The Influence of Audio-Video Instruction on Consumers' Selection of Nutritious Food Products

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ABSTRACT

The present research investigates procedures for educating people on the use of nutritional labeling. The methods incorporate instructional audio-video media in conjunction with active decision making and immediate feedback. Three groups of participants (audio-video only, audio-video plus active decision making/feedback, and no-instruction control) were asked to chose the more nutritious products from pairs of similar products based on the information on the labels. The results showed that audio-video media improved the accuracy of the product-pair selections and nutrition knowledge. No additional benefit of active decision making and feedback was found. A follow-up product choice test given approximately one week later showed that performance for the two audio-video conditions was maintained, but there were no differences between conditions primarily because of a nonsignificant increase by the control group. However, the follow-up testing showed that the two audio-video groups had greater nutrition knowledge than the control group. Additional analyses showed that demographic variables such as gender, occupation, income level, health status, and special diet were related to product-choice and nutrition test performance. This research advances empirical work in this area, first, by showing an effective and efficient way to educate the public on nutrition and food label information, and second, by employing a performance measure (consumer choice) that might be useful in future research examining differences between food label formats and education strategies.

INTRODUCTION

Interest in food labeling has increased over the last several years. Because of growing concerns for healthy lifestyles, more consumers are reading the information on labels more frequently and more extensively (Opinion Research Corporation, 1990). Some of this interest is being driven by recent publicized studies relating disease (e.g., cancer, hypertension and heart disease) with certain foods. As a result, people are seeking information on how to prevent food-associated illnesses (Jacoby, Chestnut, and Silberman, 1977; Podolsky, Roberts, Silver, and Mukenge, 1991). Because many individuals must limit consumption of certain substances for health reasons, it is important to ensure that they can make accurate decisions on what they can consume and what they should avoid.

Increased interest on food labeling has led to a recent congressional mandate concerning truthful and uniform nutritional labeling on food products (Nutrition Labeling and Education Act) in November, 1990. Although Congress passed the first FDA nutrition labeling law in 1973, few changes in labeling have taken place since then. At the same time, the dietary trends of consumers have greatly shifted. People consume more processed food, eat more often outside the home, and snack more between meals (Earl, Porter, and Wellman, 1990). While total caloric intake has remained relatively constant over this period, higher proportions of fats, oils, sugars, and preservatives have replaced grains and fresh produce.

At present, approximately 60% of all processed foods carry nutritional information on labels (Mermelstein, 1990). All labeling is voluntary, unless a nutrient is added to an existing product (e.g., "Protein Enriched") or a nutrient claim is made (e.g., "High Fiber"). The FDA's (1991) proposed food labeling policy requires that manufacturers list all nutrients that are a useful source of calories or nourishment. The FDA has also proposed replacing the current reporting of Recommended Daily Allowances (RDAs) to Recommended Daily Intake (RDIs) or Daily Reference Values (DRVs). as well as improvements in the ways serving sizes will be reported. They have also begun to solidify the terms that can be used to describe specific nutrient quantities (e.g., "Low" and "Reduced").

To date, most research on nutrition labeling has been focused on "what" to report on the label. For example, Young and Pellett (1991) investigated whether the actual amounts of nutrients stated on a label are levels appropriate to consume. Similarly, Cook, Gregory and Weaver (1990) examined whether the nutrient quantities on labels actually correspond to those present in the product. However, other important food label factors have not received much empirical investigation. These include the legibility, readability, and comprehensibility of food labels as well as their usability in decision making. Due to approaching deadlines for adoption of food labeling standards by the FDA, the proposed label formats will likely be fixed without the benefit of thorough testing. While, it is likely that the new food labels be improved over the existing ones, it is not clear whether they will be adequate and usable by many groups of individuals. Consequently, label deficiencies that remain will have to be compensated by educational programs. There is currently no research on how to educate the public on nutritional labeling in both a cost effective way and that results in healthful food choices (behavior). The present research is directed to that effort. The utility of two procedures for educating consumers is investigated: audio-video instruction, and active decision making and feedback.

One potential benefit of instructional video is that it can be viewed at or near the point of purchase decision (e.g., supermarkets), as well as available at libraries, at schools, and through television broadcasts (e.g., in public service announcements). Audio-video media also provides a way to reach diverse populations.

