# The Effect of Qualitative Versus Quantitative Nutrition Education on the Eating Habits of Female High School Athletes

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15 February 2021

## Abstract

In order to perform well and maintain their health, athletes must practice proper nutrition. However, female athletes are prone to disordered eating behaviors (Birch, 2005), which put the athletes at risk of acquiring the female athlete triad (Day et al., 2015). Although the effect of nutritional education on collegiate female athletes has been explored, with differing conclusions, the effect of different types of nutritional education on high school athletes has not been investigated. In this study, the eating habits of high school female athletes were compared before and after watching either a quantitative or qualitative nutrition education presentation. The participants were asked to use a smartphone application to track the amount of each food group they consumed over two weeks. These reported amounts were then analyzed using nutritional guidelines set by the Automated Self-Administered 24-Hour Recall (ASA24) to determine the healthiness of participants' eating habits. It was found that the quantitative presentation (M=-0.26, SD=0.97) did not have a significant effect on eating habits; $t(17)=-1.13$, $p=0.86$. The qualitative presentation (M=-0.21, SD=0.82) did not have a significant effect either; $t(18)=-1.12$, $p=0.86$. It was additionally found that the participants' eating habits largely failed to meet nutritional guidelines. These results suggest that high school female athletes do not practice proper nutrition and are generally unaffected by nutritional education, putting them at risk for the female athlete triad. By garnering a greater knowledge of how female athletes practice nutrition and are impacted by nutritional education, the medical and sports communities can implement strategies to improve athlete health.

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## Introduction

Nutrition is an important aspect of health, especially for female athletes. The female athlete triad is a syndrome that occurs in female athletes who do not practice proper nutrition (Birch, 2005). According to Jennifer Day et al. (2015), the three parts of the triad are osteoporosis, low energy availability, and menstrual dysfunction. Female athletes are particularly prone to eating disorders as a result of distorted body image and weight concern. *Anorexia athletica* is an eating disorder specific to athletes and is often accompanied by competitiveness and compulsiveness. However, many female athletes simply demonstrate disordered eating, which often consists of over-exercise (Birch, 2005). Disordered eating results in low energy availability. This energy imbalance, along with stress hormones, can cause a dysfunction in the endocrine system. In turn, this causes amenorrhea, the absence of a menstrual period, and a decrease in estrogen production. A lack of estrogen can then lead to osteoporosis (Nattiv et al., 2007). A study in 2003 found that improper nutrition is associated with fatigue and a decrease in athletic performance as well (Zawila et al.).

In female collegiate athletes and students, a need for nutritional education has been found. The need was demonstrated by a hypo-energetic diet in participants in one study (Pilis et al., 2019) and by low scores on a nutritional test in others (Day et al., 2015, & Heaney et al., 2010). Previous research on the nutritional knowledge of female athletes has found varying conclusions on the relationship between nutritional knowledge and athletes' eating habits. In 2019, Condo et al. assessed the nutritional knowledge and intake of female Australian rules football players. They found that the athletes' knowledge and intake were lacking, particularly in the topics of carbohydrates and micronutrients. In 2015, a study by Jennifer Day et al. revealed similar results, as the participants' mean energy availability was 30.8 kcals/kg of fat-free mass

per day, which is more than 10 kcals/kg of fat-free mass per day under the suggested amount.

However, the study also concluded that although nutritional education increased nutritional knowledge, it did not significantly impact caloric intake. On the other hand, Condo et al. (2019) claimed that nutritional education correlates with healthy eating habits because participants in their study who demonstrated low nutritional knowledge when taking a questionnaire also demonstrated an inadequate dietary intake when tracking their intake with an Automated Self-Administered 24-Hour Recall (ASA24). Although it is generally believed that the more knowledge an athlete has about her nutrition, the healthier she will be; multiple studies have found that the use of fitness-tracking apps contributes to eating disorders (Levinson et al., 2017, & Simpson & Mazzeo, 2017). The author of *The New Power Eating* warns against calorie counting, as it often leads to caloric restriction (Kleiner, 2018). These findings suggest that the specificity and content of one's nutritional knowledge has an impact. Few studies have investigated the impact of nutritional education on high school female athletes, and fewer still have investigated the effectiveness of specific types of nutritional education.

