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Does Instruction Enhance Students' Knowledge of Nutrition Facts?

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Abstract

Pretest and posttest results suggest that statistically significant differences exist between students' performance on two nutritional quizzes. The findings also indicate that scores are higher on the posttest for students' knowledge about the percent daily values for the selected nutrients. Overall, female students outperform male students on both tests. From the results, nutritional instruction is an effective tool to enhance students' knowledge of the Nutrition Facts labels.

Keywords: percent daily values, Nutrition Facts, students, McNemar Test, nutrition education

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Introduction

Nutritional Facts labels first appeared on processed food products in the United States in May 1994. The new food labels were standardized and displayed information on serving size, number of servings, calories, calories from fat, total fat, saturated fat, cholesterol, sodium, total carbohydrates, dietary fiber, sugars, and protein among others. Percent daily values (% DVs) for selected nutrients are displayed on the labels and are based on a 2000-calorie per day diet. The intent is to give consumers easier access to nutritional information at points of purchase to improve their diets and in so doing combat rising healthcare costs resulting from the rapid increases in overweight and obesity rates ((Ollberding, Wolf, and Contento 2010).). Ironically, almost 20 years after implementation of the standardized labels, overweight and obesity rates and costs for treating diet-related illnesses have skyrocketed. These realities led Ollberding and colleagues (2010) to argue that label use alone could not adequately modify behavior to effect changes in health status. Thus, research continues to find answers to the current dilemma of Americans having easy access to nutritional information and yet they continue to gain weight.

Four years after implementation, Levy and Fein (1998) argued that labels provided a wealth of nutrition information, informed consumers about the nutritional characteristics of foods, and were easily accessible to consumers wanting to adopt healthy eating habits. However, they warned that food labels could only be useful if the nutritional information they conveyed were easy to understand. They praised the architects of the Nutrition Facts for using percentages to convey nutrient values rather than absolute amounts and, thereby, eliminate the need for consumers to conduct rigorous mathematical or computational analyses when comparing nutrients. With the need for quantitative analyses reduced, consumers can simply compare %DVs of the nutrients in the foods they are buying and can ignore how the nutrients are measured. Levy and Fein (1998) also suggested that nutritional education should focus on teaching consumers how to improve their diets using easy tasks such as comparing food products or determining whether a food was high or low in a particular nutrient.

Grimes, Riddell, and Nowson (2009) noted that use has improved diet quality, reduced energy intake, and increased fruit and vegetable consumption and other health-related activities. However, use is not widespread across all ethnic groups and targeted nutrition education is still warranted. These researchers postulated that consumers had a basic understanding of the links between high salt intake and high blood pressure, but were confounded by the relationship between salt and sodium. And because sodium rather than salt is listed on food labels, many consumers could not make an easy transition from sodium to salt if they wanted to buy low-salt food items. They recommended more user-friendliness regarding sodium and salt in future food labeling and educational endeavors to help shoppers to accurately choose low-salt food items.

Stran and Knol (2013) indicated that nutrition educational efforts should separate men from women because the factors which determined usage were different. From their findings, frequent label users were more likely to be women, older adults, Caucasians, from higher-income households, or to have had healthier diets. Respondents who were not concerned about health and weight used labels at lower rates than their corresponding counterparts. Hawthorne and colleagues (2006) also inferred from their study that educational programs are effective in teaching young adults how to use Nutritional Facts labels to make healthier food choices.

Colleges and universities are excellence avenues for promoting health and well-being of young adults. However, researchers are often alarmed by the high percentages of students who are overweight or obese (Feldman, Harwell, and Brusca, 2013) and suggested the need for research targeting this segment of the population. Misra (2007) opined that young adults' attitudes, knowledge, and levels of label use must also be studied. This view was also supported by Sharf, et al. (2012) whose findings showed that young adults' perceptions of their knowledge of food labeling information was contrary to their test scores. Thus, they concluded that food labels alone were insufficient in increasing nutrition knowledge, necessitating the need for more targeted education programs.

We concur with the view that young adults need greater nutritional education, and our study selects a cross-section of university students or young adults to receive such information. The study is timely because of the rising numbers of university students who are overweight or obese at the national and state levels. Thus, students need access to nutritional information especially in a classroom setting so they can have better tools to make healthier food choices.

