

# **Nutrition Education Intervention Increases Dietary Knowledge and Fruit/Vegetable Consumption Among 2nd Grade Students**

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## **ABSTRACT**

This study evaluated the effectiveness of nutrition education intervention on nutrition related knowledge and dietary eating habits of a 2<sup>nd</sup> grade class. The design included mixed methods including a quasi-experimental study. Data collection includes a pre and post test and FFQ, MyPlate, Eatrightpro educational handouts. The study took place in the Town of Webb Union Free School District, Old Forge, NY from 2021-2022 and included 15 2<sup>nd</sup> grade students ages 7-8 years old enrolled in the study and received a 6-week nutrition education intervention. A 6-week nutrition education intervention was utilized with lessons covering MyPlate, Food Groups, fruits and vegetables and related nutrition activities. SPSS and Excel were used for data analysis. A paired t-test was performed to analyze pre and post test results and a P value of <0.05 was used to determine statistical significance. Post test scores were significantly higher than pre-test scores. The nutrition related intervention significantly increased nutrition related knowledge and healthy eating habits of the 2<sup>nd</sup> grade. The short 6-week nutrition education intervention was found to be effective in increasing nutrition related knowledge in 2<sup>nd</sup> grade students in addition to promoting healthy dietary eating habits.

## **INTRODUCTION**

Children in the US are not eating enough fruits and vegetables.<sup>1</sup> According to the CDC, children fail to meet recommendations for both fruit and vegetable daily consumption.<sup>1</sup> Recommendations for the amount of fruit and vegetables children should consume daily are based on a child's age, gender and level of physical activity. Recommendations range from 1-2 cups for fruit and 1-3 cups for vegetables.<sup>1,7</sup> Overall, 63 percent of children didn't eat enough fruit and 93 percent of children did not eat enough vegetables to meet recommendations in 20078-2010.<sup>1</sup> Children who do not consume the recommended amounts of fruits and vegetables daily are at an increased risk for inadequate micronutrient intake, childhood obesity, and chronic disease.<sup>2</sup> Dietary patterns are initiated in childhood and encouraging a higher fruit and vegetable intake in children is a public health priority. Children with obesity are at greater risk of suffering

from depression, anxiety, and bullying. Promoting healthy eating habits and encouraging children to try new foods such as fruits and vegetables can help increase intake and encourage healthy eating habits during the lifespan which ultimately promotes positive health outcomes. <sup>2</sup>

Poor dietary eating habits among children and adolescents can contribute to the risk of chronic disease and obesity. Primary prevention in this young population can be crucial because dietary patterns established during this life stage tend to continue into adult years. <sup>4</sup> Exposing young children to a variety of nutrient-dense foods within each food group helps build a healthy dietary pattern at an age when taste preferences are acquired. <sup>4</sup> Since over 60 million children spend the majority of their day in schools or childcare centers, these facilities end up having a big impact on a children's overall health and dietary habits. School based interventions have been recommended to increase children's fruit and vegetable consumption and increase nutrition related knowledge. <sup>5</sup> Nutrition education can be a vital part of a comprehensive health education program and empowers children with knowledge and skills to make healthy food and beverage choices. <sup>5</sup> Studies following a short 6-week multicomponent and school-based nutrition education intervention similar to ours showed the potential it has to engage students and create health promoting behaviors. <sup>6</sup>

A needs assessment was administered to a class of fifteen 2nd grade students at The Town of Webb Union Free School District in October of 2021 to determine the main nutrition problem of the class. The data was collected through a 10-question survey which was administered to the students regarding their current nutrition related knowledge and dietary eating habits. The needs assessment revealed that the students have a food and nutrition related knowledge deficit and poor dietary eating habits. In the survey, 66% of the class choose soda as their favorite drink showing the majority of the class consumes sugar sweetened beverages. In another survey question 66% of 2nd graders chose vegetables as their least favorite food. An intervention was planned to address these nutrition related problems.

A 6-week nutrition education intervention was created for the 2nd grade students at The Town of Webb Union Free School District. The intervention includes nutrition education lessons and hands-on learning activities. The purpose of the research study is to assess the impact of nutrition education intervention designed to increase fruit and vegetable intake among elementary aged students. To address this, a 6-week intervention study was designed to include nutrition education, informational handouts, MyPlate and hands-on activities such as taste tests with the goal to increase students' nutrition related knowledge. By the end of the 6-week intervention it is hypothesized that the 2nd grade students will have increased nutrition related knowledge in addition to increased fruit and vegetable consumption and an increased willingness to try new healthy foods.

