

## **Evaluation of the Effectiveness of a Nutrition Education Program for High School Students**

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### **ABSTRACT**

**Objective:** To evaluate the effectiveness of nutrition education interventions on the knowledge level and behaviors of high school students.

**Design:** Series of nutrition education interventions with pre and post-intervention assessments.

**Setting:** Oneida County, New York

**Participants:** Twenty high school students (ages 14-18) at Sauquoit Valley High School in Foods & Nutrition class.

**Intervention:** Four, thirty-minute, nutrition focused education sessions delivered in person by a Registered Dietitian.

**Outcome:** Nutrition-related knowledge and behavior changes.

**Analysis:** Results of the pre and post-intervention surveys were analyzed using multiple Mann Whitney U tests to determine the significance in the change of nutrition knowledge and behaviors.

**Results:** A majority of the students displayed an increase in knowledge levels after the intervention was implemented.

**Conclusion:** Although beneficial changes were seen from the pre to post test, statistical significance cannot be verified for this study.

### **Introduction**

The prevalence of overweight and obesity among adolescents continues to be a growing public health concern that affects close to 13 million children and teens in the United States (3). In 2009, The National Health and Nutrition Examination Survey found the 18.4% of adolescents (aged 12-19) were obese and the result of this costs our healthcare system \$190 billion annually in the United States (2,3). Existing research suggests that these conditions are caused by the combination of many factors including lack of physical activity, lack of adequate nutrition intake, genetic predisposition and some social factors (3). Comorbidities that arise due to overweight and obesity include insulin resistance, type 2 diabetes, hyperlipidemia, hypertension, depression and anxiety (2). More specifically, adolescent obesity has been associated with higher rates of school absences, lower quality of life and self-esteem (2). Improving overall health related behaviors through nutrition education and culinary skills can combat these conditions and assist in preventing them (2).

Traditional nutrition education programs provided to children have been shown to be ineffective because of their content which includes a focus primarily on potential medical conditions associated with under consumption of nutrient dense foods as opposed to providing the population with skills that are vital to prepare, select and build healthy meal and snack options (3). Through many studies observed for this intervention, it is apparent that despite providing nutrition education, the approaches utilized were lacking a realistic and user-friendly aspect that participants can utilize throughout their day to day diets. In 2013, an initiative surrounding computer-mediated nutrition education as opposed to one-on-one education, it was revealed that

after the 2 year follow up, the intervention did not improve health conditions or prevent weight gain and showed no change in fruit and vegetable consumption or fat intake among the analyzed groups (2).

Despite the outstanding benefits and the growing interest from adolescents, nutritional health intervention programs are not widely available for students in the United States (3). In 2018, a study revealed that 97% of adolescent athletes surveyed stated that they desired more information about nutrition and 71% were interested in information about eating out (1). From this study, it was also revealed through multiple questionnaires that adolescent athletes (aged 15-18 years old) had multiple nutrition knowledge deficiencies and indicated overall dietary habits that did not meet recommendations for the age bracket (1).

Providing healthy culinary habits and skills paired with nutrition education programs have been previously explored and associated with positive outcomes (3). The purpose of this study is to evaluate the effectiveness of the nutrition education program that was provided to high school students that encompasses nutrition topics that are realistic, attainable and sustainable throughout their lifetime. As opposed to other intervention methods, this incorporated culinary skills and life habits that have been proven to provide positive outcomes.

As opposed to other forms of nutrition education, these modules are designed to be hands-on and incorporate that participants into the learning process. The utilization of food models, plates and group coordination will provide the participants with a realistic experience of how to build a balanced plate and snack. The overall focus throughout the intervention will be providing resources and a mental tool kit for the participants to utilize through each step of their life and development.

## **Methods**

### Study Design

This study was designed to assess the base knowledge level and changes in knowledge levels of high school aged students on topics related to nutrition and food. Participants were selected for this study from the Foods & Nutrition class at Sauquoit Valley High School, located in Central New York. Participants completed consent and assent forms before participating in the study. Four, thirty minute nutrition education modules were presented by a trained chef and Registered Dietitian during the participants designated class period. These modules were provided through Google slides or Powerpoint. The modules were designed as a lecture style presentation, with a few activities including using food models. The data collected from the questionnaires was compared to the data collected in the pre-intervention needs assessment.