The purpose of this project was to determine whether a qualitative or quantitative nutritional education format would have a greater positive impact on the eating habits of high school female athletes. If the effectiveness of different types of nutritional education on female athletes is determined, the knowledge gained can be used by coaches and physical trainers to provide resources to athletes that can best prevent the negative impacts of improper nutrition. It was hypothesized that qualitative nutritional education would result in high school female athletes meeting a greater number of national serving size guidelines than a quantitative nutritional education. The quantitative education included a focus on calorie consumption, and calorie counting has been found to increase the risk of under-eating. Therefore, that aspect of the

quantitative education would reduce its overall effectiveness. In this study, the effects of a qualitative and quantitative nutritional education course on nutrition for female athletes were compared against each other. Start Simple with MyPlate, a smartphone application developed by the United States Department of Agriculture, was used by participants in this study to track their intake of grain, protein, dairy, fruit, and vegetables in cups throughout the day for four days over two weeks. The first week, the participants had no nutritional education, and the second week one group of participants watched a quantitative presentation on nutrition and the other group watched a qualitative presentation on nutrition. The differences in participants' eating habits between the two weeks were compared to determine which presentation was more effective.

## Materials and Methods

### Materials

Participants (female athletes aged 14-18)
Start Simple with MyPlate (smartphone app)
Automated Self-Administered 24-Hour Recall (ASA24) (National Cancer Institute)
Quantitative Nutritional Presentation on Google Slides made by the researcher
Qualitative Nutritional Presentation on Google Slides made by the researcher

### Methods

A total of 44 high school female athletes from the same school were recruited to participate by sending emails to all of the female athletes listed on the sports team rosters found on the school website. These participants were split evenly into Group One and Group Two. All participants were asked to use the app Start Simple with MyPlate on the Tuesdays and Fridays of two weeks. The app allowed the user to set and check off goals related to each of the five food groups. Participants were asked to set and check off a goal for each cup of food or drink they consumed that fell under each food group and submit a screenshot of their goals to a Google

Form (see Figure A1 for a submission sample). The participants were given no education the first week to serve as a control. Over the weekend between the two weeks, participants in Group One were asked to watch a quantitative presentation on nutrition, and participants in Group Two were asked to watch a qualitative presentation on nutrition (Figure 1). The courses were made up of two Google Slide presentations that each contained seven subsections with nutritional information (see Figures A2 and A3 for the presentations). The qualitative presentation had subsections "Home vs. restaurant" and "Whole vs. processed," whereas the quantitative presentation had subsections "Calories" and "Nutrition labels." Both presentations had the subsections "Carbohydrates," "Protein," "Fats," "Micronutrients," and "Hydration." The main words in each title were briefly defined and then qualitative or quantitative details were added. These two nutrition education presentations contained information from a number of primary and secondary sources. A reference slide was included as well. Quantitative nutritional information was defined as any detail that contained a number with a unit or a percent. Qualitative nutritional information was defined as any detail that included a comparison or standard of nutritional value. The nutritional guidelines for the daily amount of fruits, vegetables, proteins, grains, and dairy for female teenagers from the ASA24 were used to measure the eating habits of the participants. The ASA24 has been used in other studies to evaluate eating habits (Day et al., 2015 & Condo et al., 2019), and the survey has been described as effective for athlete populations because the ASA24 can measure a change over time and has low chances of affecting the data (Heaney et al., 2010). The number of nutritional guidelines that were set by the ASA24, out of five, met by all participants for each time they tracked their consumption was recorded. The average change in the number of guidelines met for each participant between the two weeks was calculated and

analyzed using a paired *t*-test and an alpha value of 0.05. A code name was generated for each participant by the ASA24 to maintain anonymity.

**Figure 1:** *Experimental Design Diagram*

**Title of the Experiment**
The Effect of Qualitative Versus Quantitative Nutrition Education on the Eating Habits of Female High School Athletes

**Hypothesis**
A qualitative nutritional education presentation would result in high school female athletes meeting a higher number of national serving size guidelines than a quantitative nutritional education. The quantitative education included a focus on calorie consumption, and calorie counting has been found to increase the risk of under-eating. Therefore, that aspect of the quantitative education may reduce its overall effectiveness.

**Independent Variable** Type of educational presentation

| **Levels of Independent Variable** | No education | Quantitative education (Group One) | Qualitative education (Group Two) |
|---|---|---|---|
| **Number of Repeated Trials** | 44 athletes | 22 athletes | 22 athletes |

**Dependent Variable**
The number of standards participants meet on the Automated Self-Administered 24-Hour Recall (ASA24) out of five. This was measured by participants keeping track of how many cups they consumed of each food group with the smartphone app Start Simple with MyPlate, which includes goals for grains, vegetables, fruits, dairy, and protein.

**Control Group**
The participants during the first week with no educational materials provided

**Constants**
The number of days of tracking for each independent variable, the application used, the duration of each nutrition course, when each course is given, and the gender of participants

## Results

Table 1 shows the raw data for each participant, including which type of presentation they watched as well as the number of nutritional guidelines they met for Tuesday and Friday of each week. Note that some of the participants did not submit a total of four responses. The change in the number of guidelines met between weeks was calculated by subtracting the average number of Week Two guidelines from the average number of Week One guidelines.