The potential of audio-video media for educating the broad segments of the population is suggested by research in other domains. Stein (1986) found that cancer knowledge increased from a television-based information campaign.

Winett, Leckliter, Chinn, Stahl, and Love (1985) used a 20-minute broadcast on public television to instruct viewers on energy conservation. The effects of the program were assessed by monitoring energy consumption through meter readings and third-party ratings. The results showed that consumers who witnessed the program conserved more energy than those who did not see the program, with reductions continuing for nine weeks after the program.

A primary goal of an effective educational program on nutrition labeling is that it will translate into the ability to make healthier product choices. However, a video that is passively viewed by consumers, by itself, may not be adequate. More active methods may be necessary. For example, while Stein's (1986) research found that cancer information was well disseminated, several misconceptions relating to cancer remained after the campaign. One way to determine whether the information is appropriately understood is to actively engage individuals in a testing and feedback procedure (Bandura, 1986; McGuire, 1980; Sirgy, 1983; Winett, Moore, and Anderson, 1991).

Feedback can help to correct erroneously-interpreted concepts and reinforce proper ones. It may also play a role in solidifying information into memory and serve to reassure consumers that they are making the correct decisions. Howard and Burnkrant (1990) found that asking questions at the end of radio advertisements to reinforce points given in the advertisements produced the greatest positive responses to the advertisements (versus no questions asked or asked at a different point).

The present study investigates whether participants viewing an audio-video instructional tape make better nutritional choices than participants who do not view the instructional tape. Additionally, the study also examined whether having practice making choices followed by immediate feedback after watching the video would improve subsequent product choices. Also examined was (a) whether performance following instruction would be retained over time, (b) whether the method of instruction influences nutrition knowledge, and (c) whether performance differs depending on participant demographics.

METHOD

Design

The experiment involved three between-subjects instruction conditions: (a) audio-video instruction only, (b) audio-video instruction plus active decision making/feedback, and (c) no-instruction control. The main dependent variables were proportion-correct product-choice and nutrition-knowledge scores. Other analyses examined the relationship of demographic variables to performance.

Participants

Participants were 129 individuals solicited from local community groups. The participants included retirees, professionals, trades persons, students, and housewives from senior citizens centers, child-birth classes, military bases, aerobics classes, and a psychology graduate program. Participants were randomly assigned to experimental groups. Of those tested initially, 105 were retested approximately seven days later.

Materials and Stimuli

The audio-video instructional tape was constructed using information from the Surgeon General's (1988) health report, and the American Dietetic Association's (1990) instructional materials for registered dietitians. On the seven-minute videotape, a female commentator described food label and nutritional information, focusing on sodium, sugar, fiber, and cholesterol content, and illustrating each point with product examples. The video was played to participants using a VHS tape player and television monitor.

Test response sheets presented product pairs in a random order using a balanced Latin Square. The questionnaire had spaces next to each item of a pair for participants to indicate which they believed was more nutritious. The two products of each pair were of a similar type. Six pairs were given in the first product-choice test (breakfast cereals, fruit drinks, desert mix, salad dressings, chicken noodle soups, and cheese products). Another six product pairs were used in the second product-choice test (canned beans, "heat and serve" canned meals, pasta products, oat cereals, popcorn/pretzels, and packaged nuts). In the decision-making phase of the audio-video plus active decision making/feedback group, three product pairs were used (low calorie salad dressings, canned tuna, and canned corn). Actual national and store brand products from local supermarkets were used. The selection of which product pairs to use in the study and the determination of the more nutritious product of each pair were based on several interviews with registered dietitians and physicians in the clinical nutrition department in an upstate New York hospital.

A questionnaire attached to the first product-pair test requested demographic information from participants to help provide insight on who might be targeted in future label education programs. The demographic question requested: age, gender, occupation (classified as professionals, trades persons, students, retirees, and housewives); total household income (divided into the categories of: less than $15,000; $15,001 > $25,000; $25,001 > $35,000; $35,001 > $45,000; $45,001 > $55,000; and greater than $55,001); a rating of their health status (1 = very poor health to 5 = excellent health); and whether they have been advised by a physician to follow a special diet. Attached to the second product-pair test was a multiple-choice test assessing nutrition knowledge. The nutrition questions concerned: the recommended daily consumption of fiber, the types of fiber in food, the quantitative meaning of "low sodium" and "cholesterol free," and the nutrient classification of sugar.