Prior to the start of this intervention approval was granted by the SUNY Oneonta Institutional Review Board.

### Tools

Appendix A.

Pre-Test –

Before and after the nutrition education modules, participants completed (10 minute) surveys. The first survey was to evaluate what the prior knowledge the participants had about general nutrition and food consumption. The questions in this survey were focused on how many servings of fruits and vegetables, whole grains and different types of beverages the participants consume on a frequent basis.

## **Appendix B.**

### Post-Test-

The format of the post education survey contained questions about the content from the nutrition education and the retention that participants had including drawing the MyPlate plate and describing the differences between a whole and refined grain. The data collected in the first survey is considered quantitative because it is converted into a numerical analysis, while the second survey's data is qualitative because it contains textual data.

### Intervention

Four, 30- minute nutrition education modules were given during the Foods & Nutrition class periods to participants. All of the intervention modules took place at Sauquoit Valley High School, in the Foods & Nutrition classroom. The modules were led by a Registered Dietitian and covered multiple basic nutrition topics. The first and second modules consisted of a Powerpoint presentation that focused on MyPlate, micro and macronutrients, vitamins, minerals and hydration. The third module consisted of a hands-on lesson in which participants utilized food models to build balanced plates and snacks. The final module included a Jeopardy style nutrition game that reviewed all of the information that was provided throughout the modules. This type of intervention can be considered group education and is not new to the facility. The modules were implemented over 4 weeks, occurring once weekly from January to February 2022.

### Participants

Participants included 20, 11th and 12th grade students from Sauquoit Valley High School that were enrolled in Mrs. Carangelo's Foods & Nutrition course during the spring semester. Recruitment occurred in the classrooms; the primary researcher described the study to students and distributed informed consent and assent forms to those interested in participating. The nutrition intervention was provided to all students within the class, including those who did not wish to participate in the surveys.

### Data Analysis

Multiple Mann Whitney U tests were utilized to evaluate and analyze the data from both surveys because of their categorical nature and the analysis revealed whether or not there was a significant difference between knowledge levels in each of the survey results. The significance level calculated was evaluated and used to show how large the difference was between each of the surveys' results.

