Adolescent Nutrition Knowledge and Self-Efficacy are Improved After Classroom Lecture and Hands-On Activity

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Background: Adolescents are at an extremely important and vulnerable stage where lifelong nutrition and health habits are being formed. It is critical for them to receive science-based knowledge for their own health and that of the following generations.

Objective: To evaluate the effectiveness of a nutrition-focused classroom lecture and hands-on shopping activity on adolescent nutrition knowledge and self-efficacy.

Design: Social Cognitive Theory

Methods and Intervention: Students completed 3 nutrition-related surveys/questionnaires before and after a classroom lecture-style presentation and hands-on meal planning and shopping activity.

Setting: Corning Painted Post High School health classes

Participants: 50 adolescents mostly between the ages of 14 and 16

Results: A statistically significant improvement in all 3 surveys/ questionnaires was seen when comparing results before and after the classroom activities. The effect was small for the Nutrition Knowledge Survey and moderate for the Healthy Eating Self-Efficacy Questionnaire as interpreted using the Cohen's d-value with 95% confidence. Of the 50 students who took the Let's Look at Labels quiz, 21 improved their score, 22 did not change, and 7 scored lower after the intervention.

Conclusions and Implications: A combination of science-based classroom presentations and engaging hands-on can effectively improve adolescents' nutrition knowledge and self-efficacy.

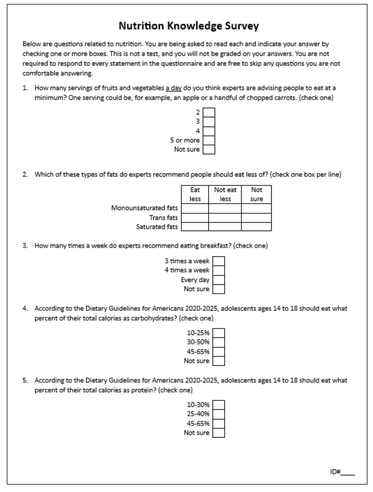
INTRODUCTION

- The cost of healthcare in American reached $4.5 trillion in 2022, 17.3% of GDP (1).
- The US obesity rates are two times that of the average peer country (2).
- Obesity among adolescents doubled between the years of 1988 and 2018 while the prevalence of type 2 diabetes in young people increased 95% from 2001 to 2017 (3,4)
- Adolescents are a vulnerable population as parental influence begins to decline just as lifelong diet and exercise habits are established.
- Beliefs and attitudes established during adolescents have been shown to heavily influence susceptibility to diseases later in life such as osteoporosis, high cholesterol, high blood pressure, obesity, and diabetes (5,6)
- Adolescents make up approximately 16% of the world's population yet limited research has been focused on this critical population.
- A nutrition assessment completed in the fall of 2023 showed students had an appreciation of the importance of healthy meals but lacked the knowledge or motivation to eat a balanced diet (7).
- This study aimed to evaluate the effectiveness of the intervention to address these deficiencies among adolescents who attend Corning Painted Post High School health classes.

Evaluation Materials: Study participant knowledge was evaluated by comparing pre- and post-test scores using three different surveys shown above: a 16 question Nutrition Knowledge Survey, a 10 statement Healthy Eating Self-Efficacy Questionnaire, and a 5 question Let's Look At Labels! quiz. All students attending each class participated in the evaluation pre- and post-tests as well as the intervention (potential for 237 students). Only those who had obtained parental consent and provided personal assent had their test data included in the data analysis. There was a total of 50 student data sets included.

A paired t-test was used to evaluate the change in mean score of both the Nutrition Knowledge Survey and Healthy Eating Self-Efficacy Questionnaire. A Cohen's d-value (95% confidence) was considered to determine the size of the intervention effect for these two methods. Consolidated answers for individual questions were mapped to assess which ones shifted the most over the course on the intervention. The shift in mean score of the Labels quiz was evaluated using the Wilcoxon Signed-Rank Test.

MATERIALS AND METHODS, CONTINUED



Nutrition Knowledge Survey

Below are questions related to nutrition. You are being asked to read each and indicate your answer by checking one or more boxes. This is not a test, and you will not be graded on your answers. You are not required to respond to every statement in the questionnaire and are free to skip any questions you are not comfortable answering.

