids, ordered ingredient listings, and requirements for health related claims), three behavioral questions (regarding use of labels at point of purchase, dependence on health claim statements in product selection, and use of labels to regulate daily nutrient intake), and three diet-disease relationship questions (addressing links between dietary fat and heart disease, dietary fiber and cancer, and calcium and osteoporosis). In addition, items were added to assess students' use of dietary supplements (two items) and demographic characteristics specific to the population.

This study's modified instrument contained 6 sections measuring knowledge, attitudes, behaviors, beliefs about diet-disease relationships, supplement use, and basic demographic information. The knowledge section contained 11 multiple-choice questions that tested the students' knowledge of basic nutrition concepts important for utilizing nutrition labels. This section also involved questions with pictures of nutrition labels that required each student to demonstrate his or her ability to read the labels correctly.

The attitude scale was comprised of five questions that assessed perceptions of usefulness, truthfulness, and accuracy of nutrition labels on a Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Due to recent attention focused on the addition of trans fatty acid content to nutritional labels,[28] the attitude scale was modified from the original instrument in order to include an question regarding perceptions of the usefulness of information regarding trans fatty acids. Reliability measures were calculated for attitudes toward nutrition labels revealing a Cronbach's alpha of 0.54. Sufficient validity for the attitude scale was

not supported by the factor analysis, and correlations between attitude scale items were low.

The four-item behavior scale assessed use of nutrition labels in selecting foods for purchase and/or consumption (scored on a five-point Likert scale from 1=Strongly Disagree to 5= Strongly Agree). An example is, "When eating foods, I use the information on the 'Nutrition Facts' label to help me fit that food into my daily diet." Behavior scale scores yielded a Cronbach's alpha of 0.71. A principle components confirmatory factor analysis with Varimax rotation supported validity for the behavior scale; all scale items loaded on a single factor and accounted for approximately 58% of the variance.

The diet-disease relationship scale consisted of three items taken from a 2000 study of student perceptions of relationships between diet and certain diseases.[10] Three items from the study were added to the Marietta and colleagues instrument[11] in order to measure the degree to which students believed a relationship existed between dietary fat and heart disease, dietary fiber and cancer, and calcium and osteoporosis, on a scale from 0 (no relationship) to 7 (strong relationship). The diet-disease relationship data yielded a Cronbach's alpha of 0.63. Principle components confirmatory factor analyses with Varimax rotation indicated all items loaded on a single factor and accounted for approximately 58% of the variance, providing support for validity of the diet-disease scale. Validity and reliability measures for the individual scales were not provided in the Marietta and colleagues study;[11] therefore, comparisons to previous use of the instrument could not be made.

Analysis

Basic descriptive statistics such as frequencies, means, and standard deviations were obtained for demographic variables and knowledge, attitudes, beliefs, and label-reading behavior. Bivariate analyses included Student's independent sample t-tests to compare label use and gender groups and Pearson's correlations for association between the constructs.

Responses to an open-ended question ("Provide the reason why you do or do not look at nutritional facts labels on foods.") explored the reasons for use of nutritional labels and were analyzed for recurring themes and coded into nine subcategories: health reasons, looking for specific information, don't care attitude, felt no need to read labels, weight control, already familiar with the labels on products purchased regularly, time (felt it took too long), buy the foods they want, and failure to understand or trust label content. Coding was conducted by two researchers, and any discrepancies regarding categorization were settled by consensus during the coding process.

A binary logistic regression was used to identify significant predictors of label use. The dependent variable was frequent/infrequent label use (as opposed to use/nonuse) in order to take advantage of a more even distribution of the variable. Respondents were classified as "frequent" label users (42.4%) if they indicated use of nutrition labels "always" or "often." Those who reported use of labels "sometimes" or "never" were classified as "infrequent" users (57.6%). Predictor variables included knowledge, attitudes, beliefs about diet-disease relationships, and reasons for label use. Data analyses were performed using the Statistical Package for Social Science (SPSS) software.

RESULTS

Sample Characteristics

Demographic analyses revealed 52% of the sample was female and 94% of the sample indicated "American" as their nationality (Table 1). Generalizability of results from the sample to the university's undergraduate population is increased due to the relative similarities of the sample characteristics for gender and national origin to that of the university population; "nontraditional" students and graduate students were underrepresented.