The goal of the study is to promote healthy dietary eating habits in elementary aged students and increase fruit and vegetable intake to act as primary prevention in the risk for obesity and chronic disease.

## **METHODS**

### **Study Design**

This was a quasi-experimental study aimed to evaluate the effectiveness of nutrition education interventions on a 2nd grade class population. A 10-question needs assessment survey was administered to the students to find the main nutritional issue of the population which was determined to be poor dietary eating habits and lack of nutrition related knowledge. A pre and post test was used to assess nutrition education level students before and after intervention as well as a FFQ to determine eating habits pre and post intervention. All students completed a FFQ and pre and post test which was delivered approximately 6 weeks apart. Nutrition education intervention included MyPlate lessons and handouts, educational videos on food, lessons of food groups, how our body uses food and fruit and vegetable taste tests. The pre and post tests were used to determine the effect of this nutrition education and activity intervention on the population. The project was deemed exempt by the SUNY Oneonta Institutional Review Board and approved.

### **Participants**

Approximately 15, 2nd grade students at The Town of Webb Union Free School District participated in the study. The participants ranged in age from 10 years old to 13 years old. Approximately 100% of the students who participated in the study were white/caucasian. The students were recruited at The Town of Webb Union Free School District by their classroom grade level. The students were recruited verbally by the primary researcher and their teacher in their 2nd grade classroom by asking who would like to participate in the study. The 2nd grade class was chosen at random and their teacher Mrs Fenton volunteered for the study to take place with her class with consent/assent and guardian permission form approval.

### **Intervention**

The study utilized nutrition education as the intervention with the Social Cognitive Theory which describes the influence of individual experiences, the actions of others, and environmental factors on individual health behaviors. Nutrition education uses the set of learning experiences designed to facilitate voluntary adoption of healthy eating habits and other nutrition related behavior conducive to health and well-being. The nutrition education took place at The Town of Webb Union Free School District in Old Forge, New York to address the food and nutrition related knowledge deficit and undesirable food choices of the population. The intervention

consisted of approximately 6, 30-minute nutrition lessons with related activities once every week for 6 weeks. Lessons included information on MyPlate, food groups, fruits and vegetables and healthy eating habits. Kahoot, MyPlate, educational handouts, EatRRightPro worksheet activities and YouTube videos were utilized in this intervention. The intervention took place from the beginning of February to mid March of 2022.

### **Tools/Instruments**

A 15 question pre and post test was used to assess nutrition education level students both before and after intervention. The test included questions on topics such as MyPlate, food groups and overall healthy vs. unhealthy choices. The pre and post tests were created by the primary researcher. The scores from the pre test and the scores from the post test were used to see how effective nutrition education intervention was on this population. All students completed the pre and post education surveys which were delivered approximately 6 weeks apart. A FFQ was also given pre and post intervention. The FFQ included questions from each food group including fruits, vegetables, dairy, protein, and grains. The FFQ asked how often the students consume foods from that group with 4 choices including; everyday, a few times a week, a few times a month, and never. The FFQ was also created by the primary researcher to determine eating habits of the students and to see if there was a positive change in eating habits post intervention.

### **Data Analysis**

Quantitative methods such as pre and post tests were used to see if students' scores were higher after a 6 week nutrition education intervention. Pre and post tests were analyzed by scoring the tests out of 10 points. Each question was worth 10 points with the highest score able to be obtained at 100. The questions were all multiple choice with 4 options including A,B,C and D. Each question only had one correct option, allowing each question to be scalable as either right or wrong. The number of correct answers were taken from each test to develop a score out of 100 points. A paired sample t-test was performed to analyze the scores from the pre and post tests. The paired sample t test compared the means of the two scores taken from the same student. Each student was given a number 1-15 to put on both their pre and post test so that the values could be paired and the t test could be performed. The pre-test and post-test score were compared with the 6-week nutrition intervention administered between the two time points to assess whether an increase in nutrition knowledge occurred. Qualitative methods were also used via a FFQ to see if the students were making better dietary choices by the end of the 6 week intervention compared to before the intervention. Excel and SPSS software were used to analyze statistical data. The statistical data was analyzed and the p-value was noted of significance since the  $p < 0.05$ .

