Mental Health-Focused Nutrition Education Intervention in Secondary School

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Introduction

Food literacy is traditionally taught to children and adolescents in K-12 schools during home economics, health, and other related courses to promote nutrition knowledge and food preparation skills.[1] However, nutrition education provided in schools is insufficient to improve food literacy and dietary behaviors in students.[2,3] Although 74.1% of schools are required to provide instruction to students on nutrition and dietary behavior, many do not provide the recommended 40-50 hours of instruction needed to affect behavior change.[4,5] In fact, the mean number of hours per school year spent on nutrition education is 13 hours in all schools.[6] Further, just 7 hours is spent on nutrition and dietary habits per school year in secondary schools.[4]

Nutrition has a strong association with mental health, due to the central nervous system's nutritional needs and the environmental factors that impact nutritional status.[7] Social and emotional learning (SEL) frameworks can be useful to teach students about hunger cues, emotional influences on eating behaviors, and healthy food-related decision making, which encourages practical nutrition skills.[8] However, there is no requirement to discuss the association between nutrition and mental health, despite 91% of secondary schools requiring the topic of the association between nutrition and physical health.[7]

Lack of effective nutrition education in schools often results in poor dietary behaviors that contribute to adverse health outcomes.[1] Existing research has found that healthy eating patterns and regular physical activity reduces the risk of chronic health conditions, such as cardiovascular disease, type 2 diabetes, and cancer, and are associated with increased life expectancy and quality of life.[1,9] Specifically, low dietary fiber and plant foods intake, along with excess consumption of processed foods and red meats, can increase the risk of developing preventable chronic diseases.[9] Intermediate outcomes of poor dietary habits, such as overweight, obesity, undernutrition, metabolic syndrome, inadequate bone health, iron deficiency, and dental carries, can begin in childhood or adolescence, leading to earlier chronic disease onset and increased risk for premature death.[9]

Strategies for effective nutrition education interventions depend on their ability to affect behavior change.[3] The most effective interventions include collaborations between teachers and parents, age-appropriate hands-on experiences, adequate duration, frequent sessions, environmental changes, and proper alignment of stated objectives, intervention methods, and desired outcomes.[8] Secondary school students respond well to experiential learning activities that provide active engagement and opportunities to develop practical nutrition-related skills.[2,3,8] Yet, just 61.3% of secondary schools in the United States require nutrition curriculum that practices communication, decision-making, goal-setting, or refusal skills.[4]

Although previous nutrition education interventions have reported positive mental health outcomes, the impact of a mental health-focused intervention on behavioral outcomes has not been evaluated.[10] To address this gap in the literature, the purpose of this study was to determine the impact of mental health-focused nutrition education on nutritional knowledge and behavior outcomes in secondary school students.

Methods

Study Design

A quasi-experimental design with intervention groups was used. Pre- and post-course changes in nutrition knowledge and behavior was assessed using nutrition knowledge surveys and food frequency questionnaires in needs assessment and intervention groups. This project was deemed acceptable by SUNY Oneonta’s Institutional Review Board.

Participants

Study participants were recruited via an oral recruitment method by the health teacher at Paul V. Moore High School in the Central Square School District. 150 students in the teacher’s health class were given an oral recruitment pitch detailing the premise of the study, while being provided with informed consent and child assent forms. Participants were high school students that were 14-18 years of age enrolled in health class. Students from the needs assessment group (n=8) and the intervention group (n=56) that completed the consent process and assessment tool were included in this manuscript.

Tools

A nutrition knowledge and behavior evaluation was administered following the intervention using SurveyMonkey and Google Forms. Study participants were given unlimited time to complete the survey and were not required to answer any questions. The 17-question nutrition knowledge survey was created based on two validated tools, the GeSNK and the SBNM (see Supplemental Figure A).[11,12] The General and Sport Nutrition Knowledge Questionnaire (GeSNK) is a validated tool to assess the relationships between nutrition knowledge, dietary behavior, and demographic characteristics in adolescents and athletic adolescents.[11] Questions from the general nutrition portion of the GeSNK were included in this survey tool, based on applicability to planned intervention topics and previously researched nutrition knowledge deficits in this population.[13] Demographic data was not collected from the subjects to ensure de-personalization of the responses. The School-Based Nutrition Monitoring (SBNM) survey is a validated tool to assess nutrition-related knowledge, attitudes, and behaviors in adolescents at the middle school and high school levels.[12] Questions relating to nutrition behaviors from the SBNM were included in this survey tool. The 10-question nutrition behavior survey was developed as a food frequency questionnaire, with influence from nutrition behavior questions in the SBNM (see Supplemental Figure B).[12]

