

Examining the Impact of a Nutrition Education Intervention Program on Middle School Students

Chanadra Young Whiting Ed.D, MPH/HSA

Clinical Assistant Professor
Florida International University
11200 SW 8th Street, Miami, FL 33199
Nicole Wertheim College of Nursing and Health Sciences
Building AHC-3, room 323

Audrey P. Miller, PhD, MSN Ed, RN, CPN

Assistant Professor
Undergraduate Nursing
Sigma Theta Tau International, Nursing Honor Society
Faculty Counselor - Pi Alpha Chapter
Nicole Wertheim College of Nursing & Health Sciences
Florida International University
Modesto Maidique Campus
11200 SW 8th Street, AHC-3, Room 525A, Miami, Florida 33199

Abstract

The objective was to evaluate whether a middle school-based nutrition intervention program had any impact on the nutrition knowledge, attitudes, and healthful food choices of the students involved. After parental consent, fifty students' ages 11-14 were randomly divided into either the intervention or control group. The experimental design included a pre and posttest that examined the comparison between the two groups over the two month intervention period. Over the 2 months, the participants of the intervention program received additional health education lessons twice a week whereas the control group received only the pre-and posttests and attended their regular science classes. Nutrition education sessions occurred twice a week for 60 minutes after school and were conducted by a certified science teacher. An analysis of covariant (ANCOVA) was conducted to compare the students' posttest scores across groups (intervention vs. control group) on the particular dependent variables (nutrition knowledge, attitudes, and healthful food choices), using their pretest scores as the covariate. ANCOVA was significant for the intervention group in specific areas, with $p = .018$ for nutrition knowledge and $p = .02$ for nutrition attitudes. ANCOVA could not be conducted for healthful food choices due to the homogeneity-of-slopes assumption being violated. The program gave students an opportunity to examine their eating habits, make positive changes, and enhance their knowledge about healthy nutritional choices. Nutrition education programs in middle schools can be effective in promoting healthy life choices by children.

Key Words: Early nutrition-education, obesity, child health,

Introduction

The World Health Organization (WHO) defines obesity as a disorder of excess body fatness that is associated with increased risk of disease. Body mass index (BMI) is the most common practical instrument used to measure body fatness. BMI, which varies among boys and girls, is the suggested method of choice to identify and diagnose obesity in children (Reily, 2010).

Healthy People 2020 identify nutrition & weight status and physical activity as two of its objectives. These objectives can be achieved by increasing the number of schools that provide nutritious meals and drinks, restrain the sale of sweetened or high caloric beverages, and include fruits and vegetables in their meals. Additionally, providing incentives to the food industries to offer foods that comply with the correct dietary guidelines can aide in achieving these objectives. Healthy People 2020 strive to reduce the number of children and adolescents who are obese by promoting the consumption of a more balanced diet including whole grains, dark green & orange vegetables, or legumes. In turn, this measure will decrease children's consumption of solid fats, added sugars, saturated fats, and sodium. A healthier diet incorporating these provisions will also assist in reducing iron deficiency among children (U.S. Department of Human Services, 2014).

Presently, obesity is largely affecting both children and adolescents and is expected to aggravate over time especially in children from minority populations, increasing their risks of developing obesity- related illnesses such as diabetes and hypertension. Thus, addressing and assessing child and adolescent obesity will contribute to the avoidance of these chronic co-morbidities in adulthood (Stevens, 2010). Children of African American, Hispanic, and Native American descent within the United States are disproportionally affected by childhood obesity, with the obesity rates among these children being much higher than with children of other ethnicities. Individual, behavioral, and environmental factors are significant in children's nutrition and influence both their eating choices and attitude towards physical activity. Therefore, correct understanding of these factors will lead to suitable prevention approaches, aimed towards reducing childhood obesity among children and adolescents (Stevens, 2010).