Objectives

The study's main objective is to document the level of nutritional knowledge among a cross-section of university students. The specific objectives are to (a) examine students' knowledge of the Nutrition Facts on % DVs for total fat, saturated fat, cholesterol, calcium, sodium, potassium, dietary fiber, and carbohydrate; (b) determine the role of gender in knowledge; and (c) assess the effectiveness of formal instruction in enhancing nutritional knowledge.

Data and Procedures

Data

The study's data were compiled from a sample of 305 university students during fall 2011 and spring 2012. The questionnaire captured students' knowledge of the information on Nutrition Facts panels, knowledge about vitamins, frequency of reading labels, frequency of consuming fresh fruits and vegetables, perceptions of health and weight, levels of physical activity, and selected demographics characteristics (age, academic classifications, majors, hometown, residency, marital status, race, and gender). A nutritional quiz was first given to all participants, and then 133 students in the biology courses were taught how to read and interpret the information on the Nutrition Facts labels. A follow-up quiz was given to determine the effectiveness of nutritional instruction they received.

Test Statistics

The chi-square test for independence between two categorical variables and the McNemar's test for paired proportions are used to analyze the data. The McNemar test is appropriate because data from the pretest and posttest scores are related. Further, it acts like a paired version of the chi-square test and is used here to analyze whether the proportion of correct scores on the two

quizzes are the same for each micronutrient studied. In other words, it is used to measure the effectiveness of the nutritional education strategy.

Empirical Results and Discussion

Descriptive Statistics

The average age of the participants in the full sample was 23 years old; freshmen comprised 21 percent of the respondents, sophomores, 34 percent, juniors, 28 percent, and seniors, 17 percent; 37 percent lived on campus; 71 percent were women, while 87 percent had never been married. The average score for all students was 55 percent. The pretest score for students enrolled in the introductory biology courses was 53 and the posttest score was 62 percent.

Chi-Square Tests for Independence

Table 1 shows the overall performance on the pretest by all participants, performance by gender, and corresponding chi-square and p-values. From the results, participants' knowledge of % DVs for the selected nutrients is very low. Although there are marginal differences in knowledge levels between male and female students on questions related to the % DVs for total fat, cholesterol, and carbohydrate, the overall performance is less than desirable. Similar observations are appropriate for students enrolled in the introductory biology courses. Gender differences exist between performance levels for knowledge on cholesterol, fiber, and carbohydrate, but not for total and saturated fats, calcium, sodium, and potassium (Table 2). The finding for total and saturated fats is somewhat disconcerting because these two micronutrients are often found in high levels in many of the food products students regularly consume, and are often singled out as some of the main drivers of the overweight and obesity epidemic at the state and national levels.

Table 1. Performance on Pretest Quiz for All Participants

Nutrition Facts	Percent Correct Total	Percent Correct Males	Percent Correct Females	Chi-Square Values	P-Values
100% DV Total Fat	14	19	12	3.206*	0.073
100% DV Saturated Fat	39	41	38	0.257	0.612
100% DV Cholesterol	34	43	30	4.898**	0.027
100% DV Calcium	49	52	48	0.579	0.447
100% DV Sodium	10	9	11	0.156	0.693
100% DV Potassium	59	57	60	0.247	0.619
100% DV Dietary Fiber	12	8	13	1.760	0.185
100% DV Carbohydrate	37	27	42	5.395**	0.020

(*) and (**) imply statistical significance at the 10 and 5% levels of probability, respectively.

After instruction scores on the posttest increased for all the selected questions on % DVs (Table 3). Knowledge of total fat and dietary fiber remained below 50 percent; however, the other categories increased for male and female students, with females scoring higher. The results in Table 3 also suggest that students' performance on the questions for saturated fat, cholesterol,

sodium, and potassium are statistically significantly associated with gender. In the case of the recommendations for saturated fat and sodium, females outscored males by a margin of more than 20-percentage points. Performance on questions related to total fat, calcium, dietary fiber, and carbohydrate is invariant to gender.