Procedure

All participants initially signed a consent form. After completing this form, participants followed one of the three procedures described below.

Participants in the audio-video only group were taken to an area where the television and VCR were stationed. After the participants watched the video, they proceeded to the product display area and were instructed on how to complete the product-choice test. They were told to examine each pair of products and then to indicate on the response sheet which of the two products was more nutritious.

Participants in the audio-video plus active decision making/feedback group first viewed the video and then took a pretest requiring them to choose the product from each of three sample product pairs that they believed was more nutritious. When they completed the pretest, the experimenter then read the correct answers, and described the reasons for the answers by referring to the videotape they had seen. After the experimenter informed and corrected this group on the proper answers, participants then completed the same product-choice test given to audio-video only group.

Participants in the no-instruction control group were immediately taken to the product-pair display, given instructions, and then asked to complete the same product-choice test given to participants in the other two groups. They were not shown the video or given any other training.

After finishing the product-choice test, all participants completed the demographic questionnaire. Finally, they were reminded of a return visit in one week and then released from the session.

Participants were visited a second time, seven to nine days after the first test. At this time, participants from all three groups were shown six new product pairs and asked to choose the more nutritious product in each pair, as they had done for the first test. After completing this test, they were given a brief nutrition-knowledge test, and then debriefed.

RESULTS

Responses on the first and second product-choice tests and nutrition knowledge tests were scored by giving a 1 for a correct answer and 0 for an incorrect answer. Proportion-correct scores were derived by dividing the participants' total scores by the tests' maximum score (six and five, for the product-choice and nutrition-knowledge tests, respectively).

First product-choice test. A one-way between-subjects analysis of variance (ANOVA) showed a significant effect of instruction group, $F(2, 126) = 7.94$, $p < .05$. Paired comparisons showed that participants in the audio-video only ($M = .57$) and audio-video plus active decision making/feedback ($M = .55$) conditions made more accurate product choices than those in the no-instruction control ($M = .42$) condition. There was no significant difference between the two audio-video groups.

Second product-choice test. Data for the second product-choice test was obtained from 105 participants. A one-way ANOVA showed no significant effect of instruction group, $F(2, 102) < 1.0$, $p > .05$ (for audio-video only, $M = .58$; for audio-video plus active decision making/feedback, $M = .59$; and for no-instruction control, $M = .54$).

Analysis combining product-choice tests. A 3 (instruction group) x 2 (time of test) ANOVA failed to show a significant main effect of instruction group at the conventional level of significance, $F(2, 102) = 2.87$, $p = .06$, though there was a trend for improved accuracy from the first ($M = .52$) to the second test ($M =.57$). Neither the main effect of time of test, $F(1, 102) = 2.44$, $p > .05$, nor the interaction were significant, $F(2, 102) < 1.0$, $p > .05$.

Product-choice performance compared to chance. Because product-choice performance yielded scores near the value expected by random guessing (.50), analyses assessed whether participants performed differently from chance. For the first test, one-group t tests showed that participants in the audio-video only group per-formed significantly better than chance, $t(42) = 2.53$, $p < .05$. Conversely, the no-instruction control group performed significantly worse than chance, $t(42) = 2.29$, $p < .05$. For the second test, none of the groups differed significantly from chance.

Individual product-pair analyses. More detailed analyses examined the choices for each product pair with respect to instruction group. While it was the case that for virtually every product pair the two video instruction groups produced more accurate product choices than the control group, the differences were significant for only two pairs in the first test (soup and fruit drinks, with both product pairs differing mainly in sodium content) and one pair in the second test (pasta products that differed mainly in fat content).

Nutrition knowledge. A one-way ANOVA on the nutrition-test scores showed a significant effect of instruction group, $F(2, 100) = 3.42$, $p < .05$. Paired comparisons showed that participants in the two audio-video conditions had significantly greater nutrition knowledge scores than participants in the no-instruction control condition ($M = .32$). The two audio-video conditions did not differ (audio-video only, $M = .49$, and audio-video plus active decision making/feedback, $M = .43$).