**Table 1:** *Number of Nutritional Guidelines Met by Participants in Each Presentation Group*

| Participant | Type of presentation | Number of Guidelines met | | | |
|---|---|---|---|---|---|
| | | Tuesday 1 | Friday1 | Tuesday 2 | Friday 2 |
| QQNPE2006 | qualitative | 2 | 2 | 2 | 2 |
| QQNPE2044 | qualitative | 3 | 5 | 2 | 2 |
| QQNPE2034* | quantitative | 2 | 2 | 3 | DNR |
| QQNPE2023 | quantitative | 3 | 3 | 3 | 3 |
| QQNPE2020 | quantitative | 3 | 4 | 3 | 2 |
| QQNPE2018* | qualitative | 2 | 3 | DNR | 2 |
| QQNPE2043 | quantitative | 5 | 5 | 3 | 3 |
| QQNPE2030* | quantitative | 2 | 5 | 4 | DNR |
| QQNPE2022 | quantitative | 4 | 4 | 3 | 3 |
| QQNPE2002 | quantitative | 3 | 5 | 5 | 5 |
| QQNPE2048 | qualitative | 5 | 5 | 5 | 5 |
| QQNPE2038* | quantitative | 2 | DNR | 2 | 2 |
| QQNPE2005* | quantitative | 3 | DNR | DNR | 3 |
| QQNPE2004* | quantitative | 4 | 5 | DNR | 4 |
| QQNPE2024 | quantitative | 4 | 4 | 4 | 4 |
| QQNPE2020* | DNR | 4 | DNR | DNR | DNR |
| QQNPE2036 | qualitative | 4 | 3 | 3 | 3 |
| QQNPE2010* | quantitative | 4 | DNR | 3 | 3 |
| QQNPE2045 | qualitative | 3 | 3 | 2 | 2 |
| QQNPE2019 | qualitative | 2 | 2 | 2 | 2 |
| QQNPE2001 | qualitative | 1 | 2 | 2 | 2 |
| QQNPE2046 | qualitative | 2 | 2 | 2 | 3 |
| QQNPE2013* | qualitative | DNR | 2 | DNR | 3 |
| QQNPE2031* | DNR | 3 | DNR | DNR | DNR |
| QQNPE2027 | qualitative | 3 | 2 | 3 | 2 |
| QQNPE2042 | quantitative | 2 | 3 | 3 | 5 |
| QQNPE2049* | DNR | 2 | DNR | DNR | DNR |
| QQNPE2025* | DNR | 2 | DNR | DNR | DNR |
| QQNPE2003* | qualitative | DNR | 3 | 4 | DNR |
| QQNPE2007* | qualitative | DNR | 4 | 2 | 3 |
| QQNPE2017 | qualitative | 3 | 3 | 2 | DNR |
| QQNPE2056* | DNR | 2 | 2 | DNR | DNR |
| QQNPE2054* | quantitative | 2 | 1 | DNR | 1 |
| QQNPE2063 | qualitative | 1 | 2 | 2 | 2 |

| Participant | Type of presentation | Number of guidelines met | | | |
|---|---|---|---|---|---|
| | | Tuesday 1 | Friday 1 | Tuesday 2 | Friday 2 |
| QQNPE2050 | quantitative | 5 | 3 | 1 | 3 |
| QQNPE2055 | qualitative | 3 | 2 | 2 | 2 |
| QQNPE2051 | qualitative | 2 | 2 | 1 | 1 |
| QQNPE2060* | DNR | 2 | DNR | DNR | DNR |
| QQNPE2057 | qualitative | 3 | 2 | 3 | 2 |
| QQNPE2059 | qualitative | 2 | 2 | 3 | 2 |
| QQNPE2058* | quantitative | 3 | 2 | DNR | 2 |
| QQNPE2052* | quantitative | 2 | DNR | 3 | 1 |

This table shows the number of nutritional guidelines met by each participant on the Tuesdays and Fridays of two weeks, as well as which presentation they watched. Note that not every participant submitted a response for all four days, and some did not watch the presentation.
*Participant submitted fewer than four responses

Of all the screenshots submitted by participants, the qualitative presentation (M=3.0) resulted in a higher number of guidelines met than the qualitative presentation (M=2.4) and the control before either presentation (M=2.9), as seen in Table 2. Furthermore, the mean of the overall guidelines met was 2.8.