Table 2. Pretest Performance by Students in Biology Courses

Nutrition Facts	Percent Correct Total	Percent Correct Males	Percent Correct Females	Chi-Square Values	P-Values
100% DV Total Fat	20	22	18	0.306	0.580
100% DV Saturated Fat	29	24	33	1.096	0.295
100% DV Cholesterol	31	40	25	3.161*	0.075
100% DV Calcium	46	52	42	1.215	0.270
100% DV Sodium	11	12	11	0.042	0.838
100% DV Potassium	56	54	57	0.087	0.768
100% DV Dietary Fiber	12	6	16	2.753*	0.097
100% DV Carbohydrate	40	30	46	3.243*	0.072

(*) implies statistical significance at the 10% level of probability.

Table 3. Posttest Performance by Students in Biology Courses

Nutrition Facts	Percent Correct Total	Percent Correct Males	Percent Correct Females	Chi-Square Values	P-Values
100% DV Total Fat	33	34	33	0.030	0.861
100% DV Saturated Fat	59	42	68	9.155***	0.002
100% DV Cholesterol	66	54	74	5.297**	0.021
100% DV Calcium	69	66	71	0.378	0.539
100% DV Sodium	59	44	68	7.087***	0.008
100% DV Potassium	77	68	82	3.386*	0.066
100% DV Dietary Fiber	47	42	49	0.686	0.407
100% DV Carbohydrate	63	58	66	0.916	0.339

(*), (**), and (***) imply statistical significance at the 10, 5 and 1% levels of probability, respectively.

McNemar Tests for Paired Proportions

Table 4 shows comparisons between pretest and posttest scores for students in the introductory biology courses. The uncorrected chi-square values for differences between paired proportions are all statistically significant at the one percent level of probability or better. Thus, the null hypotheses that scores are the same for both tests are rejected. The rejection of the null hypotheses implies that students performed better after formal instruction on how to read and interpret information on % DVs. Thus, instruction is an effective tool to enhance students' knowledge of Nutrition Facts labels.

Table 4. Comparisons Between Pretest and Posttests Scores in Biology Courses

Nutrition Facts	Percent Correct Pretest	Percent Correct Posttest	Chi-square Values	P-Values
100% DV Total Fat	20	33	5.400**	0.028
100% DV Saturated Fat	29	59	18.778***	0.000
100% DV Cholesterol	31	66	32.970***	0.000
100% DV Calcium	46	69	13.928***	0.000
100% DV Sodium	11	59	54.370***	0.000
100% DV Potassium	56	77	12.645***	0.001
100% DV Dietary Fiber	12	47	25.830***	0.000
100% DV Carbohydrate	40	63	13.535***	0.000

(**) and (***) imply statistical significance at the 5 and 1% levels of probability, respectively.

Summary and Conclusions

The study's objectives were to examine students' knowledge of the recommendations for % DVs for selected micronutrients from the Nutrition Facts labels; determine the role of gender in knowledge, and to assess the effectiveness of instruction in enhancing nutritional knowledge. The results suggested that students knew very little about the information on the Nutritional Facts labels, that gender played a role in knowledge, and that instruction was an effective tool in enhancing students' nutritional knowledge. Despite these successes, our efforts must continue because knowledge of total fat and dietary fiber remained low, and male students underperformed in all categories. Lowering daily fat intake and increasing daily intake of fiber through increased consumption of fresh fruits and vegetables and whole grains are effective tools to combat rising overweight and obesity rates. Our findings also suggest that incorporating practical nutritional information in introductory biology courses is effective in reaching greater numbers of students beyond those enrolled in nutrition-based courses.

Given the budgetary challenges at the state level, Louisiana residents must become more proactive in improving their eating habits. Many college students are ill-equipped to make healthy food choices because oftentimes it is the adults in the family who make the food purchasing decisions. Left to their devices in college, it is easy for students to adopt unhealthy eating habits from the environment. Thus, learning how to read and use food labeling information to make healthier food choices are excellent first steps to lower healthcare costs and reduce diet-related diseases. State universities can play a vital role in this effort by teaching students in the mandatory introductory biology courses how to read and use food labeling information to make healthier food choices.

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