Intervention

The intervention was two 80-minute class sessions developed based on SEL framework. Sessions were delivered to high school students enrolled in a health course at Paul V Moore High School in Central Square School District every other day over the course of a week. The first lesson was based on basic nutrition knowledge, covering macronutrients and micronutrients. This lesson included a PowerPoint presentation, along with a fiber demonstration and a cholesterol demonstration. The second lesson covered MyPlate, nutrition facts label reading, and nutrition's impact on mental health. This lesson included a PowerPoint presentation, along with a review game, a MyPlate activity, and a nutrition facts label activity.

Data Analysis

Quantitative methods were used based on the data collected. Nutrition knowledge questionnaire scoring was completed by scoring answers as 1 for correct responses and 0 for incorrect, "I do not know", or blank responses. Mann Whitney U test was used to test for significant differences in scores between the needs assessment group and intervention group. Statistical significance was determined at p-value <0.05. Nutrition knowledge test scores and reported confidence in nutrition knowledge and skills was compared to assess correlations amongst the intervention group using Pearson's Correlation test. Statistical significance was determined at p-value <0.05. The software used in this study was SPSS.

Results

Nutrition Knowledge

The mean score on the nutrition knowledge evaluation score increased 40% in the intervention group as compared to the needs assessment group (28% vs. 68%, $p=0.000$). Figure 1 shows the difference in nutrition knowledge test scores between the two groups. Students in the intervention group scored significantly higher for all macronutrient and fiber categories ($p=0.000$), as shown in Table 1. The highest scores were obtained by intervention students for questions on protein and fiber (74.1% and 76.9%, respectively). Needs assessment students scored highest on questions regarding minerals, while the intervention students scored the lowest in that category (37.5% and 54.0%, respectively).