1. How many servings of fruits and vegetables a day do you think experts are advising people to eat at a minimum? One serving could be, for example, an apple or a handful of chopped carrots. (check one)
   - 2
   - 3
   - 4
   - 5 or more
   - Not sure
2. Which of these types of fats do experts recommend people should eat less of? (check one box per line)

	Eat less	Not eat less	Not sure
Monounsaturated fats			
Trans fats			
Saturated fats			

3. How many times a week do experts recommend eating breakfast? (check one)
   - 3 times a week
   - 4 times a week
   - Every day
   - Not sure
4. According to the Dietary Guidelines for Americans 2020-2025, adolescents ages 14 to 18 should eat what percent of their total calories as carbohydrates? (check one)
   - 10-25%
   - 30-50%
   - 45-65%
   - Not sure
5. According to the Dietary Guidelines for Americans 2020-2025, adolescents ages 14 to 18 should eat what percent of their total calories as protein? (check one)
   - 10-30%
   - 25-40%
   - 45-65%
   - Not sure

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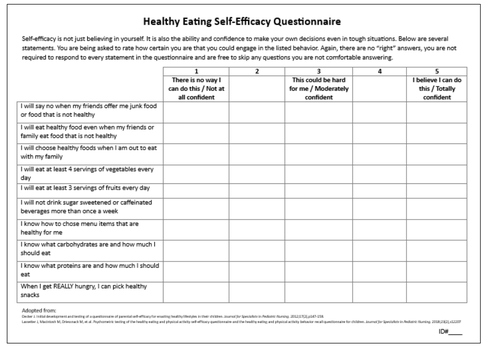

Healthy Eating Self-Efficacy Questionnaire

Self-efficacy is not just believing in yourself. It is also the ability and confidence to make your own decisions even in tough situations. Below are several statements. You are being asked to rate how certain you are that you could engage in the listed behavior. Again, there are no "right" answers, you are not required to respond to every statement in the questionnaire and are free to skip any questions you are not comfortable answering.

	1 There is no way I can do this / Not at all confident	2	3 This could be hard for me / Moderately confident	4	5 I believe I can do this / Totally confident
I will say no when my friends offer me junk food or food that is not healthy					
I will eat healthy food even when my friends or family eat food that is not healthy					
I will choose healthy foods when I am out to eat with my family					
I will eat at least 4 servings of vegetables every day					
I will eat at least 3 servings of fruits every day					
I will not drink sugar sweetened or caffeinated beverages more than once a week					
I know how to chose menu items that are healthy for me					
I know what carbohydrates are and how much I should eat					
I know what proteins are and how much I should eat					
When I get REALLY hungry, I can pick healthy snacks					

Adopted from:

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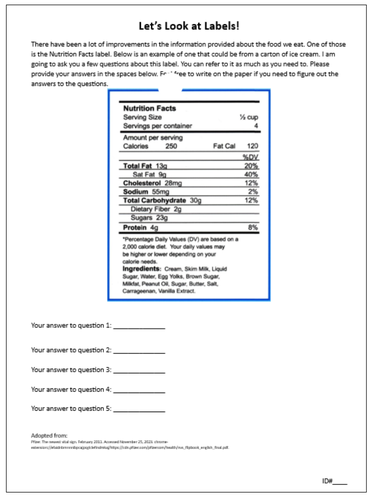

Let's Look at Labels!

There have been a lot of improvements in the information provided about the food we eat. One of those is the Nutrition Facts label. Below is an example of one that could be from a carton of ice cream. I am going to ask you a few questions about this label. You can refer to it as much as you need to. Please provide your answers in the spaces below. Fe[illegible]ree to write on the paper if you need to figure out the answers to the questions.

Nutrition Facts
Serving Size ½ cup
Servings per container 4

Amount per serving
Calories 250 Fat Cal 120
%DV
Total Fat 13g 20%
Sat Fat 9g 40%
Cholesterol 28mg 12%
Sodium 55mg 2%
Total Carbohydrate 30g 12%
Dietary Fiber 2g
Sugars 23g
Protein 4g 8%

*Percentage Daily Values (DV) are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.
Ingredients: Cream, Skim Milk, Liquid Sugar, Water, Egg Yolks, Brown Sugar, Milkfat, Peanut Oil, Sugar, Butter, Salt, Carrageenan, Vanilla Extract.

Your answer to question 1: _____

Your answer to question 2: _____

Your answer to question 3: _____

Your answer to question 4: _____

Your answer to question 5: _____

Adopted from:

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Intervention Methods: Two intervention components were executed one week apart and took place during student's regularly scheduled health class in March 2024.

Component 1 was a 15 to 20-minute classroom lecture-style presentation covering 4 key topics. Presented in a "Fact or Fiction" format, each topic asked the students if a statement was true or false, All Calories are Created Equal for example, then the investigator explained the science-based justification for the answer.

Component 2 encompassed a "grocery store" set up in the classroom with empty food boxes and plastic food items. The students were broken into small groups and given the time restricted task of shopping and creating 1 meal that fit the AMDR for each macronutrient (carbohydrates, protein, and fat). Using the online tool HappyForks.com each team calculated the nutritional content of the meals they gathered.