**Table 2:** *Descriptive Statistics Summary Table of Number of Guidelines Met*

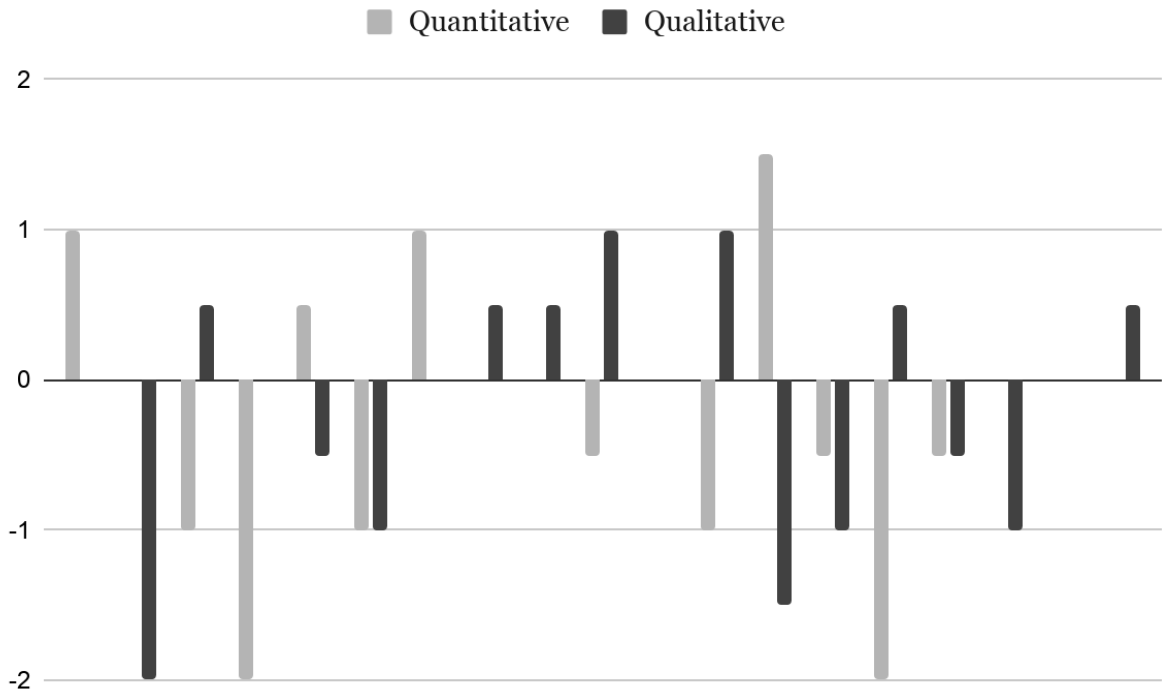
| Statistic | Number of guidelines met | | | |
|---|---|---|---|---|
| | Overall | Overall before presentation | After quantitative presentation | After qualitative presentation |
| $\bar{x}$ | 2.8 | 2.9 | 2.4 | 3.0 |
| Standard deviation | 2.0 | 1.0 | 0.9 | 1.0 |
| Mode | 3.0 | 2.0 | 2.0 | 3.0 |

This table displays the mean, median, and mode of the nutritional guidelines met by all participants over Week One and Week Two.

The change in nutritional guidelines met is shown in Figure 2, which depicts the difference for each participant, except those who did not submit a screenshot for Week Two.

Most of the participant responses displayed a negative change from Week One to Week Two. A larger number of participants who watched the qualitative presentation showed a positive change than the number of participants who watched the quantitative presentation, meaning the qualitative presentation resulted in improved eating habits more often than the qualitative presentation.

**Figure 2:** *Differences in Number of Guidelines Met Between Each Week Bar Graph*




This bar graph depicts the differences in the nutritional guidelines met by participants (Week Two - Week One) who watched either the quantitative or qualitative presentation. A negative difference corresponds to fewer nutritional guidelines met.

The mean, median, and mode of these changes were then found (Table 3). The mean of the difference of nutritional guidelines met between Week One and Week Two for participants

who watched the quantitative presentation had a greater absolute value than that of the participants who watched the qualitative presentation, although both means were negative.

**Table 3**: *Descriptive Statistics Summary Table of Difference in Number of Guidelines Met*

| Difference of guidelines met (Week Two - Week One) | | |
|---|---|---|
| Statistic | Quantitative | Qualitative |
| $\bar{x}$ | -0.3 | -0.2 |
| Median | 0.0 | 0.0 |
| Mode | 0.0 | 0.0 |

The mean, median, and mode of the difference of nutritional guidelines met between Week One and Week Two for the qualitative and quantitative presentation is demonstrated in this table. If participants submitted less than two responses, their data was not included.

A paired-samples *t*-test was conducted at an alpha level of 0.05 to compare the difference in nutritional guidelines met after watching the quantitative presentation and the qualitative presentation. The alpha value used was 0.05. The results, as seen in Table 4, indicate that there was no significance in the differences between guidelines met from Week One to Week Two for the quantitative presentation (M=-0.26, SD=0.97); $t(17)=-1.13$, $p=0.86$. Likewise, there was not a significance in the difference between guidelines met from Week One to Week Two for the qualitative presentation (M=-0.21, SD=0.82); $t(18)=-1.12$, $p=0.86$. The critical value for the quantitative presentation was 1.73, and the critical value for the qualitative presentation was 1.75.