Utilization of Nutrition Labels

A total of 85.4% of participants claimed to look at nutritional facts labels when purchasing foods "sometimes" (n = 553, 43.0%), "often" (n = 350, 27.2%), or "always" (n = 195, 15.2%). The remaining 14.6% (n = 187) reported they "never" utilize the nutrition labels in purchasing decisions. Nine participants did not provide a response to this question. (Missing data was less than 1%.)

Knowledge, Attitudes, Beliefs, and Behavior

Pearson product-moment correlations revealed that all correlations between knowledge, behavior, attitudes, and beliefs about diet-disease relationships were positive and statistically significant at the 0.01 alpha level; however, these appear to be weak associations (Table 2). The strongest relationship was found between attitudes and behavior ($r = 0.353$).

Label Users vs. Nonusers

T-tests were conducted to determine if label users differed from nonusers regarding knowledge, attitudes, and beliefs about diet-disease relationships (see Table 3). In terms of knowledge, label users exhibited significantly higher mean scores (M = 4.6013, SD = 1.600) than did nonusers (M = 3.8079, SD = 1.681), indicating label users had higher nutrition and label use knowledge. Label users also exhibited more favorable attitudes towards nutrition label use (21.4417, SD = 2.898) than nonusers (M = 19.4516, SD = 3.070). Finally, the analyses indicated label users scored significantly higher (M = 16.2567, SD = 3.085) on questions related to diet-disease relationship than did nonusers (M = 15.2556, SD = 3.657), reflecting more accurate perceptions of the relationships between diet and heart disease, cancer, and osteoporosis. The largest effect size was found for attitudes toward nutrition labels (Table 3).

Gender Differences

Gender differences in knowledge, attitudes, beliefs about diet-disease relationships, and label use behavior were also examined using t-tests (see Table 4). Significant differences were noted ($p<0.01$) between males and females for all four variables. Although females scored significantly higher than males in nutritional knowledge, atti-

tudes toward nutrition labels, beliefs about diet-disease relationship, and nutrition label usage, none of the effect sizes were large (refer to Table 4). (Cohen's recommendations for interpreting effect sizes classify effect sizes of 0.16–0.42 as small to medium.[29])

Determinants of Label Use

Results of the binary logistic regression revealed seven significant predictors of frequent or infrequent nutrition label use (see Table 5). Four variables predicted frequent label use: health reasons [OR = 4.079, 95% CI (2.272, 7.324)], looking for specific nutrient information [OR = 3.552, 95% CI (2.014, 6.267)], weight control [OR = 2.940, 95% CI (1.476, 8.032)], and knowledge [OR = 1.199, 95% CI (1.061, 1.354)], and three variables predicted infrequent use: buy the foods one wanted regardless of nutrition content [OR = 0.354, 95% CI (0.167, 0.768)], time constraints [OR = 0.237, 95% CI (0.103, 0.542)], and didn't care [OR = 0.182, 95% CI (0.091, 0.363)].

DISCUSSION

The purpose of this study was to examine college students' label usage and determine if users and non-users differed in terms of knowledge of nutrition labels, attitudes toward labels, and beliefs about diet-disease relationships. Results indicated that all the variables were significantly associated with each other. Significant differences were also noted with significantly higher knowledge, more favorable attitudes toward reading labels, and more accurate perceptions of diet-disease association among label users than nonusers. The finding of greater use of nutrition labels by females is consistent with other research results.[7, 30, 31]

Although statistically significant differences were found, it is important to understand that statistical significance is not necessarily equivalent to practical significance. An examination of mean differences in scores indicates that the statistical significance captured in this study may be primarily a function of large sample size (as illustrated by several low effect sizes). Therefore, additional analyses were conducted to elicit further information that could lead to more relevant and practical applications.

Table 1. Descriptive Characteristics of the Sample

Sample Characteristics	N*	Percent
Gender		
Male	606	47.5%
Female	671	52.5%
Class Rank		
Freshman	244	19.2%
Sophomore	366	28.8%
Junior	249	19.6%
Senior	403	31.7%
Grad Student	9	0.7%
Nontraditional	1	0.1%
Nationality		
American	1216	94.0%
Other	78	6.0%
Are you on a campus meal plan?		
Yes	453	35.6%
No	819	64.4%
Label Use/Non-use		
Users	1098	85.4%
Non-users	187	14.6%

*Totals may not equal the final sample size as data were missing for some of the responses. In all cases, however, missing data were less that 2% of the total sample.