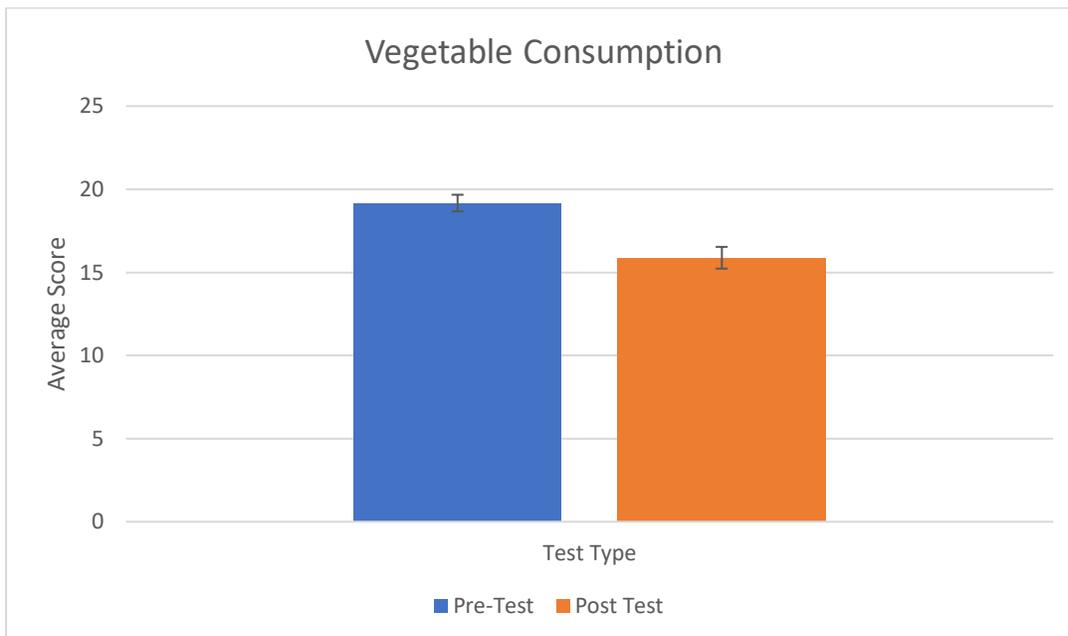
## Results

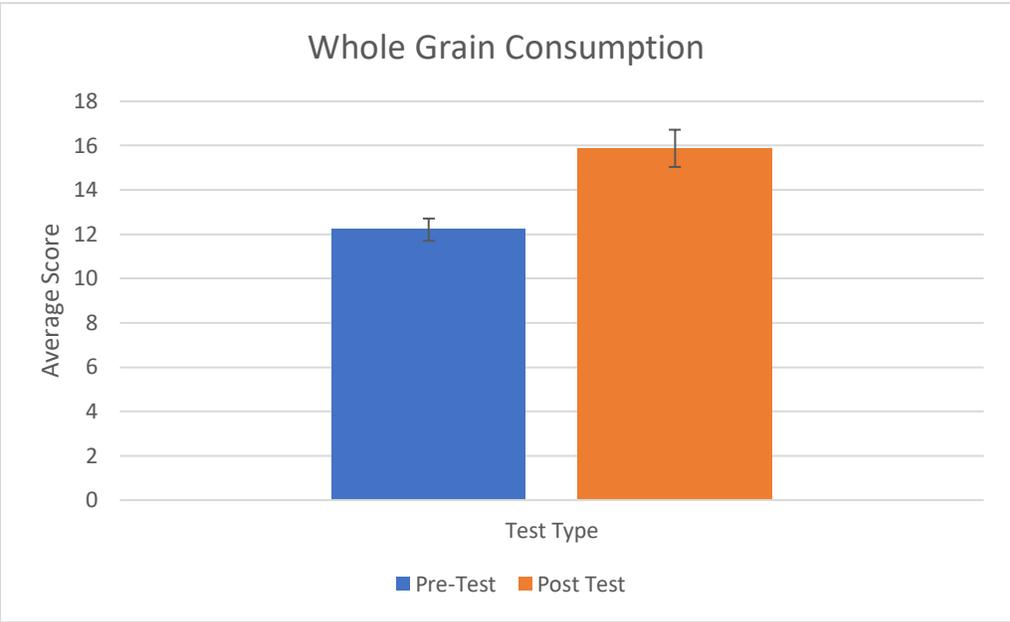
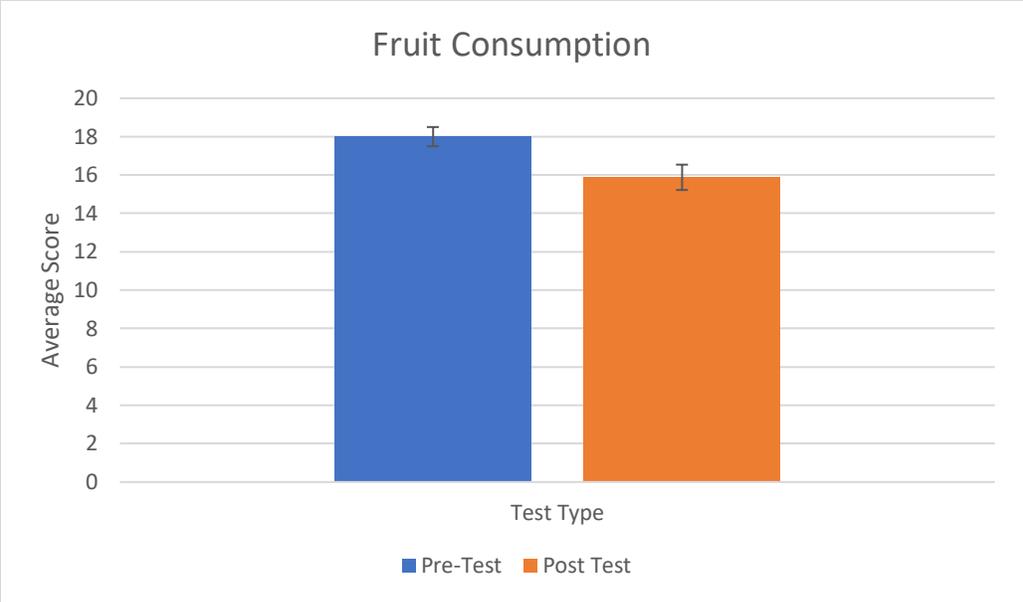
Table 1. Demographic Profile of Participants in the Nutrition Education Program (n = 20)