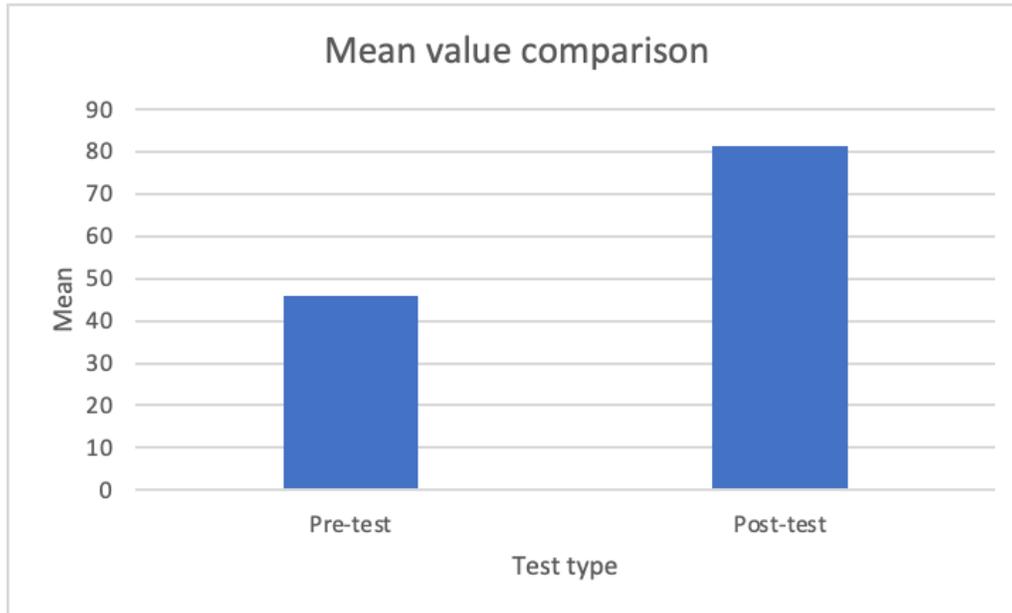
## RESULTS

The study included 15 2nd grade students (10 males and 5 females; ages 7-8 years old) who received nutrition education intervention for approximately 6 weeks. The intervention focused on increasing nutrition related knowledge and creating healthy eating habits such as increased fruit and vegetable consumption. We hypothesized that the nutrition education intervention would increase nutrition related knowledge in the 2nd grade students while also improving dietary eating habits. According to our hypothesis, although a majority of students have poor dietary eating habits and little nutrition knowledge prior to intervention, the 6-week nutrition education intervention will be effective in improving overall knowledge and improving dietary eating habits specifically with an increased fruit and vegetable consumption. According to our data below our hypothesis was correct and the null hypothesis; the median of differences between the pre and post test equals 0 was rejected. The significance level used in the data was 0.05 and we were able to reject the null hypothesis since  $p < 0.001$  is significantly less than 0.05 showing significant statistical data.

### Pre and post test

Nutrition related knowledge was assessed using a pre and post test developed by the researcher to examine the effectiveness of the nutrition education intervention. The results show that a short 6 week nutrition intervention was effective in increasing overall nutrition related knowledge in 2nd grade students. The pre and post test consisted of 10 questions regarding food groups, healthy breakfast, lunch and dinner choices and overall nutrition knowledge. The scores from the pretest were compared to the scores from the post test to determine if knowledge had changed over the course of the 6 week nutrition education intervention where students learned about MyPlate, food groups, healthy eating habits and how we use food as fuel for our bodies.

**Table 1** shows the mean value comparison between the pre-test and post test. (Mean pre test=46.00), and (Mean post test=81.33). Scores were rated out of 100 points. The minimum score on the pretest was 30 while the maximum score on the pre-test was 70. The minimum score on the post test was 60 while the maximum was 100. Pre-test scores were significantly lower than scores on the post test. Mean scores on the post test were higher by approximately 35.33% showing an increase in nutrition related knowledge among the students post intervention.