**Table 4**: *Inferential Statistics t-Test Comparing Difference of Guidelines Met (Week Two- Week One)*

| Presentation type | $n$ | $\bar{x}$ | $\sigma$ | $t$ | $p$ | Decision |
|---|---|---|---|---|---|---|
| Quantitative | 17 | -0.26 | 0.97 | -1.13 | 0.86 | Fail to reject |
| Qualitative | 18 | -0.21 | 0.82 | -1.12 | 0.86 | Fail to reject |

Table 4 shows the *t*-statistic and *p*-value for the quantitative and qualitative presentation results, as well as the null hypothesis decision.

## Discussion

The purpose of this project was to determine whether a qualitative or quantitative nutritional education would have a greater positive impact on the eating habits of high school female athletes. The hypothesis that the qualitative nutritional presentation would have a greater positive impact was not supported because neither the quantitative nor qualitative presentation had a significant impact on the eating habits of the participants.

There was not enough evidence to reject the null hypothesis that watching the nutrition presentations had no or a negative effect on the eating habits of participants. Neither the quantitative presentation ($t(17)=-1.13$, $p>0.05$) nor the qualitative presentation ($t(18)=-1.12$, $p>0.05$) had a significant impact on the eating habits of the participants (See Table 4). This lack of significance suggests that both a quantitative and qualitative perspective on nutrition are needed to affect eating habits, or that nutritional knowledge does not necessarily influence nutrition.

A sample screenshot submitted by Participant QQNPE2051 is shown in Figure A1, and Table 1 contains all of the raw data collected, including each participant, the type of presentation they watched, and the number of nutritional guidelines they met the week before and after watching a nutritional presentation. The mode of two nutritional guidelines met out of five (Table 3) suggests that participants' diets are inadequate. Figure 2 displays the differences

between the weeks for each type of presentation. The participants who watched the qualitative presentation had a positive change more frequently, supporting the hypothesis that the qualitative presentation would be more effective than the quantitative. However, the results from both types of presentation are similar enough that the null hypothesis cannot be rejected. This trend is depicted in Table 3 as well since the mean of the change between the two weeks for the quantitative presentation is slightly more negative than the mean of the changes between the two weeks for the qualitative presentation. Since both means in Table 3 are negative, the participants' eating habits met less nutritional guidelines in the second week. The mode of the differences for both presentations is zero, meaning there was no change between the two weeks for most participants. These mean and mode values suggest that overall the presentations had a neutral or negative effect on the eating habits of participants.

Although a negative change was present between Week One and Week Two and participants who watched the qualitative presentation met more guidelines than those who watched the quantitative presentation, neither differences were statistically significant, meaning that neither presentation had a notable effect on the athletes' eating habits. Additionally, few participants met all nutritional guidelines. The participants' diets did not align with the suggested daily nutritional values. These poor eating habits can result in low energy availability, which in turn puts the athletes at risk of developing the female athlete triad. A study done in 2019 acknowledges this high risk for female athletes (Winter et al.). Instead of educating female athletes, the study evaluated their knowledge of the triad and found that this knowledge was incomplete. Not being fully aware of the consequences of proper eating habits may have been a factor in the participants' low energy intake in the 2019 study. Studies by Condo et al. in 2019 and Day et al. in 2015 garnered similar results when evaluating the diets of female athletes. The

participants of both studies were found to be lacking in their daily energy consumption. The dietary choices of professional athletes during a competition were evaluated in a 2019 study (Pelly & Thurecht). They found that the athletes chose foods containing carbohydrates over any other food group. A similar occurrence could have taken place in this study, which could explain the low number of guidelines met since the guidelines covered a variety of food groups. While participants were exposed to nutritional knowledge, they failed to implement that knowledge into their daily consumption habits. The aforementioned study by Day et al. likewise concluded that nutritional knowledge does not impact dietary intake. In contrast, Manore et al. (2017) emphasize the importance of nutritional education for high school athletes, suggesting that this healthful knowledge will help them make more beneficial dietary decisions later in life. A nutritional smartphone application was used by participants to track their eating habits in this current study. In previous studies, correlations between fitness tracking apps and eating disorders have been made (Levinson et al., 2017, & Simpson & Mazzeo, 2017). Perhaps the utilization of the application made participants more sensitive to and therefore self-conscious about their eating habits, leading them to practice and report low consumption.