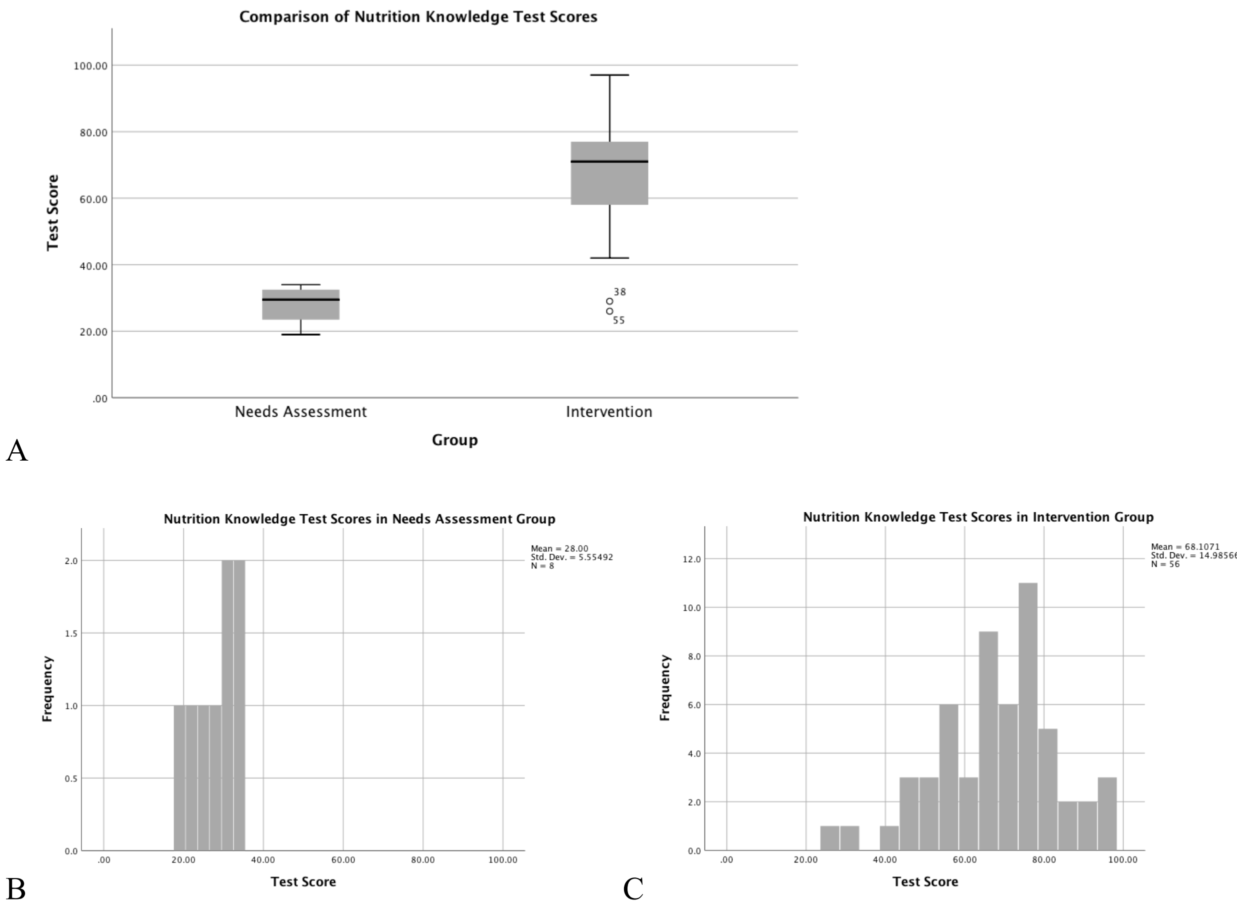

Figure 1. Student performance: test score comparisons between the needs assessment and intervention groups on the nutrition knowledge section of the evaluation tool. (A) Nutrition knowledge test scores for the needs assessment and intervention groups. (B) Nutrition knowledge test scores of needs assessment group. (C) Nutrition knowledge test scores of intervention group. n=8 students in needs assessment group, n=56 students in intervention group. Mann Whitney U test. p=0.000.

	Number of Questions	Needs Assessment (n=8)	Intervention (n=56)	p-value
Carbohydrates	5	28.6%	58.4%**	p=0.000
Protein	7	21.6%	74.1%**	p=0.000
Fat	8	31.5%	63.3%**	p=0.000
Fiber	7	35.6%	76.9%**	p=0.000
Minerals	4	37.5%	54.0%	p=0.103
Total Questionnaire Score	31	28.0%	68.1%**	p=0.000

Table 1. Comparison of categories of the nutrition knowledge evaluation between the needs assessment and intervention group. Mann Whitney U test. *=significant at p<0.05 level. **=significant at p<0.01 level.

Perception of Confidence in Nutrition Knowledge and Skills

Confidence in nutrition knowledge and skills was assessed in students following the intervention. Confidence was assessed using a Likert scale of very confident, somewhat confident, and not confident. The intervention group mainly reported they were "somewhat confident" in their nutrition knowledge and skills. The highest number of students reported they were "very confident" in their ability to choose foods to support their physical and mental health (64.3%), which was higher than their confidence in their ability to choose generally healthy foods (46.4%). Students reported that they felt "very confident" in their nutrition-related skills, such as using MyPlate (51.8%) and reading food labels (46.4%). The least students reported they were "very confident" in their nutritional knowledge of macronutrients and micronutrients (17.9% and 12.5%, respectively). However, many students did report they were "somewhat confident" in their knowledge of macronutrients and micronutrients (71.4%). These results can be found in Table 2 and Figure 2.

	Very Confident, n (%)	Somewhat Confident, n (%)	Not Confident, n (%)
Choose Foods to Support Physical and Mental Health	36 (64.3)	17 (30.4)	3 (5.4)
Micronutrient Knowledge	7 (12.5)	40 (71.4)	8 (14.3)
Macronutrient Knowledge	10 (17.9)	40 (71.4)	6 (10.7)
Using MyPlate	29 (51.8)	22 (39.3)	5 (8.9)
Choose Healthy Foods	26 (46.4)	27 (48.2)	3 (5.4)
Reading Food Labels	26 (46.4)	27 (48.2)	3 (5.4)

Table 2. Reported confidence in nutrition knowledge and skills in the intervention group.

