THE EFFECTIVENESS OF NUTRITION INSTRUCTION ON STUDENT NUTRITION KNOWLEDGE AND FOOD CHOICES

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This quasi-experimental study used a pretest-posttest design to determine the effects of fourteen hours of nutrition instruction on nutrition knowledge and food selection of high school students. Nutrition knowledge was measured by a 57-item test. A food selection chart allowed numbers to be assigned to subjects' choices of foods for one day. Multiple regression analysis indicated students who received instruction in nutrition scored significantly higher on the nutrition knowledge posttest than students who did not receive the instruction. No significant difference was found in food selection between the two groups. A conclusion was that nutrition education does improve knowledge of nutrition; however, it does not seem to greatly influence food choices.

Through healthy eating habits, certain diseases and disorders such as heart disease, cancer, high blood pressure, diabetes, dental complications and gastrointestinal disorders can be prevented or at least positively influenced (Keon, 1997). According to Peterson, Kris-Etherton, and Sigman-Grant (1994), healthy eating habits adopted in childhood may facilitate healthier eating habits in adulthood. Adolescents often lack the knowledge and experience necessary to make adequate evaluations and may adopt ill-conceived diets (Rickert, 1996). In addition, adolescents have greater freedom of choice and purchasing power than ever before. Societal changes, such as an increase in television watching, a decrease in school physical education requirements, and a decrease in energy expenditure among adolescents (Achterberg & Shannon, 1993) also contribute to poor eating habits.

Adolescents often face enormous peer pressure, especially where food choices are concerned (Barber, 1995). Americans, in general, have the idea that being thin is healthy; this obsession is perpetuated by the media at the expense of many Americans' health (Ryan, 1995). "Dieting is a common trend among Americans despite the fact that long-term weight loss seldom results from dieting" (Girouard, Hunt, Pope & Tolman, 1997, p. 55).

Nutritional requirements and dietary behavior change dramatically during adolescence, creating a nutritionally vulnerable population (Rickert, 1996). Between five percent and ten percent of adolescents in the United States are obese and a much greater percent are overweight (Achterberg & Shannon, 1993). An analysis of high school students' diets showed that they were more than meeting recommended dietary allowances (RDAs), consuming more food energy then necessary (Fierke, 1995). Specifically, students consumed more protein, fat, and sodium than is recommended (Fierke).

Nutrition education is defined as "the means by which functional and scientific nutrition science is transmitted to the American public in a manner which leads to reasonable nutrition behavior" (Kirk, Hamrick, & McAfee, 1980, p. 21). According to Hochbaum (1981), nutrition education programs can be evaluated most effectively by measuring three dimensions that include cognitive and affective changes, immediate behavioral changes, and long-term behavioral effects. Using these criteria, effectiveness of nutrition education programs provided in secondary schools has been documented in some cases (Contento, Manning, & Shannon, 1992; Hochbaum, 1981). As a result of nutrition education, students' knowledge, attitudes, and behaviors have been improved. The one area that lacks evidence of significant change is long-term behavioral change (Hochbaum).

In order to improve nutrition education aimed at adolescents, James, Rienzo, and Frazee (1997) suggest that an understanding of adolescents' nutrition knowledge as well as adolescents' nutrition interests is crucial. In addition, the use of educational media and appropriate teaching strategies for adolescent audiences must be employed to capture the attention of teenagers. The purpose of this study was to determine the effectiveness of a nutrition unit on nutrition knowledge and food selection of students at a public high school in the south.

Method

The subjects for this study were 118 high school students who ranged in age from 14 to 18 years. Sixty-three subjects were white, 54 were black, and one was Hispanic. Ninety-eight subjects were females and 20 were males. Twenty-five subjects were in the control group and 93 were in the experimental group. Because experimental and control groups both the received the intervention, the teaching of a nutrition unit, during the normal rotation for the specific class, school officials permitted the research study without obtaining parental permission. The University Human Subjects Protection Review Committee approved the research study design.

The experimental treatment for the study was the teaching of a unit on nutrition. The nutrition unit, four weeks long, was a part of the curriculum for students taking Comprehensive Family and Consumer Sciences. The unit used materials from *Guide to Good Food* (Largen, 1991). A wide variety of teaching methods and tools such as crossword puzzles and group activities were used to help students understand nutrition concepts. For example, students completed a worksheet illustrating the similarities and differences of carbohydrates, proteins, fats, vitamins, and minerals. Students identified the functions of each nutrient and the sources of food in which specific nutrients could be found. There was also an activity in which students had to answer true/false questions about kinds of nutritious foods to purchase for their personal consumption. A food analysis chart was devised to assist students in determining whether or not their food choices were nutritious. Students kept a food diary for 24 hours and then analyzed their choices according to nutrients necessary for persons their age.