<b>Age (y)</b> 13-18	20
<b>Education Level</b> < High School High School > High School	0 20 0
<b>State</b> New York	20

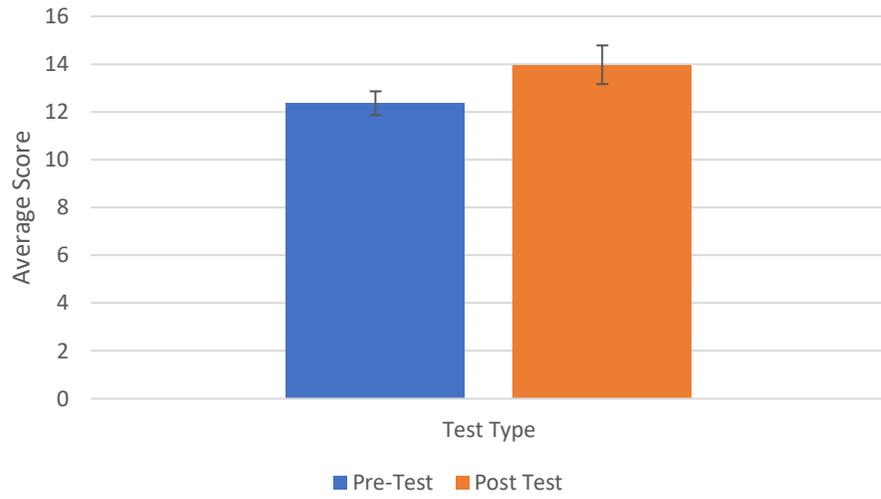
**Figure 1.** Demographic identifiers of the participants are shown in this table. Participants did not provide their name, sex or gender for this intervention.