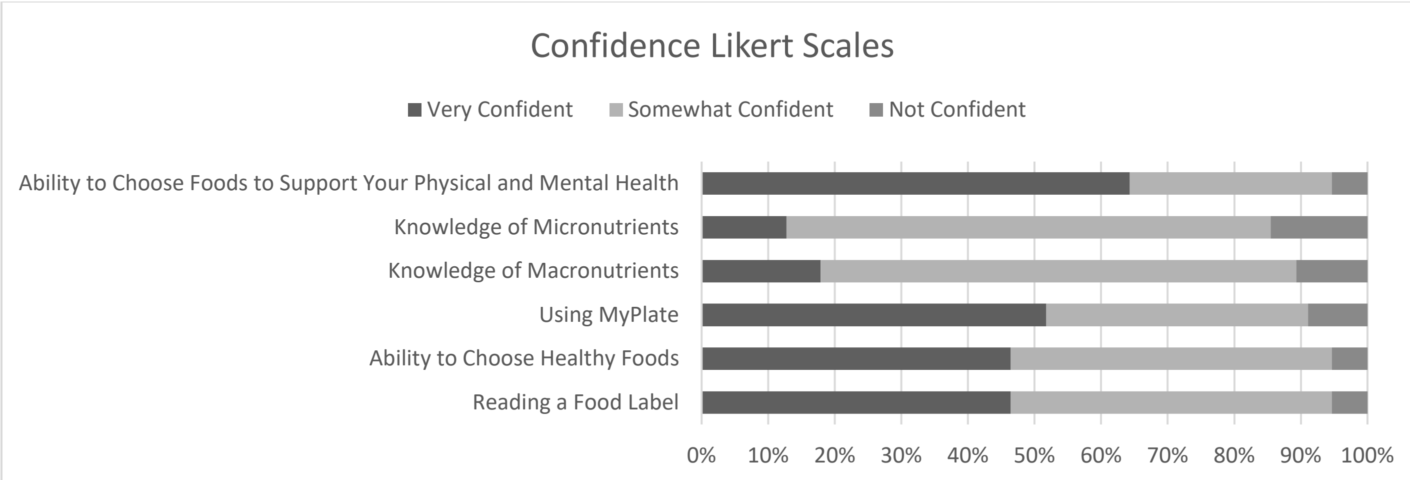

Figure 2. Reported confidence in nutrition knowledge and skills in the intervention group.

Table 3 displays correlations between assessed confidence factors. Confidence in ability to choose foods to support their mental and physical health was correlated with confidence in reading food labels ($r=.310$, $p<0.05$), choosing healthy foods ($r=.498$, $p<0.01$), macronutrient knowledge ($r=.501$, $p<0.05$), and micronutrient knowledge ($r=.468$, $p<0.01$). Confidence in reading food labels was the most strongly correlated variable, as it was correlated with all confidence questions, including confidence in choosing healthy foods ($r=.512$, $p<0.01$), using MyPlate ($r=.285$, $p<0.05$), macronutrient knowledge ($r=.331$, $p<0.05$), micronutrient knowledge ($r=.387$, $p<0.01$), and choosing foods to support mental or physical health ($r=.310$, $p<0.05$), along with nutrition knowledge tests scores ($r=.351$, $p<0.01$). Nutrition knowledge test scores were only found to be correlated with confidence in reading food labels ($r=.351$, $p<0.01$) and choosing healthy foods ($r=.453$, $p<0.01$). Further, test scores were not correlated with confidence in macronutrient knowledge ($r=.183$, $p>0.05$), micronutrient knowledge ($r=.167$, $p>0.05$), or confidence in ability to choose foods to support their mental and physical health ($r=.261$, $p>0.05$).

	Reading Food Labels	Choose Healthy Foods	Using MyPlate	Macronutrient Knowledge	Micronutrient Knowledge	Supporting Health	Test Scores
Reading Food Labels	1	.512**	.285*	.331*	.387**	.310*	.351**
Choose Healthy Foods	.512**	1	.213	.393**	.386**	.498**	.453**
Using MyPlate	.285*	.213	1	.296*	.301*	.253	.167
Macronutrient Knowledge	.331*	.393**	.296*	1	.565*	.501*	.183
Micronutrient Knowledge	.387**	.386**	.301*	.565**	1	.468**	.167
Supporting Health	.310*	.498**	.253	.501**	.468**	1	.261
Test Scores	.351**	.453**	.167	.183	.167	.261	1

Table 3. Correlation between perceived confidence of nutrition-related behaviors and knowledge, along with nutrition-knowledge test scores. Pearson's Correlation. *=significant at the 0.05 level (2-tailed). **=significant at the 0.01 level (2-tailed).