The instruments for this study consisted of a nutrition knowledge test and the food analysis chart. The nutrition knowledge test was an objective test taken from the instructors' guide to *Guide to Good Food* (Largen, 1991), and was used as both a pretest and a posttest. The test contained 20 true/false, 15 multiple choice, and 22 matching items for a total of 57 objective questions. All test items were weighted equally. The internal consistency reliability of the test of nutrition knowledge was found to be .99 using Kuder-Richardsons Formula 21 (Fraenkel & Wallen, 1996).

The food analysis chart scored subjects on the foods that they ate during a 24-hour period. The food analysis chart required the subjects to write in the kind of foods eaten and the quantity of each food eaten. Additional space allowed students to analyze specific nutrients such as proteins, carbohydrates, and fats in each food. To measure nutrition selection, a standard diet analysis was employed. Subjects received a score of one if their food analysis revealed a diet of less than 700 calories from nutritious sources. Subjects received a score of ten if their food analysis revealed a diet of 1200 calories from nutritious sources. Scores ranged from one to ten on the food diet analysis.

Information on knowledge of nutrition and food selection was gathered on both the experimental group and control group subjects prior to the treatment. Following the experimental group's treatment, the test of nutrition knowledge was again administered to all the subjects and again all the subjects completed the food selection chart. The control group, who had received a different unit during the experimental group's treatment, then received the nutrition group instruction.

Results

In this study it was hypothesized that there would be significant difference in nutrition knowledge and food selection between students who received and students who had not received nutrition instruction. The .05 level of significance was used in each analysis. The means and standard deviations of the pre- and posttest knowledge of nutrition scores and pre- and posttest food analysis indicate similarities between the groups on the pretests. The groups appear to differ on the posttests.

Table 1
Means and Standard Deviations

	Experimental Group			Control Group		
Measurement	M	SD	n	M	SD	n
Pre-test	40.32	9.86	93	38.28	8.77	25
Posttest	54.37	13.80	93	39.24	6.79	25
Pre-food analysis	2.82	1.99	93	3.24	2.08	25
Post-food analysis	4.01	2.59	93	2.52	2.86	25

Note. Pre-test = Pre-test of nutrition knowledge, Post-test = Posttest of nutrition knowledge. Pre-food analysis = Pretest of food analysis, Post-food analysis = Posttest of food analysis.

Hierarchical regressions were used to test the effect of treatment on posttest knowledge and posttest food analysis while controlling for pretest knowledge and pretest food analysis. The multiple correlation for Model 1-Knowledge, between scores on the posttest (test of nutrition knowledge) and the predictor variables, pretest, and pre-test food analysis was .525 (Table 2). The variance in scores of the predictor variables accounted for approximately 28 percent of the variance in scores on the test of nutrition knowledge. The change in the variance accounted for by including the experimental/control group variable was 15 percent (Model 1-Knowledge). The effect size of instruction in nutrition on the adjusted posttest scores of the knowledge of nutrition test was 1.384. Results indicated significance for treatment on food knowledge ($p < .001$).

The multiple correlation for Model 1-Food Analysis between scores on the post-food analysis and the predictor variables, pretest, and pre-food analysis was .177. The variance in scores of the predictor variables accounted for approximately three percent of the variance in scores on the post-diet analysis. The change in the variance accounted for by including the experimental/control group variable was only one percent (Model 2-Food Analysis). The probability of a change this large was .173. There was only a slight change in scores on the food diet analysis instrument as a result of instruction in nutrition (three percent to four percent). There was no significant effect for treatment on food diet analysis (p = .250).

Table 2
Model Summary for Posttest Nutrition Knowledge and Post-diet Food Selection

Model	R Square	R Change	R Square Change	F	df	P of Change
Posttest Nutrition Knowledge						
1	0.525	0.276	0.276	21.915	2/115	0.000*
2	0.654	0.428	0.152	30.287	3/114	0.000*
Posttest Food Analysis						
1	0.177	0.031	0.031	1.863	2/115	0.160
2	0.206	0.043	0.011	1.337	3/114	0.250

Note: Posttest-Knowledge Model 1 predictors: Pretest, Pre-food analysis; Criterion: POSTTEST: Model 2 Predictors: Pretest, Pre-food analysis. Exp/Control: Criterion: POSTTEST Nutrition Knowledge; Posttest Food Analysis Model 1 Predictors: Pretest, Pre-food analysis: Criterion: POSTFOOD ANALYSIS; Model 2 Predictors: Pretest. Pre-food analysis. Exp/Control: Criterion: POSTTEST FOOD ANALYSIS.