According to Hedley et al. (2004), the number of middle school-age children has tripled in the past three decades and has become the largest age group of all those considered overweight and obese. Even though middle school – age children are taught in school about health promotion strategies and the importance of maintaining a healthy lifestyle, some schools lack the necessary resources to provide healthy meals. Several models that describe children's psychological development and interactions with their social settings show that children develop more sophisticated levels of self-confidence when they establish and achieve goals (Stevens, 2010). Programs that motivate children to change or improve their diet habits and exercise by encouraging them to set nutritional goals and take control of their environment (in order to modify their behaviors) are very helpful. However, many of these programs have not been developed or have not proven to show benefits with ethnic minority children (Stevens, 2010).

One of the behavioral elements that impact obesity in middle school-aged children is nutritional habits. Poor dietetic consumption has a negative impact on children of ethnic backgrounds by increasing their obesity rates. This is evidenced by an increased consumption of fried foods that are high in calories & saturated fats (Stevens, 2010). Environmental factors also affect the health behaviors of middle school-aged children such as lack of parental support & involvement in the child's daily. Children imitate their parent's eating behaviors, parental participation and modeling of healthy eating habits and lifestyle can contribute to the reduction of obesity in this age group (Stevens, 2010)..

The responsibility of decreasing the childhood obesity epidemic requires the combined efforts of the schools, parents, and especially the children. Unfortunately, if children are unable to decide on healthier lifestyles, the population will remain to grow overweight.

Children are usually unable to differentiate age-appropriate food servings and might choose larger portions which will increase their caloric consumption (Lueke, 2011). Additionally, many schools offer easy access to vending machines stocked with high-calorie snacks and carbonated beverages, creating even more of a challenge for students attempting to make healthful nutrition choices.

Childhood obesity has many consequences, one of the most dire being a shorter life expectancy. Other long term consequences of childhood obesity include: metabolic syndrome, hyperlipidemia, insulin resistance, diabetes, asthma, sleep apnea, orthopedic complications, and fatty liver disease. Additionally, psychological problems such as depression and self-image disorders are frequently encountered. Children tend associate with skinnier peers and stereotype overweight people as lazy and sluggish, creating a negative psychological impact on these individuals throughout their lives, contributing to extensive emotional and psychosocial disorders. Obesity has a large impact on the economy directly affecting individuals, employers, and the government.

Statistics show that costs and medical expenses will only increase as obesity rates continue to rise (Lueke, 2011). It is evident that poor nutrition habits that develop during childhood and adolescence are a key component in adult obesity. Research to find possible solutions to the childhood obesity epidemic is urgently needed; therefore, this study focuses on the nutrition knowledge, attitudes, and healthful food choices of middle school students. The research questions addressed in this study include:

- i. Will a middle school-based program promoting proper nutrition affect the students' nutrition knowledge?
- ii. Will a middle school-based program promoting proper nutrition affect the students' attitudes about food and eating?
- iii. Will a middle school-based program promoting proper nutrition affect healthful food choices?

Material and methods

Research Design and Participants

The nutrition education program used in this study was designed by the Expanded Food and Nutrition Education Program (EFNEP) from the My Pyramid Food Guide and Dietary Guidelines for Americans (U.S. Department of Agriculture, 2005). The sample consisted of 50 students attending a public middle school in southeastern Florida whose ages ranged from 11 to 14 years. Parental and student consent were obtained and the first 50 students who consented were chosen for the study. To reduce the potential chances of systematic differences between groups, participants were randomly assigned to either the intervention or control group by a coin toss, with each group consisting of an equal 25 students (Bailey, 1997) and (Ledbetter, 2001).

The dependent variables included nutrition knowledge, nutrition attitudes regarding food and eating, and knowledge on healthful food choices. The independent variable was the nutrition education program that the intervention group received. The nutrition education program took 1 school semester or 2 months to implement. The participants of the intervention group received additional health education lessons twice a week whereas the control group received only the pre- and posttests and attended their regularly scheduled science classes daily.