Nutrition Behaviors

Nutrition behaviors were assessed in both the needs assessment and intervention groups; however, there was insufficient data from the needs assessment groups to complete a comparative analysis. Students in the intervention group reported relatively positive nutrition behaviors through their completion of the food frequency questionnaire, as is shown in Table 4 and Figure 3. Intake of the three standard meals increased throughout the day, as 57.1% of respondents eat breakfast every day, 87.5% eat lunch every day, and 96.4% eat dinner every day. Students reported good snack intake, as 57.9% eat snacks every day and 28.6% eat snacks every other day. Self-reported intake of fruits and vegetables were low, where only 44.6% of students ate vegetables every day and 41.1% of students ate fruits every day. Intake of desserts was low, where 39.3% report consuming them once a week and 23.2% report consuming them once a month.

	Every Day, n (%)	Every Other Day, n (%)	Once a Week, n (%)	Once a Month, n (%)	Almost Never, n (%)
Breakfast	32 (57.1)	9 (16.1)	8 (14.3)	2 (3.6)	5 (8.9)
Lunch	49 (87.5)	4 (7.1)	3 (5.4)	0 (0.0)	0 (0.0)
Dinner	54 (96.4)	1 (1.8)	1 (1.8)	0 (0.0)	0 (0.0)
Snacks	38 (57.9)	16 (28.6)	1 (1.8)	0 (0.0)	1 (1.8)
Vegetables	25 (44.6)	23 (41.1)	7 (12.5)	1 (1.8)	0 (0.0)
Fruit	23 (41.1)	20 (35.7)	11 (19.6)	2 (3.6)	0 (0.0)
Pasta, Macaroni, Rice	10 (17.9)	21 (37.5)	20 (35.7)	4 (7.1)	1 (1.8)
Hot or Cold Cereal	15 (26.8)	8 (14.3)	17 (30.4)	4 (7.1)	12 (21.4)
Bread, Bagel, Tortilla	32 (57.1)	18 (32.1)	4 (7.1)	1 (1.8)	1 (1.8)
Desserts	6 (10.7)	14 (25.0)	22 (39.3)	13 (23.2)	1 (1.8)

Table 4. Reported food frequency questionnaire responses among the intervention group.