Demographics and performance

Table 1 shows performance on the two product-choice and the nutrition-knowledge test as a function of demographic variables. Analyses examined whether performance on the tests differed as a function of participants' demographics. Only the significant effects at $p < .05$ are cited below.

First product-choice test. A one-way ANOVA indicated an effect of occupational category, $F(4, 112) = 4.34$. Comparisons showed that trades persons ($M = .61$) and students ($M = .58$) performed better on the first product-choice test than housewives ($M = .39$). There was also an effect of reported household income, $F(5, 91) = 2.41$. Participants in the low income group (less than $15,000) performed worse than those in middle income group ($35,000 to $45,000: $M = .69$). The need for a special diet also had an effect, $F(1,120) = 5.23$). Participants on a special diet performed less well on the product-choice test ($M = .44$) than those not on a special diet ($M = .54$). Other analyses showed that participants who performed better on the first product-choice test tended to be younger, $r = -.38$, N = 112, and rate their health as good, $r = .19$, N = 115.

Second product-choice test. A one-way ANOVA on scores from the second product-choice test showed an effect of occupational category, $F(4, 94) = 23.28$. Professionals ($M = .79$), trades persons ($M = .73$) and students ($M = .70$) outperformed retirees ($M = .32$) and housewives ($M = .33$). Analysis of income level, $F(5, 74) = 5.39$, showed that participants in households with incomes less than $15,000 ($M = .42$) scored lower than participants earning above $45,000 annually (for $45,000 to $55,000, $M = .81$; for greater than $55,000, $M = .76$). The need for a special diet showed an effect, $F(1, 99) = 5.95$. Participants indicating they were on a special diet performed worse ($M = .44$) than those not on one ($M = .60$). Additionally, males had more correct choices ($M = .75$) than females ($M = .51$), $F(1, 100) = 13.56$. Other analyses showed that participants who scored higher on the second product-choice test tended to be younger, $r = -.63$, N = 94, and rate their health as good, $r = .25$, N = 95.

Nutrition knowledge. An ANOVA on the nutrition-knowledge scores showed an effect of occupational category, $F(4, 92) = 16.52$. Professionals ($M = .64$) and students ($M = .54$) had higher nutrition knowledge scores than retirees ($M = .28$) and housewives ($M = .17$). Analysis of household income, $F(5, 72) = 6.15$, showed that participants with incomes less than $15,000 ($M = .28$) scored lower than participants with incomes exceeding

\$45,000 (for \$45,000 - \$55,000, $M = .73$; for greater than \$55,000, $M = .58$). Males ($M = .52$) gave more correct responses than females ($M = .38$), $F(1, 98) = 5.56$. Younger participants had greater nutrition knowledge than older participants, $r = -.51$, N = 92.

DISCUSSION

Audio-video media was used to educate consumers on how to more effectively choose which food products are more healthful based on nutrition label content. The results showed that shortly after viewing the video participants were better able to choose the more nutritious product from a pair of similar products than persons not seeing the video. The video also had a positive effect on nutrition knowledge. Participants seeing the video performed better on the knowledge test than those not seeing the video. It is notable that the knowledge test was taken one week after seeing the video, indicating that its influence was more than a short-term effect. Together, these two findings, indicate that audio-video media has value in educating consumers. These results support research in other domains showing positive effects of audio-video media on knowledge and behavior change (e.g., Kelly, 1991; Stein, 1986; Winett, King, and Altman, 1989; Winett et al., 1985).

While the first product-choice test showed a benefit of the video instruction, the results of a follow-up test one week later were less clear. All groups showed a small increase, but none of the differences were significant (compared to scores on the first test or between groups on the second test). The most notable trend in the second product-choice scores was produced by the no-instruction control group, showing a larger increase than the other two groups. Several tentative explanations can be offered for this result. The first is that the small increase by the control group was simply due to chance fluctuation. This result was supported by the ANOVAs. The second explanation relates to the methodology. As two different sets of products were used in the first and second product-choice tests, it is possible that it was easier to make correct selections in the second test than the first. But given that all of the groups did not show an equivalent increase, and the fact that scores were not near ceiling, this explanation becomes less plausible.