Data Collection and Instrument

The nutrition education information was collected in the form of a pre-and posttest. The School Physical Activity and Nutrition (SPAN) Questionnaire was used to assess the nutrition knowledge, attitudes, and healthful food choices of both groups. The SPAN Questionnaire consists of a 74-item, self report survey that was selected because it assesses food choice behaviors, food selection skills, nutrition knowledge and attitudes about food and eating. The validity of this questionnaire has been proven through the Child and Adolescent Trial for Cardiovascular Health (CATCH) program and similar studies at the University of Texas-Houston Science Center research studies.

It addresses nutrition knowledge, attitudes, and food selection as well as a single-item measure of age, gender, and ethnicity (Hoelscher, et al., 2003-2004).

Nutrition curriculum

The nutrition education occurred twice a week after school, for 60 minutes each class and was conducted by a certified science teacher over the course of 8 weeks. Each week, the previous lesson's information was reviewed and incorporated into that week's session.

Lesson 1 (Weeks 1 and 2). Participants were taught: the timing of meals and snacks, the combination of food groups at each meal, and the importance of meal planning. During this lesson the food pyramid was used in educating students about proper portion sizes and daily caloric intake required by middle-school aged children.

Lesson 2 (Weeks 3 and 4). Participants used the information from Lesson 1 to fill a plate diagram with actual food and portion sizes to show their typical daily meals and snacks. The sample diagrams were demonstrated by their science teachers.

Lesson 3 (Week 5). Participants utilized knowledge from Lessons 1 & 2 on calorie level and plate recognition to create their own meal plan and shopping list based on their week's worth of meals.

Lesson 4 (Week 6). Participants learned about healthy dining with low calorie dessert options.

Lesson 5 (Week 6). Participants learned about healthy dining with main dishes.

Lesson 6 (Week 7). Participants learned about healthy dining with side dishes.

During **Week 8**, Lessons 4 to 6 were used as food demonstrations allowing participants to observe proper food preparation, including desserts, side dishes, and main dishes. This week, participants learned how the food preparation process starts as a shopping list and leads to food on a plate.

Statistical Analysis/ Results

Phase I of a two step interventional nutrition and physical fitness program focused on the key areas of: nutrition knowledge, nutrition attitudes, and healthful food choices. After obtaining consent, all 50 students (25 intervention group, 25 control group) were administered the School Physical Activity and Nutrition (SPAN) Questionnaire as a pre and post-test whereas only the intervention group received the nutrition education lessons for 8 weeks. Analysis of covariance (ANCOVA) was used to compare the control and intervention group's post-intervention scores with their pretest scores as the covariate.

Nutrition Knowledge

The student's knowledge of nutrition was gauged using the Nutrition Knowledge Score Survey, items 58-68, of the SPAN Questionnaire. Eight points were awarded for the best response, 0 points for the worst responses, and a sliding scale was assigned to intermediate answers. The principal investigator's (PI) question of whether a middle-school based program promoting physical activity and proper nutrition affected the students' nutrition knowledge yielded the following results.

The interaction group's nutrition knowledge pretest was not significant, $F(1,46) = 2.410$, $p = .127$, $MSE = 3.413$, and partial $\eta^2 = .050$, indicating that the assumption of homogeneity was not violated and therefore, the ANCOVA test that was used was accepted. The ANCOVA determined if there were any significant differences between the control group and intervention group for average nutrition knowledge scores measured by the SPAN Questionnaire (Young, 2011).

The ANCOVA was significant, $F(1,47) = 5.958$, $p = .018$, $MSE = 157.771$, indicating that the mean scores in the intervention group were significantly higher than the mean scores in the control group after adjusting for the nutrition knowledge pretest scores¹⁰. The strength of the relationship between the independent variable (groups) and the dependent variable (posttest) was moderately strong as indicated by a partial η^2 of .113, with the group variable accounting for 18.8% of the variance of the nutrition knowledge posttest (Young, 2011).

Nutrition Attitudes

The student's attitude towards nutrition was gauged using the Nutrition Attitude Score Survey, items 67-71, of the SPAN Questionnaire. Two points were given to the response "agree", indicating the best attitude toward nutrition; one point was given to "neither agree nor disagree", indicating suboptimal attitudes; and 0 points were given to the response "disagree", indicating the poorest nutrition attitudes (Young, 2011). The PI's question of whether a middle school- based program promoting physical activity and proper nutrition affected the student's attitudes about food and eating yielded the following results.