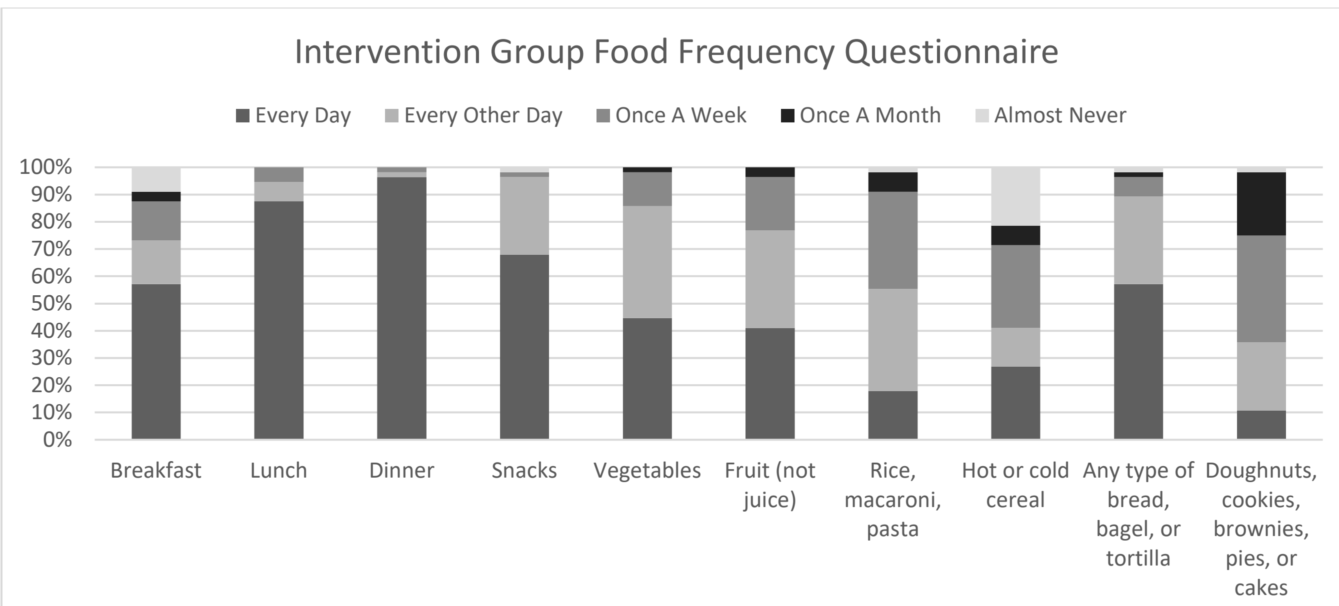

Figure 3. Reported food frequency questionnaire responses among the intervention group.

Discussion

This study found that mental health-focused nutrition education had a statistically significant impact on nutrition knowledge outcomes. Mean nutrition knowledge test scores increased from 28% in the needs assessment group to 68% in the intervention group, which was accompanied by significant score increases in all macronutrient and fiber categories. Students in the intervention group reported high confidence in their ability to choose foods to support their mental and physical health, along with relatively positive nutrition behaviors. The positive outcomes found in this study are consistent with existing literature on similar interventions. Effective school-based nutrition education intervention methods for adolescents have been found to include age-appropriate activities, aligning objectives with activities, and accurate implementation of interventions, which in turn results in positive nutrition knowledge and behavior outcomes.[2,8,10,13] These factors were implemented during the intervention of this study, corroborating the findings of similar literature. Adequate duration of intervention has been recognized as another important factor, with most effective nutrition education interventions occurring in multiple sessions over the span of several months.[8] The intervention in this study was conducted in two sessions over the span of one week, which is a considerable difference from the recommended six month duration in the literature.[8] This could indicate that the mental-health focus of this intervention contributed to the development of positive results over a shorter period of time as compared to similar interventions. Although, this study did not evaluate long-term impacts of the intervention, which are most affected by the duration of the intervention.[8]

Reported confidence in nutrition knowledge and skills was found to be correlated to other certain nutrition knowledge areas and skills. Nutrition-related skill confidence tended to be correlated to each other. For example, confidence in reading foods labels was correlated with confidence in all nutrition-related skill prompts, as well as nutrition knowledge prompts. This may implicate that ability to read food labels as the most important factor to following nutritional guidelines. Nutrition knowledge test scores were correlated with confidence in reading food labels and choosing healthy foods. However, test scores were not correlated with macronutrient knowledge, micronutrient knowledge, and ability to choose foods to support physical and mental health, which was unanticipated given those are expected outcomes of increased nutrition knowledge. Nutrition interest has been found to strongly influence nutrition knowledge, behaviors, and skills, which is consistent with the findings in this study that nutrition knowledge is largely paired with nutrition skills.[14] There is space in the literature to further investigate the discrepancy between test scores' expected correlation with macronutrient and micronutrient knowledge.

There were several limitations to this study. The small sample size of the needs assessment group lead to limitations in data evaluation. For instance, not requiring answers on survey questions resulted in many prompts in the food frequency questionnaire being unanswered by all needs assessment participants, such that there was insufficient data to compare nutrition behaviors between the two groups. Another limitation of this study was the lack of pre- and post-intervention evaluation of confidence measures, wherein changes in confidence in nutrition-related knowledge and skills could not be assessed in terms of effectiveness of the intervention. Additionally, the food frequency questionnaire being administered one week following intervention may have resulted in data not accurately representing changes in nutrition behavior amongst the intervention groups.

Conclusion

Positive changes were found in nutrition knowledge, behaviors, and beliefs following a school-based mental health-focused nutrition education intervention amongst adolescents. This study found that there are discrepancies between expected correlations amongst nutrition knowledge and confidence in nutrition-related skills. Further research is needed to understand the associations between nutrition knowledge and nutrition behaviors or beliefs, along with methods to bridge this gap in adolescents. Additionally, further research on the inconsistency between nutrition knowledge test scores and confidence in nutritional knowledge subject areas would be valuable for future educational interventions in adolescents. Insufficient data from the needs assessment group limited available comparisons in nutrition behaviors and beliefs. Further research utilizing a larger sample size is needed to evaluate the potential for change in adolescents receiving school-based mental health-focused nutrition education interventions.