**Table 1: Pre and post test score means, p value=0.001**

### **Food Frequency Questionnaire**

Dietary eating habits were assessed using the FFQ developed by the researcher including questions on how often the students eat fruit, vegetables, dairy, protein, grains and sweets/candy products. Answers included “everyday, once a week, a few times a month, and never”. The FFQ was given twice throughout the study; pre intervention and post intervention. The eating habits of the students were analyzed to see if the short 6 week nutrition education intervention had a positive effect on the students' eating habits. The data was analyzed and bar charts comparing eating habits both pre and post intervention were developed to assess the overall changes in eating habits of the 2nd grade students. Data from the FFQ was analyzed using Excel and bar graphs were developed to see differences and changes in eating habits both pre and post test. As seen in **Figure 1**, vegetable consumption among the 2nd grade students, many 2nd grade students did not meet the recommended guidelines for vegetable consumption. The USDA recommends that girls and boys ages 9-13 years old should consume 1 and ½ cups of fruit and between 2 and 2 ½ cups of vegetables each day. <sup>1</sup> Pre-intervention, only 26% of the 2nd grade students were consuming vegetables daily. Comparing this to post intervention, approximately 53% of students were consuming vegetables each day post intervention. From pre to post intervention there was a 27% increase in vegetable consumption showing that the short 6 week intervention had a positive effect on dietary eating habits and increased vegetable consumption among the 2nd grade students. **Figure 2** includes data from the students on how often they consume fruit. According to **Figure 2** approximately 4 students are consuming fruit each day which is about 26% of the students. This increased to 9 students post intervention which was

about 60% of the students showing a 34% increase in fruit consumption post intervention. The 34% increase in fruit consumption shows the positive effect that the 6 week intervention had on overall fruit and vegetable consumption with a 27% increase in vegetables and a 27% increase in fruit consumption among the 2nd grade students. **Figure 3** shows the students eating habits with sweets and candy; pre-intervention 53% of the students were consuming sweets/candy everyday, post intervention this decreased to 33% showing improvements in dietary eating habits, the students were consuming less foods with added sugars such as candy, cake and cookies for snacks. **Figure 4** shows dietary eating habits regarding dairy products both pre and post intervention did not change significantly and 66% of students are consuming dairy products such as milk, yogurt and cheese everyday. **Figure 5** shows the consumption of grains by the 2nd grade students, pre-intervention about 53% of students were consuming grains each day, compared to post intervention data which shows that about 66% of students were consuming gains everyday. There was a 13% increase in grain consumption post intervention. **Figure 6** shows data regarding protein consumption among the 2nd grade students. Less than half of the students at 46% were consuming protein sources such as eggs, chicken, and beef each day. Post intervention the number of students consuming protein increased to about 80% showing a 34% increase in protein consumption post intervention.