Limitations of this research must be addressed before continuing with the discussion. The non-equivalent control group design (Campbell & Stanley, 1963) presents possible barriers to internal and external validity and, therefore, do not permit testing of a causal model. The test of nutrition knowledge used in the study (Largen, 1991) accompanied the textbook; reliability and validity information is not available. The one-day food analysis may not accurately measure typical food intake. Finally, results are based only on scores from the pretest and posttest of nutrition knowledge and pre-food analysis and post-food analysis.

Discussion and Implications

A major finding of this study was that students who have instruction in nutrition gain knowledge about nutrition. Students in the experimental group had significantly higher posttest scores on the test of nutrition knowledge than students in the control group. The effect size (1.384) indicated a substantial gain in knowledge of the experimental group subjects as compared to gain in knowledge of the control group subjects.

A second major finding of this study was that although students showed improvement in nutrition knowledge, they showed little improvement in food selections. The scores of students, who received instruction in nutrition, were no better on the food selection instrument than the scores of students in the control group, who did not receive instruction in nutrition. It appears that knowledge by itself is not enough to produce change in food choices. This finding is consistent with current literature in the field (see Barnett & Johnson, 1996). Apparently, there are a number of other variables that play a role in food selection. Among these are peer influence and/or acceptance, convenience, taste, and accessibility both at school and in the community.

Because proper nutrition is thought to assist in the prevention of heart disease, cancer and diabetes, and is thought to assist in cognitive development, development of strong bones and maternal and fetal health during pregnancy (Brech, 1996), nutrition education in secondary schools is imperative. Without nutrition education, students are left to learn about nutrition on their own and many suffer the consequences of this lack of knowledge. Therefore, nutrition education must include transformative learning experiences (Mezirow, 1995) so that behavior change in food selection occurs.

Thus, further research on effective ways to implement behavior change in adolescent's food selections is warranted. Adolescents experience life in a rapidly changing society that requires them to make many distinctly different decisions. Their belief systems guide their actions (Mezirow, 1996). Thinking systemically, their belief systems are influenced by the cultural beliefs, values, and attitudes of society in general and family members in specific. Institutions and ecological circumstances, such as neighborhood, mass media, the economy, governmental agencies, and social networks also influence their actions. Family interactional patterns and events influence actions as well as the actual systems in which adolescents interact (Bronfenbrenner, 1977). Adolescents are in a transition between seeking guidance from parents and mentors/other leaders (Erikson, 1997). Peers are a tremendous influence on adolescents' actions (Erikson, 1963). In addition, adolescent egocentrism and the concept of imaginary audience in which adolescents confuse their own thoughts with others' thoughts (Elkind, 1988) present unique challenges to family and consumer sciences teachers. Implementing a systemically designed nutrition education curriculum that helps students use their prior interpretations of events and concepts to form new or revised interpretations of their experience may be helpful in guiding future actions (Mezirow, 1996).

Thus, using adolescents' context and developmental characteristics to motivate change may produce desired results. Bandura's (1977) work indicates that prestigious, successful, powerful models attract attention. Thus, soliciting persons who adolescents identify as leaders to model nutritious selections may be helpful in any educational curriculum. Family rituals related to food selection and eating habits could be re-ritualized, incorporating healthy food selections and eating patterns into the family system (Imber-Black, 1999; Wolin & Wolin, 1993). Finally, interventions that help students accomplish personal goals (Covey, Merrill, & Merrill, 1994; Covey, 1989), such as being a stronger athlete or healthier partner, are worth exploring for incorporation into nutrition education curriculum.

Strategies to consider, in addition to nutrition instruction, include laboratory exercises involving problem-solving dilemmas (Mezirow, 1994). For example, writing vignettes of adolescents with similar characteristics that present situations involving peer pressure to eat foods that are not nutritious could provoke excellent discussion and reflection. Instruction also could require students to figure the nutritional value of their most recent meal at a fast food establishment and how their choices affect overall nutrition needs. Dialogue among students and young persons who are suffering the consequences of poor nutritional habits and subsequent group and private reflection may be helpful. Discussion and reflection activities help students make connections to personal dilemmas and sort out information that may not fit their present meaning schemes (Mezirow, 1990).

The results of the present study indicate that the knowledge students receive from secondary nutrition units of study may need to be supplemented so that students learn to select and eat healthier foods. Nutrition curriculum must incorporate instruction as well as motivate behavior change so that students make "an informed and reflective *decision* to act" (Mezirow, 1996, p. 164). This is transformative learning. Studies, such as the one presented here, are necessary to provide data when seeking federal funding for nutrition education programs. Nutrition education with the added component of behavior change will lead to reduced health care costs in the future and an improved quality of life for the students and generations to come.

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