Appendix A Nutrition Knowledge Survey

1. The carbohydrate content of the following foods is:
   a. Ham
      i. High
      ii. Low
      iii. I do not know
   b. White bread
      i. High
      ii. Low
      iii. I do not know
   c. Apple
      i. High
      ii. Low
      iii. I do not know
   d. Cheese
      i. High
      ii. Low
      iii. I do not know
   e. Breakfast cereals
      i. High
      ii. Low
      iii. I do not know
2. The protein content of the following foods is:
   a. Chicken meat
      i. High
      ii. Low
      iii. I do not know
   b. Dried beans
      i. High
      ii. Low
      iii. I do not know
   c. Pear
      i. High
      ii. Low
      iii. I do not know
   d. Rice
      i. High
      ii. Low
      iii. I do not know
   e. Fish
      i. High
      ii. Low
      iii. I do not know
   f. Cheese
      i. High
      ii. Low
      iii. I do not know

Figure A1. Page 1 Questionnaire

g. Chocolate
    i. High
    ii. Low
    iii. I do not know

3. The fat content of the following foods is:
    a. Salami
        i. High
        ii. Low
        iii. I do not know
    b. Mayonnaise
        i. High
        ii. Low
        iii. I do not know
    c. Dried chickpeas
        i. High
        ii. Low
        iii. I do not know
    d. Pasta
        i. High
        ii. Low
        iii. I do not know
    e. Jam
        i. High
        ii. Low
        iii. I do not know

4. The fiber content of the following foods is:
    a. Honey
        i. High
        ii. Low
        iii. I do not know
    b. Brown bread
        i. High
        ii. Low
        iii. I do not know
    c. Chicken broth
        i. High
        ii. Low
        iii. I do not know
    d. Potatoes
        i. High
        ii. Low
        iii. I do not know
    e. White bread
        i. High
        ii. Low
        iii. I do not know

Figure A2. Page 2 Questionnaire

5. The salt content of the following foods is:
    a. White bread
        i. High
        ii. Low
        iii. I do not know
    b. Canned peas
        i. High
        ii. Low
        iii. I do not know
    c. Frozen peas
        i. High
        ii. Low
        iii. I do not know
6. Olive oil is high in unsaturated fat
    a. True
    b. False
    c. I do not know
7. Brown bread is richer in fiber than white bread
    a. True
    b. False
    c. I do not know
8. Omega-3 and omega-6 are types of fatty acids
    a. True
    b. False
    c. I do not know
9. The iron in meat is more easily absorbed than the same mineral found in vegetables
    a. True
    b. False
    c. I do not know
10. Fiber helps to ease constipation
    a. True
    b. False
    c. I do not know
11. Saturated fat is healthier than monounsaturated or polyunsaturated fats.
    a. True
    b. False
    c. I do not know
12. How confident do you feel reading a food label?
    a. Very confident
    b. Somewhat confident
    c. Not confident
13. How confident do you feel in your ability to choose healthy foods?
    a. Very confident
    b. Somewhat confident
    c. Not confident
14. How confident do you feel using MyPlate?

Figure A3. Page 3 Questionnaire

a. Very confident
b. Somewhat confident
c. Not confident

15. How confident do you feel in your nutrition knowledge of macronutrients (carbohydrates, fats, protein, and water)?
    a. Very confident
    b. Somewhat confident
    c. Not confident
16. How confident do you feel in your nutrition knowledge of micronutrients (vitamins and minerals)?
    a. Very confident
    b. Somewhat confident
    c. Not confident
17. How confident do you feel that you can eat foods that support your physical and mental health?
    a. Very confident
    b. Somewhat confident
    c. Not confident