The third explanation concerns the possibility of information-seeking by participants after experiencing to the first test. Participants' interest in nutrition labeling might have heightened by exposure to the first test, and as a consequence, might have been motivated them to attend to labels during the intervening week. While this explanation could describe the control group's better performance on the second test, it does not concur with other results showing no change in performance by the two video groups from the first to the second test.

The fourth explanation concerns the possibility that non-nutritional influences, such as label attractiveness, product familiarity and preference, print legibility, label color, and packaging design, affected participants' choices. The lower than chance selection rates by the no-instruction control group provides evidence for the existence of non-nutritional influences on participants' selections. Unfortunately, data on product perceptions such as familiarity were not collected, so the validity of this explanation can not be assessed by the current study. However, researchers at the FDA have noted influences such as cost in previous nutrition education programs measuring purchase behavior (Shucker, Levy, Tenney, and Mathews, 1992).

While the video was able to change product-choice performance in the first test session and nutrition knowledge in the second test session, benefit from practice making choices and feedback had no additional value beyond the video alone. One possible reason for this failure is that the preliminary practice session was not extensive and powerful

Table 1

Mean Performance on the Two Product-Choice Tests and Nutrition-Knowledge Tests as a Function of Demographic Variables

	1st Product Choice Test		*2nd Product-Choice Test*		*Nutrition-Knowledge Test*	
Category	*N*	*Mean*	*N*	*Mean*	*N*	*Mean*
Occupation:						
Professional	27	.55	24	.79	23	.64
Trade Professions	13	.61	8	.73	7	.40
Student	31	.58	28	.70	28	.54
Housewife	27	.39	21	.33	21	.17
Retiree	19	.52	18	.32	18	.28
Annual Household Income:						
\$15,000 or below	25	.45	23	.42	23	.28
\$15,000 to \$25,000	15	.60	12	.65	11	.44
\$25,001 to \$35,000	12	.50	9	.56	9	.42
\$35,001 to \$45,000	8	.69	6	.72	5	.56
\$45,001 to \$55,000	9	.48	6	.81	6	.73
\$55,000 or above	28	.56	24	.76	24	.58
Special Diet:						
Yes, on one.	29	.44	23	.44	23	.33
No, not on one.	93	.54	78	.60	76	.43
Gender:						
Male	35	.50	30	.73	30	.52
Female	88	.57	72	.51	70	.38

enough to produce an effect. Only three product-pair choices were used which might not have been adequate to change people's strategies and preferences.

The demographic results showed several consistent relations with the performance and knowledge measures. Trades persons, professionals, and students performed better than retirees and housewives on all three tests. Lower performance on both product-choice tests was associated with participants who reported lower annual household income, who were older and less healthy, and who were on a special diet. A similar pattern was seen for the nutrition-knowledge test. These results suggest that the persons who most need to make good nutritional choices performed worse than other persons. These results also suggest that effective nutrition educational programs should target individuals in these and other categories. Nutrition videos could be made available in physicians' offices and community health centers for patients and their families when diagnoses indicate a need to change consumption habits.

Besides finding an effect of the video, the present study also makes another contribution. The present study uses a methodology that measured performance (product selection) that may be useful in other research on product labels. Participants' selections were evaluated against an objective referent, the nutritional content of the products (that was verified by expert dietitians and physicians) to attain a measure of accuracy.

Many of the issues involved in the design of food labels and education/training programs fall within the domain of Human Factors. Indeed, nutrition labeling is related to one of the currently most active research areas of the discipline—warnings. For both kinds of labels, the goal is to ensure that people understand the information presented and are motivated to change their behavior as a result of receiving the information. Most of the design features and the procedures to investigate the efficacy of warnings could be useful for the design and testing of nutrition labels. Human Factors Specialists would strongly advocate that the labels be designed and tested using the most relevant population groups to ensure they are understandable, usable, and behaviorally effective. However, given current pressures on the FDA to quickly put into place revised labels, the new label designs may not receive adequate testing. Audio-video media would appear to be a useful and cost-effective tool (as part a large-scale educational program) to compensate for label design deficiencies.

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