**Figure 2. Questionnaire Results**

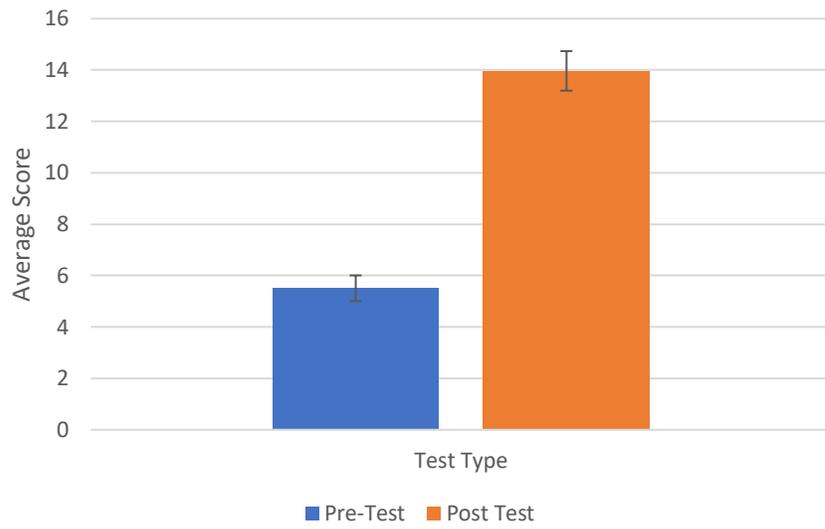




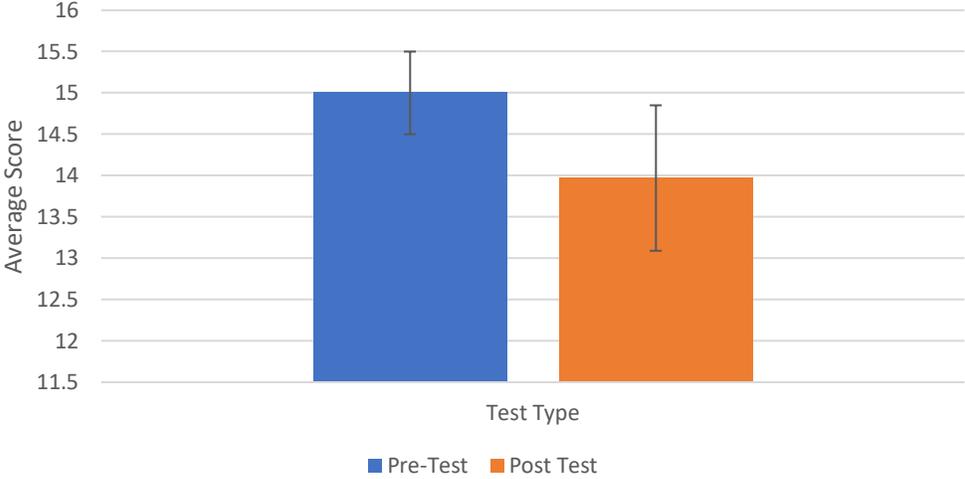
### Refined Grain Consumption



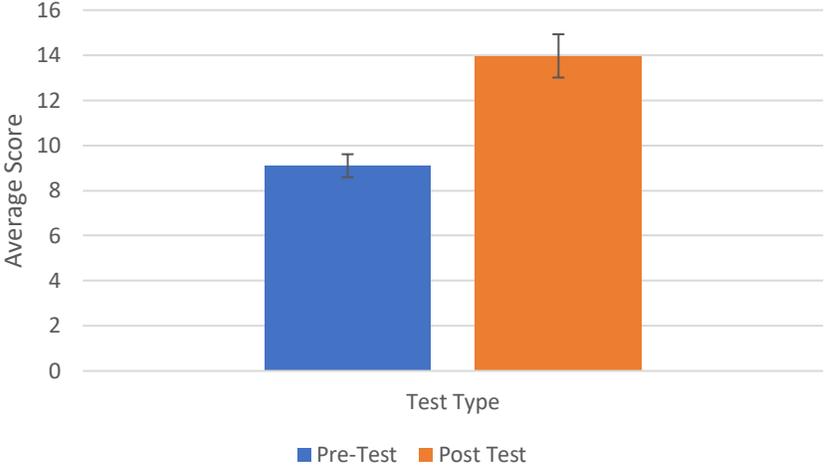
### Water Consumption

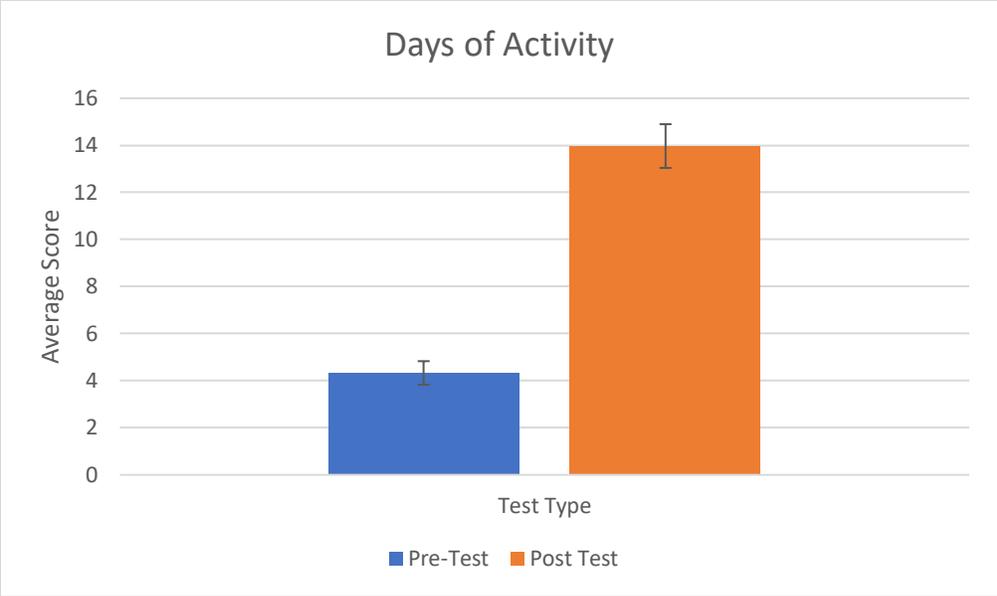


### Sugar Sweetened Beverage Consumption



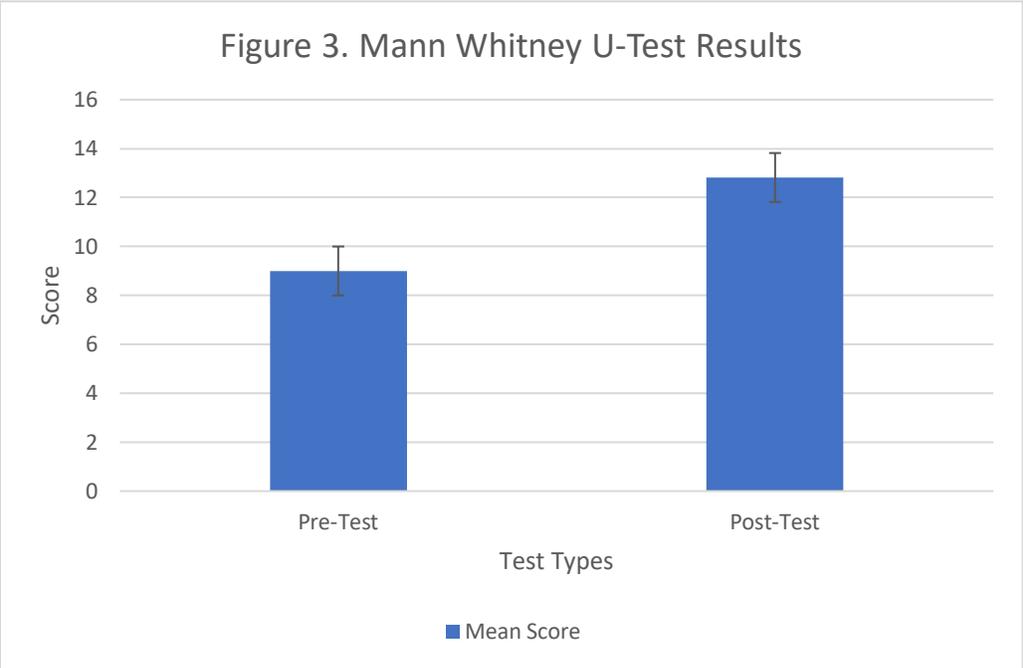
### Eat Out/ On the Go





**Figure 2:** Reported behaviors pre- and post-implementation of the intervention. (A) Vegetables consumed, (B) fruit consumed, (C) whole-grains consumed, (D) refined grains consumed (E) water consumed, (F) sugar sweetened beverages (G) times eating out, (H) days participating in exercise. n=20 participants for both pre and post questionnaires. It was concluded from the multiple Mann Whitney tests that the data collected from pre and post tests did not have a statistical significance for knowledge related results.

**Figure 3.** Knowledge test scores pre- and post-implementation of the nutrition education program. Mann Whitney U-Test Results,  $p = 0.353$ . Standard deviation noted using error bars.