The interaction group's nutrition attitude pretest was not significant, $F(1,46) = 1.361$, $p = .399$, $MSE = 1.361$, and partial $\eta^2 = .009$, indicating that the assumption of homogeneity was not violated and therefore, the ANCOVA analysis was accepted. The ANCOVA determined if there was a significant difference between the control group and intervention group for average nutrition attitude scores as measured by the SPAN Questionnaire (Young, 2011).

The ANCOVA was significant, $F(1,47) = 5.788$, $p = .02$, $MSE = 3.369$, indicating that the mean scores of intervention group were significantly higher than the mean scores in the control group after adjusting for their nutrition attitude pretest scores (Young, 2011). The strength of the relationship between the independent variable (groups) and dependent variable (posttest) was moderately strong with a partial η^2 of .11, where the group variable accounted for 14.2% of the variance of the nutrition attitude posttest variable (Young, 2011).

Healthful Food Choices

The student's healthful food choices were gauged by the Healthful Food Choices Survey, items 11-39 on the SPAN Questionnaire.

Points were assigned based on the difference between the number of servings consumed and the recommended daily allowances for that food group, outlined by the U. S. Department of Agriculture (2005) dietary guidelines, with bonus points awarded for consuming foods of higher quality (Young, 2011). The PI's question of whether a middle school-based program promoting physical activity and proper nutrition affected healthful food choices yielded the following results.

The interaction between the group and healthful food maker pretest was significant, $F(1,46) = 14.673$, $p < .001$, $MSE = 33.480$, and partial $\eta^2 = .242$, indicating a failed test of homogeneity, and the difference in healthful food choices posttest among the groups varied as a function of the healthful food maker pretest (Young, 2011). As a result, ANCOVA could not be performed therefore, the PI could not determine whether a significant posttest difference existed between the two groups.

Discussion

Nutrition Knowledge

The results indicate that students in the intervention group reported higher levels of nutrition knowledge post-intervention, when compared with the control group. The intervention group's self-reported nutrition knowledge was significantly impacted and the students cited motivation and eagerness in examining their eating habits as the impetus for their wanting to make positive changes in their lives (Young, 2011). Post-intervention, the number of students who chose fruits and vegetables doubled, while the number who chose candies and cookies decreased (Young, 2011).

Nutrition Attitudes

Results indicate the students in the intervention group reported more positive attitudes about food and eating when compared with the control group post-intervention. This study's findings indicated that the nutrition education intervention program seemed to have a significant impact on the student's self-reported nutrition attitudes (Young, 2011). There is little research related to attitudes about nutrition in this population as so, this study has made an initial contribution to the literature (Young, 2011).

Healthful Food Choices

ANCOVA could not be used to analyze this research question thus, a difference between the intervention and control groups healthful food choices pretest could not be determined.

Implications of the Study

The results from this study were consistent with previous research indicating that intervention programs promoting physical activity and proper nutrition implemented at school, did have an effect on children aged 11-13 in the areas of: muscular fitness, cardiovascular fitness, nutrition knowledge, and attitudes about food and eating (Young, 2011). The use of hand-on activities allowed the students to think critically and the program allowed students to see a process through from planning to implementation to completion. This study's findings illustrate the need to continue to strive for a healthy nutrition environment for students in school, at home, and in the community.

Limitations

The possible threats to the validity of this study are discussed as the following: (1) the research participant's answer imprecision could not be controlled; (2) potential exposure of subjects to media prior to or during the study was an influence for some of the student's responses; (3) the PI had no control over the types of students placed in the physical education class, and parental consent was needed before students could participate; (4) only 3 of the 5 components of the Presidential Physical Fitness Test were used; and (5) the intervention time line consisted of only 8 weeks (Young, 2011). . Because of the limitations highlighted, the results of this study could not be generalized to other public middle schools and were specific to the students who participated in this study.

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