Table 2. Pearson's Correlations between Food Label Knowledge, Behavior, Attitudes, and Beliefs about Diet-Disease Relationships

	Knowledge	Behavior	Attitudes	Diet-Disease
Knowledge	1.00	0.171*	0.204*	0.174*
Behavior		1.00	0.353*	0.162*
Attitudes			1.00	0.207*
Diet-Disease				1.00

*Significant at the 0.01 alpha level

Results of a logistic regression revealed significant predictors of both frequent and infrequent label use. Predictors for frequent label use included health reasons (control diabetes, balance diet, be "healthier," etc.), looking for specific nutrition information (such as calories, fat grams, carbohydrates), weight control, and knowledge. Respondents' desire to purchase foods they wanted regardless of nutrition content, time constraints, and simply a "don't care" attitude were predictors of infrequent label use.

The reasons for label use that significantly predicted frequent or infrequent use provide the most relevant information for both researchers and practitioners. The four factors that predicted label *use* could provide focal points for nutrition education programs that encourage nutrition label use among college students. For example, given the large odds ratio for health reasons, it might be useful for practitioners to incorporate messages related to health benefits of using nutrition labels to make wise dietary choices. In ad-

Table 3. Results of *t*-tests Examining Differences in Knowledge, Attitudes toward Food Labels, and Beliefs about Diet-Disease Relationships for Label Users versus Non-users

	Label Users (85.4%)	Label Non-users (14.6%)	T score	p-value	Cohen's d
Knowledge Scores ranged from 0 (no correct responses) to 11 (all correct responses)	4.6013 (1.600)	3.8079 (1.681)	6.062	.000*	0.48
Attitudes Scores ranged from 5 (less favorable attitudes) to 25 (more favorable attitudes)	21.4417 (2.898)	19.4516 (3.070)	8.572	.000*	0.67
Diet-Disease Scores ranged from 0 (less belief in diet-disease relationships) to 21 (more belief in diet-disease relationships)	16.2567 (3.085)	15.2556 (3.657)	3.472	.001*	0.30

*Significant at the 0.01 alpha level

Table 4. Results of *t*-tests Examining Differences in Knowledge, Attitudes toward Food Labels, Beliefs about Diet-Disease Relationships, and Label Use Behavior for Males versus Females

	Male (47.5%)	Female (52.5%)	T score	p-value	Cohen's d
Knowledge Scores ranged from 0 (no correct responses) to 11 (all correct responses)	4.3385 (1.636)	4.6338 (1.607)	-3.192	.001*	0.18
Attitudes Scores ranged from 5 (less favorable attitudes) to 25 (more favorable attitudes)	20.9048 (3.039)	21.3763 (2.958)	-2.786	.005*	0.16
Diet-Disease Scores ranged from 0 (less belief in diet-disease relationships) to 21 (more belief in diet-disease relationships)	15.7621 (3.264)	16.4314 (3.103)	-3.729	.000*	0.21
Behavior Scores ranged from 3 (less label use) to 15 (more label use)	8.2699 (2.860)	9.5511 (3.146)	-7.566	.000*	0.42

*Significant at the 0.01 alpha level

dition, the apparent importance of looking for specific information on labels would indicate that health/nutrition educators should tailor messages to audiences that include the specific pieces of information that are important consideration for their needs; for example, patients with heart disease might want to pay particular attention to fat content and cholesterol. Pointing out specific values of interest might enable consumers to utilize labels more effectively without feeling overwhelmed by abundance of information provided. This may help avoid confusion over labels that even nutrition professionals deem as problematic.[32] A 2005 review of the literature supports this and provides further evidence that label users are motivated to read nutrition labels when searching for specific nutrient content such as sugar, calories, and fat.[33]

Another significant predictor of frequent label use was knowledge, although it had a relatively small odds ratio as compared to the other three predictors. This could indicate that while nutritional knowledge may be essential for label use behavior, it is not a sufficient *reason* for label use. Therefore, nutrition education programs that simply target an increase in knowledge of nutritional labels among a college population may not result in increased label use.

The fourth predictor of frequent label use was weight control. A review of the data revealed that many participants use nutrition labels to select foods that allowed for effective weight maintenance or loss. National data from the Behavioral Risk Factor Surveillance System reveal a increase in obesity among young adults (aged 18–34 years) from 7.4% in 1990 to 16.5% in 2002.[34] Further, the 1995 College Health Risk Behavior Survey found one in five college students was overweight, and 30.8% of students had reported dieting within the 30 days prior to the survey.[35] Hence, use of nutrition labels for weight maintenance and weight loss is reasonable, and is supported

by prior research.[1]

While this seems logical to most health/nutrition educators, a twist on this concept emerged in the data. Several respondents indicated that it was unnecessary for them to lose weight; therefore, they did *not* look at nutrition labels. For example, one participant stated, "I am thin and in shape, so I don't worry about this [nutritional] information." This finding may be indicative of an attitude among some college students that healthy dietary practices correspond solely to weight. It may be important for practitioners working with this age group to emphasize other important reasons for good nutrition practices.