### Nutrition-Related Behaviors

Participants reported their nutrition and lifestyle habits for a 24-hour period in both a pre-and post- intervention questionnaire. The bar graphs in **Figure 2** show the results of the Mann Whitney U-tests done for each paired question on the pre and post questionnaires.

### Nutrition-Related Knowledge

The pre- and post- questionnaire data was determined to be normally distributed, and an independent t-test was used to compare the difference between pre- and post- intervention scores of the knowledge and confidence levels of participants. The confidence levels were scored on a range from 1-4, one being not confident and 4 being extremely confident.

The mean scores of the pre- and post- questionnaire were 9 and 12.82 respectively. It was concluded from the multiple Mann Whitney tests that the data collected from pre and post-tests did not have a statistical significance for knowledge related results ( $U= 15$ ,  $p= 0.353$ ) The data is summarized in **Figure 3**.

## **Discussion**

The primary finding of this study was that the nutrition intervention significantly increased knowledge in high school students but did not significantly alter food or exercise related behaviors. This intervention was based on the Social Cognitive Theory and its focus on Behavioral Capability. Behavioral capability refers to a person's actual ability to perform a behavior through essential knowledge and skills. After completing the nutrition education modules, discussions and questionnaires, the participants had ample knowledge to utilize within their daily lives, diets and habits surrounding food and nutrition. According to the behavioral capability theory, individuals must know what to do and how to do it before performing a behavior. Because the interventions were hands-on, using food models and engaging activities, participants were given the knowledge and skills necessary to go forth and practice these skills.

Previous research has shown that different types of nutrition education programs can also be effective, but many programs are not widely available. Despite the outstanding benefits and the growing interest from adolescents, nutritional health intervention programs are not widely available for students in the United States (3). In 2018, a study revealed that 97% of adolescent athletes surveyed stated that they desired more information about nutrition and 71% were interested in information about eating out (1). From this study, it was also revealed through multiple questionnaires that adolescent athletes (aged 15-18 years old) had multiple nutrition knowledge deficiencies and indicated overall dietary habits that did not meet recommendations for the age bracket (1). From the pre-intervention questionnaire in the current study, it was noted that the participants were lacking nutrition knowledge and therefore gained it during the intervention provided. As opposed to other forms of nutrition education, the modules designed for this study were hands-on and incorporated the participants into the learning process.

A strength to this current study was that 100% of the participants completed the education modules and the required questionnaires to their fullest extent. Because all of the participants were required to be in their class for the extent of the nutrition education sessions, the data was fully recorded and analyzed based on the entire anticipated population size. One of the limitations to this study was that the participants were not fully motivated to complete the

modules and questionnaires to their highest level of effort. This intervention was not required and the participants did not receive any compensation for being included, therefore the motivation and effort level were questionable.

## Conclusion

While there have been previous studies to show that nutrition education for adolescents can provide beneficial results, this current study solidified these findings. The significance of the data analyzed reveals that adolescents did recognize and reflect the effectiveness of healthy lifestyle habits and changes after receiving hands-on, interactive nutrition education modules. It was concluded from the multiple Mann Whitney tests that the data collected from pre and post-tests did not have a statistical significance for knowledge related results.

## Citations

1. Partida S;Marshall A;Henry R;Townsend J;Toy A; Attitudes toward Nutrition and Dietary Habits and Effectiveness of Nutrition Education in Active Adolescents in a Private School Setting: A Pilot Study. *Nutrients*. <https://pubmed.ncbi.nlm.nih.gov/30205479/>. Accessed July 7, 2021.
2. Ajie, W. and Chapman-Novakofski, K., 2021. Impact of Computer-Mediated, Obesity-Related Nutrition Education Interventions for Adolescents: A Systematic Review.
3. LeRouge C, Durneva P, Sangameswaran S, Gloster AM. Design Guidelines for a Technology-Enabled Nutrition Education Program to Support Overweight and Obese Adolescents: Qualitative User-Centered Design Study. *J Med Internet Res*. 2019 July 29;21(7).
4. *Introduction*. Behavioral Change Models. (n.d.). Retrieved February 12, 2022, from [https://sphweb.bumc.bu.edu/otlt/mph-modules/sb/behavioralchangetheories/BehavioralChangeTheories\\_print.html](https://sphweb.bumc.bu.edu/otlt/mph-modules/sb/behavioralchangetheories/BehavioralChangeTheories_print.html)

## Appendix

### A. Pre-Test

Question	Very Poor	Poor	Fair	Good	Excellent
1. How would you rate your health overall?					