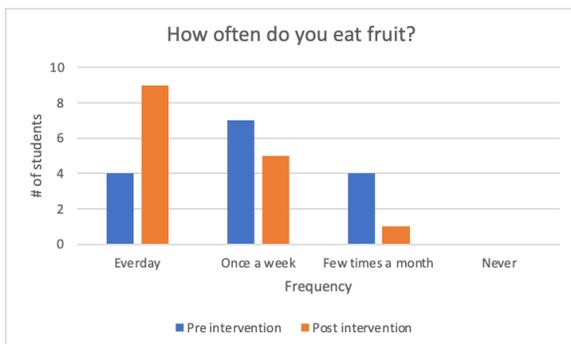


Figure 1: Fruit FFQ N=15

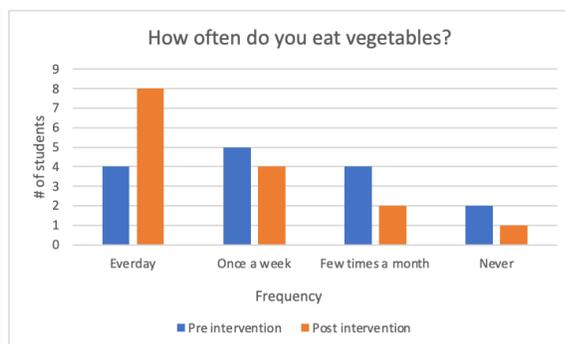


Figure 2: Vegetable FF1 N=15

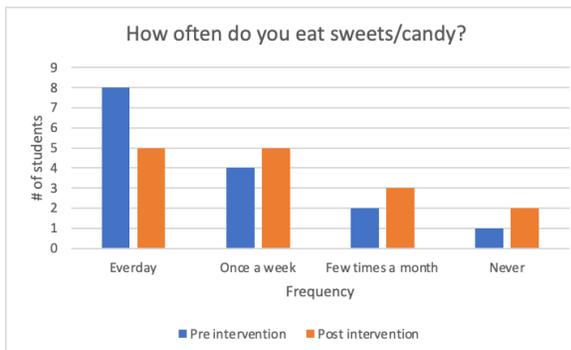


Figure 3: Sweets/candy FFQ N=15

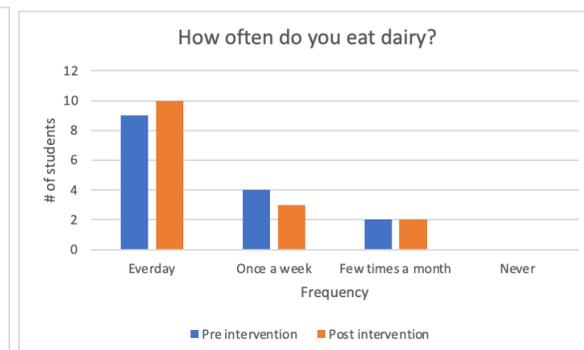


Figure 4: Dairy FFQ N=15

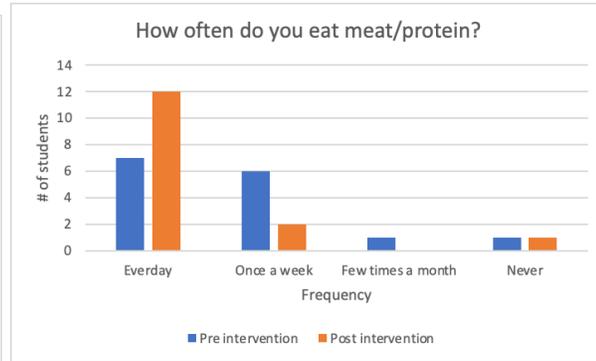
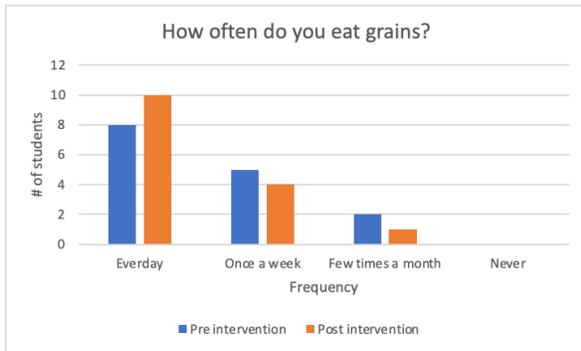


Figure 5: Grains FFQ pre/post test N=15      Figure 6: Protein FFQ pre/ post test N=15.

## DISCUSSION

The study found that nutrition education intervention increased nutrition related knowledge among 2nd grade students and improved dietary eating habits. After the 6-week intervention the 2nd grade class showed increased nutrition related knowledge and their dietary eating habits had improved with an increased fruit and vegetable consumption in addition to a lower consumption of sweets/candy. Similar to other literature on related topics, our study proved that a short 6 week nutrition education intervention was effective in increasing the consumption of fruits and vegetables in the 2nd grade population while also increasing overall nutrition related knowledge of this population which was consistent with other literature that studied the effect of nutrition education knowledge on elementary aged students. A 2018 study “The effects of a nutrition education curriculum on improving young children’s fruit and vegetable preferences and nutrition and health knowledge” by Schmitt, developed and evaluated a nutrition education curriculum to enhance young children’s dietary behaviors and nutrition and health knowledge. This study used a very similar intervention to improve children’s nutrition and health knowledge and preferences for fruits and vegetables through classroom lessons and activity. Findings suggested that a short, 6-week intervention that aligns with educational standards has the ability to significantly enhance children’s outcomes and thus may be a more feasible option for teachers to incorporate into their classrooms than what is currently available.<sup>2</sup> These findings were consistent with the findings from our study, similarly, participants who received a nutrition education intervention had increased fruit and vegetable consumption as well as overall nutrition related knowledge knowledge on healthy dietary eating habits.

### Strengths and limitations

#### Limitations

The greatest disadvantage of the study is that randomization is not used, limiting the study's ability to conclude a causal association between an intervention and an outcome. Another limitation includes a small sample size of N=15. A small sample size can cause high variability and smaller validity. A larger sample size would give more reliable results with greater precision and power. Another limitation of the study would be the lack of diversity among the sample population. The study included a 100% caucasian population. Participants in research should reflect the diversity of our culture and conditions, taking into account race, ethnicity, gender, age, etc. The final limitation of the study would include the narrow age group of 7-8 year olds.

### **Strengths**

Strengths of the study include the use of validated tools such as a pre and post test as well as a FFQ. The FFQ is a validated tool and is an important method for collecting dietary data and uses a context-specific food list to estimate the usual diet and understand the relationship between consumption patterns and health outcomes. The use of a pre and post test is simply defined as a before & after assessment to measure whether the expected changes took place in the participants in the study. Another strength includes the study being much less expensive, requiring fewer resources and is less time consuming than RCTs or Cluster Randomized Trials.

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## Appendix: