

Evaluating the Effectiveness of a Balanced Plate Intervention

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ABSTRACT

Objective: To evaluate the effectiveness of 3 educational sessions on nutrition knowledge and behavior in a virtual Facebook group run by a Registered Dietitian.

Design: Quasi-experimental design

Methods: Three educational sessions were created based on the needs of the Nourished with Emily Facebook group members. Pre and post-tests were used to determine a difference in knowledge before and after the intervention. Behavior change was also evaluated in participants.

Setting: Virtual; Zoom

Participants: Women who are between the ages of 25-55, live across the United States, and are employed who are members of the Nourished with Emily Facebook group.

Intervention: A pre-test was sent out to those that signed up before the intervention. A zoom link was sent to all participants who signed up. The 3 educational sessions were based off the areas on the needs assessment survey that were answered incorrectly by most participants. A post-test was sent to participants after the final educational session as well as another post-test one week later.

Results: There was no significant difference between the mean total scores of the pre and post-tests. There was also no significance difference in the qualitative data found on the pre and post-tests. However, it was seen that the participants reported that they did apply the information they learned from the intervention on post-test that was sent out 1 week after the last session.

Conclusions and Implications: The 3 educational sessions were not effective in significantly increasing nutrition knowledge in this virtual population. These findings reject the authors' hypothesis that the educational sessions would increase knowledge of the participants.

INTRODUCTION:

Nutrition knowledge varies throughout the population due to several different reasons. Some may not have access to nutrition education, however, even having access to nutrition education does not mean that you have been provided accurate nutrition information. Other factors like where someone lives, and their age also affects nutrition knowledge. In a study done, the mean score of nutrition knowledge was 44.3% which was considered a low level of nutrition knowledge.¹ On the other hand, the maximum score was only 73.8% which was considered a moderate level of nutrition knowledge.¹ This shows that a large amount of the population does

have a low level of nutrition knowledge. By not having accurate nutrition knowledge, one may be unaware of how their behaviors affect their likelihood of developing certain diseases. For example, cardiovascular disease and obesity are more common in people who eat a diet higher in salt, sugar, or fat.²

However, social media also plays a large role in the level of nutrition knowledge people have. Nutrition information is constantly being shared and reposted, however, most of it is not accurate. Only around 5% of nutrition information read online is posted by actual Registered Dietitians.³ Since social media is easily accessible today, false nutrition is being read and believed which in turn lowers the nutrition knowledge of the population.

This false nutrition information may be impacting the nutrition knowledge in population's who use social media more. In one study, it was found living in a rural area, being young, and having low education level were associated with a low nutrition knowledge score.⁴ Research shows that 46% of teens say they use the internet almost consistently.⁵ It is also shown that at least 50% of people under 30 trust information on social media.⁵ In a recent study, it was also found that only around 36% of people from ages 39-49 and 25% from ages 50 – 64 believe what they read on social media.⁶

Nutrition education should be taught by qualified professionals (Registered Dietitians) to all populations to increase their knowledge of nutrition topics. Not only is it important to increase the nutrition knowledge of the population, but it is also important to have the population change their daily habits involving nutrition. Registered Dietitians do this by individualizing goals for the individual while keeping other factors like economic state and cultural preferences in mind.⁷

Nutrition education is not only taught in schools but is also taught over social media. One example is the Nourished with Emily Facebook group, which is run by Emily Tills, a Registered Dietitian. Prior to joining this online group, many of these members were reading false information from unqualified people on the internet. Emily post's accurate nutrition information to help these members reach their nutrition goals. A needs assessment was done on this population to see where nutrition knowledge gaps were present. Some common themes that emerged were the parts of a balanced plate and portion sizes, sodium recommendations, as well as fat sources and the different types of fat. Since this population had little knowledge on these topics, a 3-part educational session was created that went over these topics. Pre and post-tests were distributed to those who signed up to determine if knowledge was gained as well as if they applied this knowledge to their daily life (behavior change).

The purpose of this study is to evaluate the effectiveness of an intervention based on the Adult Learning Theory to improve the nutrition-related knowledge and behaviors of participants. This theory discusses how adults learn differently than children. One using this theory should consider that adults should have a say in the content that they are learning, the information should add to what they already know, content should focus on issues related to their personal life and should be centered on solving problems and not memorizing content. My educational intervention applies solutions to real-life, nutrition-related problems.

METHODS:

Study Design:

A quasi-experimental design was used for this study. The population looked at for this study were members of the Nourished with Emily Facebook group. Three educational sessions were created based on the needs of this population. The educational sessions went over what a balanced plate looks like/portion sizes, types of fat/sources of fat, and sodium recommendations. Zoom was used to hold all three of these educational sessions. Pre and post-tests were used to determine if there was a difference in knowledge before and after the intervention. Behavior change was also looked at to see if participants applied this information in their daily life. These tests were taken on Qualtrics. This study was approved by the SUNY Oneonta Institutional Review Board.

Participants:

The Nourished with Emily's Facebook group was the population studied. Email was used to communicate with participants. Zoom was used for all 3 educational sessions over 3 consecutive days. Research participants were recruited via Nourished with Emily's Facebook group. Women who are between the ages of 25-55, live across the United States, and are employed make up most of this Facebook group. A summary of this study as well as a link to a Google Form for participants to sign up with their name and email was posted every day to recruit participants. All identifying information was kept confidential on the sign-up sheet. The inclusion criteria for participants included being over the age of 18, and a member of the Nourished with Emily Facebook group. The exclusion criteria included being under the age of 18, being a 1:1 client with any coach from Nourished with Emily, or not being a member of the Nourished with Emily Facebook group. 1 on 1 clients were not allowed to join this study because the information provided in this intervention is gone over with client with their Nourished with Emily coach. After one week, ten participants signed up to be a part of this study. One participant dropped out due to being a 1:1 client, two more could not attend due to prior engagements, and five other participants did not attend any sessions. The remaining 2 participants who signed up attended all 3 educational sessions.

Intervention:

A pre-test was sent out to all 10 participants that signed up one week before the intervention. The pre-test was sent every morning for one week to all those who signed up. Four participants took the pre-test. A day prior to the beginning of the intervention, a zoom link was sent to all participants who signed up. Only two participants who signed up came to all three sessions. All sessions were group educational sessions. The educational sessions were based of the areas on the needs assessment survey that were answered incorrectly by most participants. The first educational session went over what the different parts of a balanced plate were and the portion size of each. However, fat was left out of this first educational session as it would be more specifically talked about in the third educational session. Carbohydrates, protein, and vegetables/fruits were discussed. The difference between complex and refined carbohydrates were gone over as well as examples of the two. Lean and fatty protein were also reviewed as well as examples of these foods as well. Finally, vegetables and fruit were gone over and the difference between non-starchy and starchy vegetables. Throughout the first educational

session, the presenter asked if the participants had any questions as well as at the end of the session. All questions were answered, and participants were reminded that the next educational session would happen at the same time the following day. The second educational session went over the different types of fat as well as food sources of each. Unsaturated (poly and monounsaturated) fats, saturated, and trans fats were reviewed and examples of each were given. A nutrition facts label was also presented to show where participants could find fat content in the foods they are purchasing at the store. The presenter also explained that fat is higher in calorie, so the portion size is smaller than other food groups. Questions asked throughout and after the presentation were answered. Finally, the last educational session was about sodium recommendations. The daily value of sodium was provided as well as what the daily value means. Food sources high in sodium as well as tips on how to lower sodium intake were also reviewed. After all educational sessions were over, all questions were answered, and participants were asked to take the post-test that was sent via email the following day as well as the second post-test that was sent a week after these sessions. Two participants took both post-tests. Only the participants who participated in all three sessions were sent both post-tests. The Adult Learning Theory by Knowles was used for this intervention which discusses how adults learn differently than children. Solutions to real-life, nutrition-related problems were provided in this intervention.

Tools:

The pre and post-tests were adapted from the General Nutrition Knowledge Questionnaire (GNKQ). The GNKQ is a previously validated questionnaire. Most questions for the pre and post-tests were taken from the original GNKQ, and some were created and added. Questions 1-15 on both the pre and post-tests were quantitative and identical. Questions 16 and 17 on both the pre and post-test were qualitative data and identical. The post-test had an additional 3 questions (18 – 20) that were also qualitative that were not found on the pre-test. Questions 19 and 20 specifically asked about the educational sessions. The second post-test that was sent one week later had questions related to the behavior of the participants. This was created by the researcher and asked if they applied what they learned from the educational sessions and if so what they added. If they reported that they didn't apply any of the information from the educational sessions, it was asked why they didn't.

Data Analysis:

Excel was used to gather all data analysis. Pre-test and post-test responses were examined to see if any change in total score was noticed (quantitative data). Questions 1-15 were looked at for this test on both pre and post-test. A t-test assuming unequal variances was used to determine if there was any significant change in total scores before and after the intervention. The p value of <0.05 was used. Questions 16-17 used the Likert scale for the multiple-choice answers. Each answer was given a number from 1-5 and a t-test assuming unequal variances was done. Finally, the responses to the short answer questions on the post-test after one week were examined by using content analysis to track behavior changes in the participants.

RESULTS:

The surveys from before and after the three educational sessions were analyzed and organized into tables and charts. **Figure 1** shows the mean and standard deviation of the total scores from the pre and post-tests. The t-statistic was -1.414 which is not significant as a p-value of $<.05$ was used. The significance was found to be .2301 which is not less than 0.05. This shows that there is not a significant difference between the mean total scores of the pre and post-tests. **Figure 2** shows the mean values for the total scores on pre to post-test answers to the question of “how important is changing your lifestyle and using the balanced plate method”. The t-value for this question was -0.292 which is not significant as a p-value of $<.05$ was used. The significance was found to be 0.779 which is not less than 0.05. **Figure 3** shows the mean values for the total scores on pre to post-test answers to the question of “how confident do you feel about applying the balanced plate method to your daily life”. The t-value for this question was -1.666 which is also not less than 0.05. The significance was found to be 0.1466 which is also not less than 0.05. Finally, **figure 4** shows the answers to whether the participants will be using the information they learned from the 3 educational sessions in their daily life. This question was only found on the post-test.

Multiple questions that related to what makes up a balanced plate were found to be answered correctly on both the pre and post-tests. Question 7 asked about the different parts of a whole grain was answered incorrectly by 50% of participants on the pre-test but was answer 100% correctly on the post-test. Question 13 asked about the daily value of sodium and was answered correctly by 25% of participants on the pre-test while 100% of participants answered this question correctly on the post-test. Question 10 asked about the types of fat found in different food choices. Both the pre and post-test answers for what type of fat is found in butter was answered 100% correctly. However, the other options of olive oil, sunflower oil, and eggs were spread out over polyunsaturated, monounsaturated, and saturated. 50% of participants answered correctly that olive oil was mostly a monounsaturated fat, 75% of participants answered correctly that sunflower oil is mostly a polyunsaturated fat, and 25% answered correctly that eggs are mostly a saturated fat on the pre-test. However, on the post-test, only 50% again answered correctly that monounsaturated fat was olive oil, 100% correctly answered that butter was saturated fat, 100% answered correctly that polyunsaturated fat was mostly sunflower oil, but 100% answered incorrectly that eggs were mostly polyunsaturated fat.

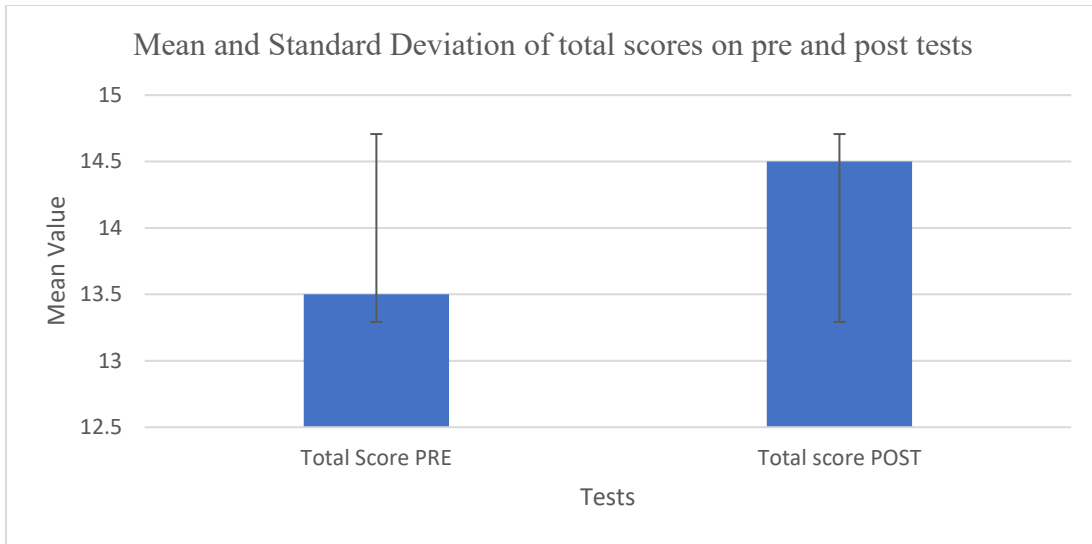


Figure 1. Mean and Standard Deviation of total scores on pre and post-tests.

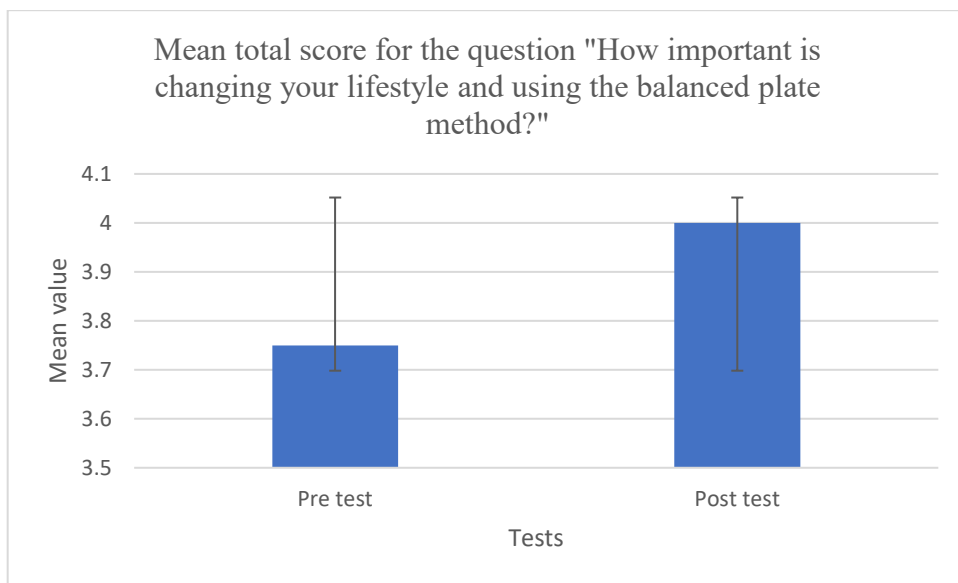


Figure 2. Mean values for the total scores on pre to post-test answers to the question of how important is changing your lifestyle and using the balanced plate method.

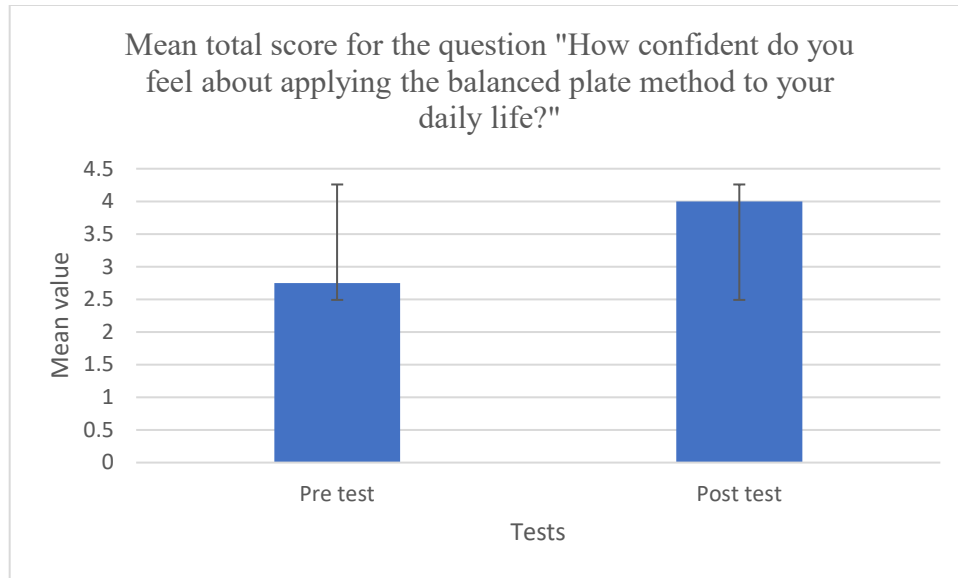


Figure 3. Mean values for the total scores on pre to post-test answers to the question of how confident do you feel about applying the balanced plate method to your daily life.

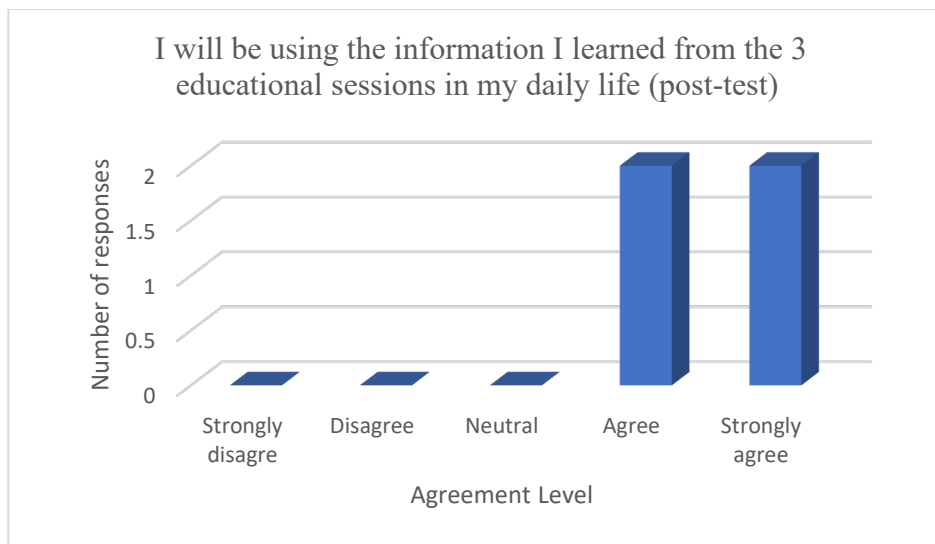


Figure 4. Post-test answers to question 18; I will be using the information I learned from the 3 educational sessions in my daily life.

Qualitative Data:

Questions 16-20 were qualitative data. Questions 16 and 17 on both the pre and post-test were identical. Figures 2 and 3 show the means for questions 16 and 17 from both pre and post-test as well as the standard deviation. The t-value for question 16 was -0.292 which is not significant as a p-value of <math><.05</math> was used. The significance was found to be 0.779 which is not less than 0.05. The t-value for question 17 was -1.666 which is also not less than 0.05. The significance was found to be 0.1466 which is also not less than 0.05. The post-test had additional questions 18-20. Figure 3 shows the responses from participants on the post-test on question 18.

Questions 19 and 20 both asked about the educational sessions. It was reported that participants were either satisfied (n=2) or very satisfied (n=2) with the educational sessions. When asked what changes they would make to the educational sessions, it was reported that they would have liked to have seen recipes and example plates using the information from the sessions.

Post-test 1 week Post Education:

A 2 question short answer post-test was sent to participants 1 week after the educational sessions were given. This was done to see if participants changed and applied their learning to their everyday life. All participants reported applying information they learned from the educational sessions to their life. When asked what information the participants applied to their everyday lives, it was reported that all information taught in the educational sessions was used by participants. Portion sizes and types of fat as well as sodium intake was applied into their daily life.

DISCUSSION:

The data collected from the quantitative questions on the pre and post-test showed that the 3 educational sessions were not effective in significantly increasing nutrition knowledge in this virtual population. These findings reject the authors' hypothesis that the educational sessions would increase knowledge of the participants. Even though the results were not found to be significant, several questions increased in correct responses and the participants reported being able to use this information in their lives. The goal of this study was to provide the participants with accurate nutrition information and have them be able to apply it to their daily lives.

A systematic review was done looking at the factors that make an effective online nutrition education intervention.⁸ A few of the main conclusions of this study were to include individualized feedback, participant engagement, and have the intervention be longer than 3 months.⁸ If this study was done again, having more participant engagement in the intervention as well as having the intervention take place over at least 3 months may affect the results.⁸ Six of the studies looked at had interventions that were longer than 3 months were found to be more likely to meet their stated objectives while 15 of the studies looked at were shorter than 2 months and were less likely to meet their stated objectives.⁸ These findings support the need to increase the time of the intervention for future research. This study also looked at studies with sample sizes of more than 500 participants.⁸ More than half of the successful interventions had the investigators interact with their participants.⁸ This was also done in my study, as after the educational sessions I answered all questions as well as asked questions throughout the sessions.

Strengths and Limitations:

This study had very specific inclusion and exclusion criteria which was a strength. Questions from the GNKQ were also used in the pre and post-tests which helped make them more reliable since this questionnaire is already validated.

However, these findings are limited due to the fact that this study had only 3 educational sessions and were only around 30 minutes each. This study also took place over a 3-day time span consecutively. This study took place over a very short amount of time which may have

affected the results in the post-test data. Having more sessions may affect how much information the participants are able to remember. If this study were to be done again, increasing the number of sessions may cause a more significant changes in total score between the pre and post-test data.

Another limitation that may have affected the results was the number of participants who participated in all educational sessions and surveys. The goal was to recruit 10 participants. 8 participants were able to be recruited however 4 dropped out because they were either not able to attend the sessions or were a 1:1 client. Only 4 participants attended all educational sessions and took the surveys. This affected the data as it is not able to be normally distributed. Having such a small sample size can cause inconclusive results like if there was a significant difference between the pre and post-tests. If this study were to be redone, an important focus should be increasing the amount of people who are recruited and participate in all the educational sessions.⁹ A possible way to get more participants is some type of incentive to give people who participant.

Finally, if this study was done again, more question could a have been asked on the post-tests about how they applied the information provided in the educational sessions. This would provide more specific information about how well the information provided was learned. The information gathered in this post-test was general and more specific information may have been more helpful.

CONCLUSION:

The Nourished with Emily Facebook group was looked at in this study to determine where there was a nutrition knowledge deficit. It was found that several members of this Facebook group had a lack of knowledge in what a balanced plate was composed of, portion sizes, sodium recommendations, and fat sources.

These findings reject the authors' hypothesis that the educational sessions would increase knowledge of the participants. However, participants reported using the information they learned in their daily lives.

APPENDIX:

Pre-Test:

1. According to the dietary guidelines, roughly what proportion of your plate should be a protein?
 - a. $\frac{1}{2}$ of the plate
 - b. $\frac{1}{4}$ of the plate
 - c. $\frac{1}{8}$ of the plate
 - d. Not sure
2. What is an example of a lean protein?
 - a. Chicken breast
 - b. Skirt steak
 - c. Pork chop
 - d. Chicken thigh with skin
3. What type of cut of beef is the leanest?
 - a. T-bone steak
 - b. New York Strip Steak
 - c. Filet Mignon
 - d. Sirloin Tip Side Steak
4. According to the dietary guidelines, roughly what proportion of your plate should be a carbohydrate or starch?
 - a. $\frac{1}{2}$ of the plate
 - b. $\frac{1}{4}$ of the plate
 - c. $\frac{1}{8}$ of the plate
 - d. Not sure
5. What is an example of a whole grain carbohydrate?
 - a. White rice
 - b. White bread
 - c. Veggie pasta
 - d. Oats
6. What is an example of a starchy vegetable?
 - a. Corn
 - b. Potato
 - c. Cauliflower
 - d. Both A & B
7. What do whole grain carbohydrates have that refine carbohydrates do not?
 - a. Bran
 - b. Endosperm

- c. Germ
 - d. A and C
8. According to the dietary guidelines, roughly what proportion of your plate should be vegetables?
- a. $\frac{1}{2}$ of the plate
 - b. $\frac{1}{4}$ of the plate
 - c. $\frac{1}{8}$ of the plate
 - d. Not sure
9. Which of these is a non-starchy vegetable?
- a. Broccoli
 - b. Corn
 - c. Peas
 - d. Beans
10. Which is the main type of fat present in each of these foods?
- | | | | | |
|--------------------|-------------------|-------------------|---------------|----------|
| | polysaturated fat | monosaturated fat | saturated fat | not sure |
| Olive oil | | | | |
| cholesterol butter | | | | |
| Sunflower oil | | | | |
| Eggs | | | | |
11. Which food choice is highest in saturated fat?
- a. Olive oil
 - b. Avocado
 - c. Nuts
 - d. Coconut
12. What types of fats are found in steaks and processed foods?
- a. Saturated Fats
 - b. Polyunsaturated fats
 - c. Monounsaturated fats
 - d. B and C
13. What is the daily value recommendation for sodium?
- a. 2,000mg
 - b. 1500 mg
 - c. 2300 mg
 - d. 1300mg
14. Which of the following is a source of high sodium?
- a. Deli meat
 - b. Soup

- c. Crackers
- d. All of the above

15. You should never consume refined carbohydrates or fatty protein sources because they are not good for you.
- a. True
 - b. False
16. How important is using the balanced plate method to you when meal planning?
- a. Not important
 - b. Slightly important
 - c. Neutral
 - d. Important
 - e. Very important
17. How confident do you feel about applying the balanced plate method to your daily life?
- a. Not confident
 - b. Slightly confident
 - c. Neutral
 - d. Confident
 - e. Very confident

Post-test:

1. According to the dietary guidelines, roughly what proportion of your plate should be a protein?
 - e. $\frac{1}{2}$ of the plate
 - f. $\frac{1}{4}$ of the plate
 - g. $\frac{1}{8}$ of the plate
 - h. Not sure

2. What is an example of a lean protein?
 - e. Chicken breast
 - f. Skirt steak
 - g. Pork chop
 - h. Chicken thigh with skin

3. What type of cut of beef is the leanest?
 - e. T-bone steak
 - f. New York Strip Steak
 - g. Filet Mignon
 - h. Sirloin Tip Side Steak

4. According to the dietary guidelines, roughly what proportion of your plate should be a carbohydrate or starch?

- e. ½ of the plate
- f. ¼ of the plate
- g. 1/8 of the plate
- h. Not sure

5. What is an example of a whole grain carbohydrate?

- e. White rice
- f. White bread
- g. Veggie pasta
- h. Oats

6. What is an example of a starchy vegetable?

- e. Corn
- f. Potato
- g. Cauliflower
- h. Both A & B

7. What do whole grain carbohydrates have that refined carbohydrates do not?

- e. Bran
- f. Endosperm
- g. Germ
- h. A and C

8. According to the dietary guidelines, roughly what proportion of your plate should be vegetables?

- e. ½ of the plate
- f. ¼ of the plate
- g. 1/8 of the plate
- h. Not sure

9. Which of these is a non-starchy vegetable?

- e. Broccoli
- f. Corn
- g. Peas
- h. Beans

10. Which is the main type of fat present in each of these foods?

polysaturated fat monosaturated fat saturated fat not sure

Olive oil

cholesterol butter

Sunflower oil

Eggs

11. Which food choice is highest in saturated fat?

- e. Olive oil
- f. Avocado
- g. Nuts
- h. Coconut

12. What types of fats are found in steaks and processed foods?

- e. Saturated Fats
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14. Which of the following is a source of high sodium?

- e. Deli meat
- f. Soup
- g. Crackers
- h. All of the above

15. You should never consume refined carbohydrates or fatty protein sources because they are not good for you.

- c. True
- d. False

16. How important is using the balanced plate method to you when meal planning?

- f. Not important
- g. Slightly important
- h. Neutral
- i. Important
- j. Very important

17. How confident do you feel about applying the balanced plate method to your daily life?

- 18. Not confident
- 19. Slightly confident
- 20. Neutral
- 21. Confident
- 22. Very confident

23. I will be using the information I learned from the 3 educational sessions in my daily life.

- a. Strongly disagree

- b. Disagree
- c. Neutral
- d. agree
- e. strongly agree

24. How satisfied were you with the 3 educational sessions that you attended?

- a. Not satisfied
- b. Slightly satisfied
- c. Neutral
- d. Satisfied
- e. Very satisfied

25. What changes to the 3 educational sessions would you make to help you better understand the information provided?

Post-test 1 week:

After 1 week, this survey will be sent to participants to determine if they have applied the information they learned in the 3 educational sessions.

- 1. Have you applied any of the information you learned in the 3 educational sessions with Cassandra Snow in your daily life?
 - a. Yes
 - b. No

If yes:

- 2. What information that you learned in the 3 educational sessions did you apply to your daily life? (ex: portion sizes, sodium recommendations, fat food sources, types of fats)
- 3. What have you done differently in your daily life to apply this information you learned?

If no:

- 4. What barriers kept you from applying the information you learned during the educational sessions?

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