2. How would you rate your understanding of basic nutrition overall?					
3. How familiar are you with MyPlate?					
	<b>Not at all Familiar</b>	<b>Somewhat Familiar</b>	<b>Familiar</b>	<b>Very Familiar</b>	
1. How familiar are you with a Nutrition Facts Label?					
2. How familiar are you with the main macro nutrients?					
	<b>Not at all Likely</b>	<b>Not Very Likely</b>	<b>Somewhat Likely</b>	<b>Very Likely</b>	<b>Extremely Likely</b>
1. How likely are you to choose whole grain products over refined-grain products (white pasta, bread)?					

<p>2. How likely are you to choose water over a sugar sweetened beverage?</p>					
	<b>0</b>	<b>1</b>	<b>2</b>	<b>3-4</b>	<b>5+</b>
<p>1. How many servings of vegetables do you consume(in any form- raw, frozen, canned) per day?</p>					
<p>2. How servings of fruit do you consume (in any form- raw, frozen, canned, dried) per day?</p>					
<p>3. How many cups of water do you drink per day?</p>					
<p>4. How many sugar sweetened beverages do you drink per day (soda, tea, energy drinks)?</p>					

5. How many times per week do you eat out (fast food, convenience store foods, take out, sit down restaurant)?					
6. How many days per week do you participate in physical activity?					

**B. Post Intervention Questionnaire:**

Consider your food and beverage intake over the last 24 hours, then answer the following questions.

1. How many servings of vegetables did you consume?
  - a. None
  - b. 1-2 servings
  - c. 3-4 servings
  - d. 5+ servings
2. How many servings of fruit did you consume?
  - a. None
  - b. 1-2 servings
  - c. 3-4 servings
  - d. 5+ servings
3. How many servings of whole grain products did you consume?
  - a. None
  - b. 1 servings
  - c. 2 servings
  - d. 3-4 servings
4. How many servings of refined (white) grain products did you consume?
  - a. None
  - b. 1 servings
  - c. 2 servings
  - d. 3-4 servings
5. How many sugar sweetened beverages (soda, tea, energy drinks) did you consume?
  - a. None

- b. 1 serving
- c. 2 servings
- d. 3-4 servings

6. How many cups of water did you consume?

- a. 1-2
- b. 3-4
- c. 5+

Consider the last week of time, then answer the following questions.

1. How many times did you eat out (fast food, convenience stores, restaurants, drive throughs)?

- a. None
- b. 1-2 times
- c. 3-4 times
- d. 5+ times

2. How many times did you participate in physical activity (running, walking, biking, weight lifting)?

- e. None
- f. 1-2 times
- g. 3-4 times
- h. 5+ times

Draw the MyPlate plate:

1. How confident do you feel in your ability to apply your knowledge of nutrition to your own life?
  - a. Not at all confident
  - b. Somewhat confident
  - c. Confident
  - d. Very confident
2. How knowledgeable do you feel about nutrition?
  - e. Not at all knowledgeable
  - f. Somewhat knowledgeable
  - g. Knowledgeable
  - h. Very knowledgeable
3. Where do you find most of your nutrition information?
4. Are there topics you wish we covered?
5. How effective did you find this nutrition program?
  - a. Highly effective
  - b. Effective
  - c. Not very effective

Narrative:

This questionnaire will be handed out prior to the 4 nutrition education modules. The modules will be done during class time, in person, in the classroom over the course of a one month time frame. After completing the lessons, the participants will complete the questionnaire to evaluate how much and what they have learned from this project.