RESULTS

Table 1. Paired t-Test analysis results comparing student scores for the Nutrition Knowledge Survey pre- and post-intervention.

		Mean Score	Std Deviation	Paired t-Test (n = 50) Change in Score	Std Dev	P-value	Cohen's d-value
Nutrition Knowledge Survey	Pre-test	54.8	12.7	+3.3 pts	10.4	<0.05	0.321 (95% conf) Small effect
	Post-test	58.2	15.6				
Healthy Eating Self-Efficacy Questionnaire	Pre-test	33.2	7.4	+2.7 pts	5.0	<0.001	0.545 (95% conf) Moderate effect
	Post-test	35.9	7.8				

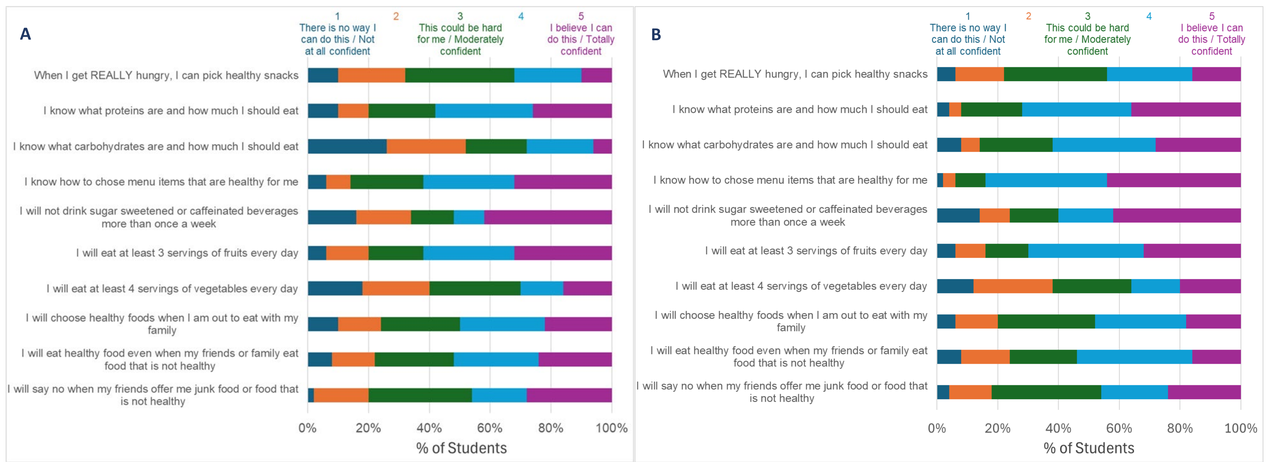

Figure 1. 100% stacked bar charts showing consolidated student responses to the Healthy Eating Self-Efficacy Questionnaire statements. A) Pre-intervention results. B) Post-intervention results.

RESULTS, CONTINUED

Table 2. Wilcoxon Signed-Rank Test results comparing student scores on the Let's Look at Labels! quiz pre- and post-intervention

		Mean Score	Std Deviation	Wilcoxon Signed-Rank Test (n = 50)
Let's Look at Labels! quiz	Pre-test	80.8	26.5	Z = 2.679, p = 0.007
	Post-test	91.6	14.0	

Table 3. Wilcoxon Signed-Rank Test results summarizing the number of students who improved, stayed the same or scored lower on the Let's Look at Labels! quiz after the intervention.

		N
Post (Labels Quiz Score) – Pre (Labels Quiz Score)	Negative Ranks	7[a]
	Positive Ranks	21[b]
	Ties	22[c]
	Total	50

a. Post Labels quiz score < Pre Labels Quiz score
b. Post Labels quiz score > Pre Labels Quiz score
c. Post Labels quiz score = Pre Labels Quiz score

DISCUSSION

- This study show that a Social Cognitive Theory-based intervention combining classroom nutrition education and hands-on activities can effectively improve adolescents' nutrition knowledge scores and self-efficacy questionnaire ratings.
- The mean scores for each of the three assessment tools showed statistically significant improvements from pre- to post-intervention.
- The level of impact for this intervention ranged from minimal in the knowledge scores to moderate in self-efficacy.
- This study helped to fill a research gap in nutrition education by delivering practice, skills, and confidence required for adolescents to make educated healthy food-related decisions.

The design and results of this study can serve as a foundation for other similar research aimed at improving the health of adolescents. The effectiveness of Social Cognitive Theory with knowledge and skill-based methodologies demonstrated here can be expanded upon not only within the research realm but also incorporated into health class teaching techniques. As the US strives to get a better hold on the health of Americans, it is critical to put effort into young people who are at elevated risk for poor diet and who are establishing habits not only for their own lifetime but for the next generations as well.

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