There were some possible sources of error in the experiment. There was a relatively small sample size. Moreover, not all participants submitted screenshots for all four days, and some participants may have not been entirely accurate in their reports. The participants may have not watched the presentation that they were instructed to watch. Additionally, in a 2013 telephone survey of adults in the United States, 63% of respondents who track their health data reported that the tracking has impacted their perspective on health (Fox & Duggan). Therefore, the simple action of participants tracking their intake could have affected their results.

Future research on this topic could explore how including the benefits of healthy eating in nutritional education impacts athletes' eating habits and attitudes toward eating. Studies could try to determine how one's sport, gender, or competitive level impacts their eating habits. Finally, the viewing of nutritional presentations could be compared to other methods of teaching healthy habits, such as being rewarded for healthy behaviors. Further investigations of athlete nutrition and education are essential in developing strategies to improve athletes' health and performance.

## Acknowledgments

The author would like to thank the participants for their time, Tracy Burke and Dr. James McCallum for their presentation suggestions, and Dr. Michelle Wyatt and Lindsey Rega for their support and guidance.

**References**

Birch, K. (2005). Abc of sports and exercise medicine: Female athlete triad. *British Medical Journal*, *330*(7485), 244-246. https://doi.org/10.1136/bmj.330.7485.244

Condo, D., Lohman, R., Kelly, M., & Carr, A. (2019). Nutritional intake, sports nutrition knowledge and energy availability in female Australian rules football players. *Multidisciplinary Digital Publishing Institute*, *11*(5). https://doi.org/10.3390/nu11050971

Day, J., Wengreen, H., Heath, E., & Brown, K. (2015). Prevalence of low energy availability in collegiate female runners and implementation of nutrition education intervention. *Sports Nutrition and Therapy*, *1*(1), 1-7. https://doi.org/10.4172/2473-6449.1000101

Fox, S., & Duggan, M. (2013). Tracking for health. *Pew Research Center.* https://www.pewresearch.org/internet/2013/01/28/tracking-for-health/

Kleiner, S. M., & Greenwood-Robinson, M. (2019). *The new power eating*. Human Kinetics. Retrieved October 8, 2020 from https://www.bscg.org/nutrition-for-female-athletes/

Levinson, C. A., Fewell, L., & Brosof, L. C. (2017). My Fitness Pal calorie tracker usage in the eating disorders. *Eating Behaviors*, *27*, 14-16. https://doi.org/10.1016/j.eatbeh.2017.08.003

Manore, M. M., Patton-Lopez, M. M., Meng, Y., Wong, S. (2017). Sport nutrition knowledge, behaviors and beliefs of high school soccer players. *Molecular Diversity Preservation International*, *9*(4). https://doi.org/10.3390/nu9040350

National Cancer Institute (Ed.). (n.d.). *Automated Self-Administered 24-Hour (ASA24®) Dietary Assessment Tool*. National Cancer Institute. Retrieved October 8, 2020, from https://epi.grants.cancer.gov/asa24/

Nattiv, A., Loucks, A. B., Manore, M. M., Sanburn, C. F., Sundgot-Borgen, J., & Warren, M. P. (2007). The female athlete triad. *American College of Sports Medicine*, *39*(10), 1867-1882. https://doi.org/10.1249/mss.0b013e318149f111

Pelly, F. E., & Thurecht, R. (2019). Evaluation of athletes' food choices during competition with use of digital images. *Molecular Diversity Preservation International*, *11*. https://doi.org/10.3390/nu11071627

Pilis, K., Stec, K., Pilis, A., & Mroczek, A. (2019). Body composition and nutrition of female athletes. *National Institute of Public Health, 70*(3), 243-251. https://doi.org/10.32394/rpzh.2019.0074

Simpson, C. C., & Mazzeo, S. E. (2017). Calorie counting and fitness tracking technology: Associations with eating disorder symptomatology. *Eating Behaviors*, *26*, 89-92. https://doi.org/10.1016/j.eatbeh.2017.02.002