Figure A4. Page 4 Questionnaire

Appendix B Nutrition Behavior Survey

1. How often do you usually consume the following?
   a. Breakfast
      i. Every day
      ii. Every other day
      iii. Once a week
      iv. Once a month
      v. Almost never

   b. Lunch
      i. Every day
      ii. Every other day
      iii. Once a week
      iv. Once a month
      v. Almost never

   c. Dinner
      i. Every day
      ii. Every other day
      iii. Once a week
      iv. Once a month
      v. Almost never

   d. Snacks
      i. Every day
      ii. Every other day
      iii. Once a week
      iv. Once a month
      v. Almost never

   e. Vegetables, including salad and potatoes
      i. Every day
      ii. Every other day
      iii. Once a week
      iv. Once a month
      v. Almost never

   f. Fruit (not juice)
      i. Every day
      ii. Every other day
      iii. Once a week
      iv. Once a month
      v. Almost never

   g. Rice, macaroni, spaghetti, pasta
      i. Every day
      ii. Every other day

Figure B1. Page 1 Food Frequency Questionnaire

iii. Once a week
iv. Once a month
v. Almost never

h. Hot or cold cereal
   i. Every day
   ii. Every other day
   iii. Once a week
   iv. Once a month
   v. Almost never

i. Any type of bread, bun, bagel, tortilla, or roll
   i. Every day
   ii. Every other day
   iii. Once a week
   iv. Once a month
   v. Almost never

j. Sweet rolls, doughnuts, cookies, brownies, pies, or cakes
   i. Every day
   ii. Every other day
   iii. Once a week
   iv. Once a month
   v. Almost never

Figure B2. Food Frequency Questionnaire

References

1. Nanayakkara J, Margerison C, Worsley A. Senior Secondary School Food Literacy Education: Importance, Challenges, and Ways of Improving. *Nutrients*. 2018;10(9):1316. doi:10.3390/nu10091316

2. Santaló MI, Gibbons S, Naylor PJ. Using Food Models to Enhance Sugar Literacy among Older Adolescents: Evaluation of a Brief Experiential Nutrition Education Intervention. *Nutrients*. 2019;11(8):1763. doi:10.3390/nu11081763

3. Hayes D, Contento IR, Weekly C. Position of the Academy of Nutrition and Dietetics, Society for Nutrition Education and Behavior, and School Nutrition Association: Comprehensive Nutrition Programs and Services in Schools. *J Acad Nutr Diet*. 2018;118(5):913-919. doi:10.1016/j.jand.2018.03.005

4. *Results from the School Health Policies and Practices Study 2014*. Centers for Disease Control and Prevention; 2014.

5. Connell DB, Turner RR, Mason EF. Summary of Findings of the School Health Education Evaluation: Health Promotion Effectiveness, Implementation, and Costs. *J Sch Health*. 1985;55(8):316-321. doi:10.1111/j.1746-1561.1985.tb05656.x

6. Board F and N, Board on Children Y, Medicine I of. *Lessons Learned from Federal Programs*. National Academies Press (US); 2013. Accessed February 19, 2022. https://www.ncbi.nlm.nih.gov/books/NBK202129/

7. Wattick RA, Hagedorn RL, Olfert MD. Relationship between Diet and Mental Health in a Young Adult Appalachian College Population. *Nutrients*. 2018;10(8):957. doi:10.3390/nu10080957

8. Murimi M, Moyeda-Carabaza A, Nguyen B, Saha S, Amin R, Njike V. Factors That Contribute To Effective Nutrition Education Interventions in Children: A Systematic Review. *Nutr Rev*. 2018;76(8):553-580.

9. Centers for Disease Control and Prevention. School Health Guides to Promote Healthy Eating and Physical Activity. *MMWR 2011*. 2011;60(5).

10. Yu H jie, Li F, Hu Y feng, et al. Improving the Metabolic and Mental Health of Children with Obesity: A School-Based Nutrition Education and Physical Activity Intervention in Wuhan, China. *Nutrients*. 2020;12(1):194. doi:10.3390/nu12010194

11. Calella P, Iacullo VM, Valerio G. Validation of a General and Sport Nutrition Knowledge Questionnaire in Adolescents and Young Adults: GeSNK. *Nutrients*. 2017;9:439. doi:10.3390/nu9050439

12. Hoelscher DM, Day S, Kelder SH, Ward JL. Reproducibility and Validity of the Secondary Level School-Based Nutrition Monitoring Student Questionnaire. *J Am Diet Assoc*. 2003;103(2):186-194. doi:10.1053/jada.2003.50031

13. 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*. 2018;10(9):1260. doi:10.3390/nu10091260

14. Worsley A. Nutrition knowledge and food consumption: can nutrition knowledge change food behaviour? *Asia Pac J Clin Nutr*. 2002;11:S579-S585. doi:10.1046/j.1440-6047.11.supp3.7.x