Of the three significant predictors of infrequent label use, the one that may have the most practical implications is related to time constraints. The students in this sample seemed to feel that reading nutrition labels was time consuming, and benefits gained from familiarization with nutrition content did not outweigh this loss of time. Due to this, practitioners might want to stress that with proper understanding of reading nutrition labels, the process does not have to be time-consuming or labor-intensive.

Implications for Practitioners

The previous discussion section identified multiple findings of relevance to practitioners. In order to facilitate a smooth transition between research and practice, the following provides a summary of implications addressing key focal areas for practitioners working to increase use of nutrition labels. First, explain that there are health benefits in using nutrition labels for proper food selection. Second, teach students/clients which specific components of the nutrition label are important for making food selections to meet their individual needs. Third, remain aware that nutrition knowledge, in and of itself, may not be sufficient to prompt use in food selection. Fourth, while many individuals may choose to use nutrition labels to assist in weight loss or maintenance, it is important to continue to emphasize the need for proper nutrition (and thus, the use of nutrition labels) in maintaining health dietary practices, regardless of current weight status (i.e., being "thin and in shape" does not eliminate the need for healthy eating). Finally, stress that with a basic understanding of nutrition labels, using them is neither time-consuming nor labor-intensive.

Table 5. Summary of Logistic Regression for Predictors of Frequent versus Infrequent Food Label Use†

	B	Exp(B) (Odds Ratios)	95% CI	p-value
Health reasons	1.406	4.079	(2.272, 7.324)	.000*
Looking for specific information	1.268	3.552	(2.014, 6.267)	.000*
Weight Control	1.078	2.940	(1.476, 8.032)	.035*
Knowledge	0.181	1.199	(1.061, 1.354)	.004*
Buy the foods they want	-1.026	0.358	(0.167, 0.768)	.008*
Time	-1.441	0.237	(0.103, 0.542)	.001*
Don't Care	-1.704	0.182	(0.091, 0.363)	.000*

*Significant at the 0.05 alpha level
†Frequent users served as the reference group (i.e., odds ratios higher than 1.00 indicated higher likelihood of frequent label use).

Limitations

This study has several limitations. A self-selection bias and non-random sample may have influenced the results; however, the sampling of students in required physical education activity classes provided enhanced representation. The sample characteristics were similar to the demographics of the university population and hence support generalizibility of findings for the sampled university. The findings, however, cannot be applied to all college students. Future studies should use random samples from several universities in order to increase generalizability.

Reliability and validity of the attitude scale was relatively low (Cronbach's alpha = 0.54). While the instrument for this research was based on one utilized in research previously published in a major peer-reviewed journal,[11] the attitude scale data collected from its use in this study were not found to be reliable. Although the most relevant results for practitioners were not based on this scale, it is recommended that all results based on the attitude scale be interpreted with caution.

The instrument itself may have additional limitations. Although constructed based on surveys used in previous research, it is important to consider the practical significance of some of the items. For example, is it really important to know what percent of daily values a food must contain to be labeled "High in Calcium," or is it more important to know one should choose foods high in calcium and that the claim printed on the box is legitimate?

Recommendations

These limitations lead to several recommendations for future research. Studies that focus on skills (such as actually reading nutrition labels) and knowledge should include questions with practical significance to enhance relevance of results. Use of random samples and ethnic and age variations will provide important information for practitioners.

Ultimately, researchers work to increase knowledge that can be translated into practice, which ideally will lead to better quality of life. In order to reach this goal, researchers should pay attention to the practicality of their work. Doing so should facilitate a more clear translation of research into practice, thus helping to bridge the gap that often exists between them.

Future studies should also add qualitative components for an in-depth understanding of certain constructs such as reasons for nutrition label use. The use of open-ended

items in this study provided depth to the findings that might have been overlooked had responses been restricted to previously identified categories. These responses allowed researchers to extract factors that were both predictive of the behavior of interest and that serve as logical points of intervention for practitioners.

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