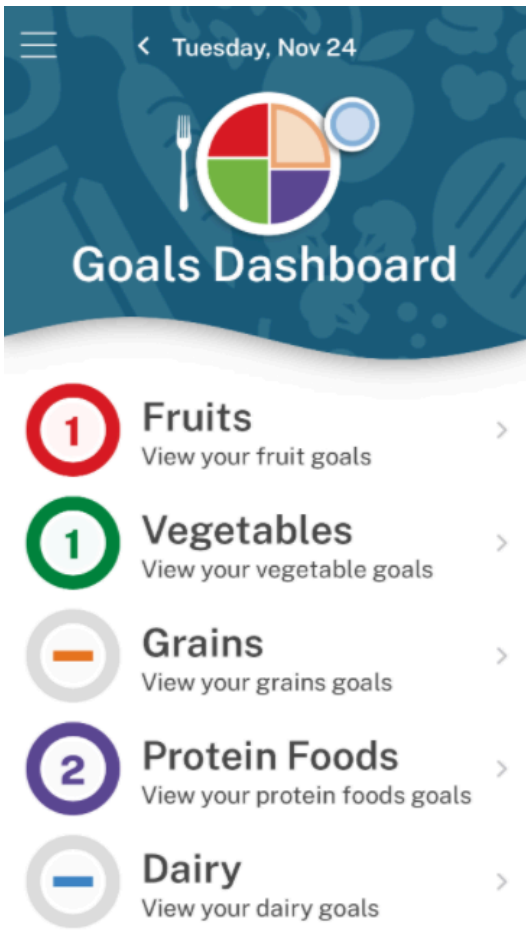
Heaney, S., O'Conner, H., Gifford, J., & Naughton, G. (2010). Comparison of strategies for assessing nutritional adequacy in elite female athletes' dietary intake. *International Journal of Sport Nutrition and Exercise Metabolism, 20*(3), 245-256. https://doi.org/10.1123/ijsnem.20.3.245

Winter, J., Black, K., Brown, R. (2019). Knowledge of low energy availability, relative energy deficiency in sport and the female athlete triad amongst female athletes and active individuals. *Molecular Diversity Preservation International, 37*(1). https://doi.org/10.3390/proceedings2019037024

Zawila, L. G., Steib, C.-S. M., & Hoogenboom, B. (2003). The female collegiate cross-country runner: Nutritional knowledge and attitudes. *Journal of Athletic Training*, *38*(1), 67-74. https://www.journalofathletictraining.org

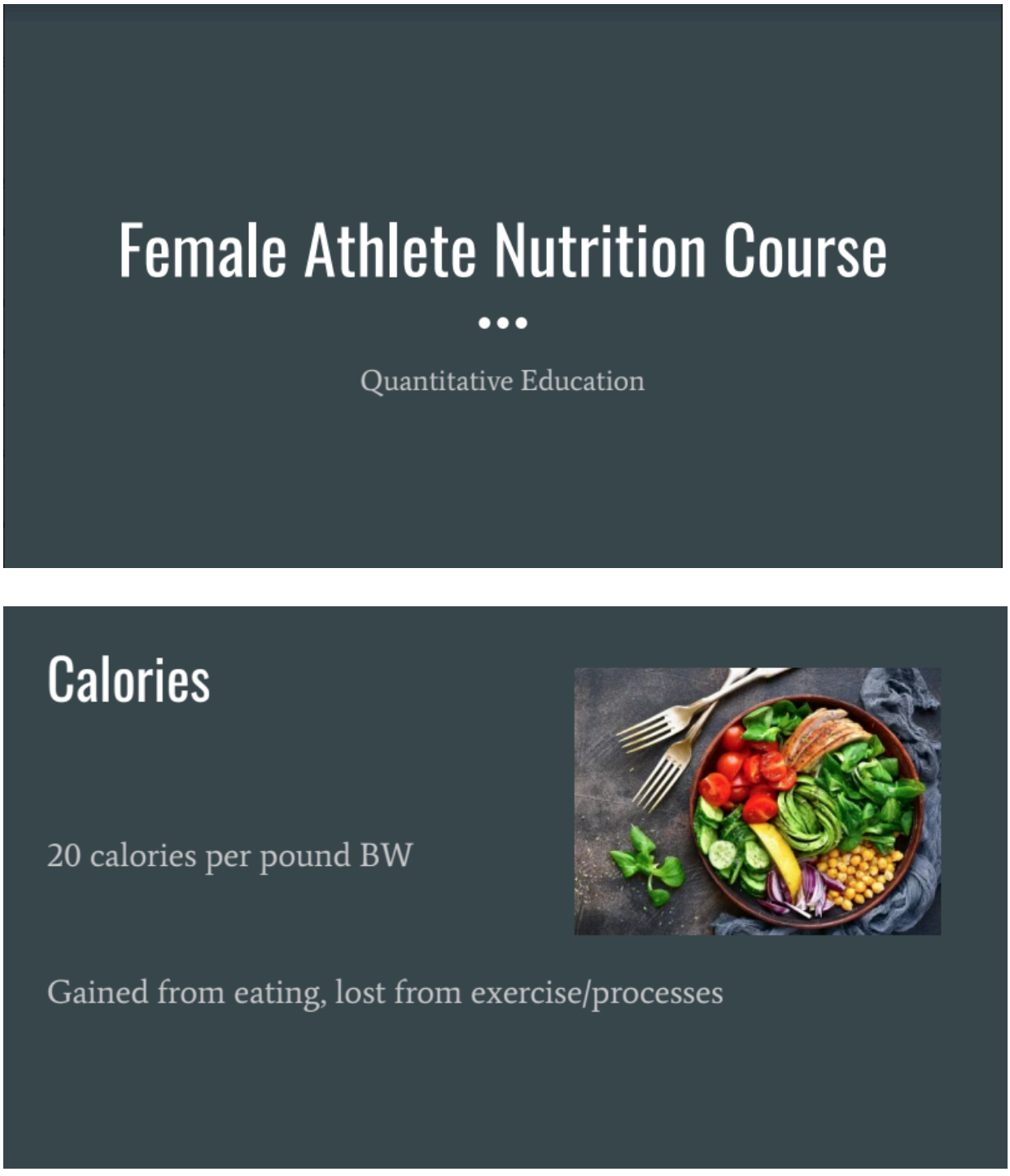
# Appendix

**Figure A1**: *Sample Submission*




This screenshot was submitted by Participant QQNPE2051 on the Tuesday of Week Two. The number in each circle represents the serving(s) of that food group consumed. --- indicated that no servings were consumed.

**Figure A2:** *Quantitative Presentation*



# Nutrition Labels

**Nutrition Facts**

Serving size 1 potato (148g/5.2oz)

Amount per serving

**Calories** **110**

| | % Daily Value* |
|---|---|
| **Total Fat** 0g | **0%** |
| Saturated Fat 0g | **0%** |
| Trans Fat 0g | |
| **Cholesterol** 0mg | **0%** |
| **Sodium** 0mg | **0%** |
| **Total Carbohydrate** 26g | **9%** |
| Dietary Fiber 2g | **7%** |
| Total Sugars 1g | |
| Includes 0g Added Sugars | **0%** |
| **Protein** 3g | |
| Vitamin D 0mcg | 0% |
| Calcium 20mg | 2% |
| Iron 1.1mg | 6% |
| Potassium 620mg | 15% |
| Vitamin C 27mg | 30% |
| Vitamin $B_6$ 0.2mg | 10% |

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

# Carbohydrates

2-6 grams per pound BW

60% of calories

# Protein

½-1 gram per kilogram BW

15% of calories

# Fats

20-30% of total calories

# Micronutrients

18 mg iron

1,000 mg calcium ~ 4 8oz glasses

1,340 mg vitamin D

# Hydration

Performance compromised in deficits of 2% of BW

BW/2 → oz per pound

# References


Kleiner, S. M. (n.d.). *Nutrition for female athletes*. BSCG. Retrieved October 8, 2020, from https://www.bscg.org/nutrition-for-female-athletes/

Loyola University Health System. (2014, September 2). Drinking too much water can be fatal to athletes. *ScienceDaily*.Retrieved October 8, 2020 from www.sciencedaily.com/releases/2014/09/140902143238.htm

Oxford University Press (Ed.). (2020, September). Oxford English dictionary. *Oxford Language Dictionaries Online*. Retrieved October 8, 2020, from https://languages.oup.com/research/oxford-english-dictionary/

Thomas, D. T., Erdman, K. A., & Burke, L. M. (2016). Position of the Academy of Nutrition and Dietetics, Dietitians of Canada, and the American College of Sports Medicine: Nutrition and athletic performance. *Journal of the Academy of Nutrition and Dietetics*, *116*(3), 501-528. https://doi.org/10.1016/j.jand.2015.12.006

TrueSport (Ed.). (2019). *How much water do youth athletes need?* TrueSport. Retrieved October 8, 2020, from https://learn.truesport.org/how-much-water-should-youth-athletes-drink/#:~:text=A%20good%20rule%20of%20thumb,ounces%20of%20water%20a%20day).

Tuax, R. (2012, May 6). *Basic nutrition guidelines for female athletes* (MinuteMedia, Ed.). STACK. Retrieved October 8, 2020, from https://www.stack.com/a/basic-nutrition-guidelines-for-female-athletes

Zawila, L. G., Steib, C.-S. M., & Hoogenboom, B. (2003). The female collegiate cross-country runner: Nutritional knowledge and attitudes. Journal of Athletic Training, 38(1), 67-74.


# Image References


[Carbohydrates]. (2019, January). Diabetes.co.uk. https://www.diabetes.co.uk/nutrition/simple-carbs-vs-complex-carbs.html

[Fats]. (n.d.). APWU. https://www.apwuhp.com/healthy-fats-vs-unhealthy-fats/

[Micronutrients]. (2019, June 20). Luxury Lifestyle Magazine. https://www.luxurylifestylemag.co.uk/food-and-drink/everything-you-need-to-know-about-micronutrients-to-stay-healthy/

[Nutrition label]. (2016, July 7). Colorado Potato. https://www.coloradopotato.org/new-nutrition-label/

[Protein]. (2020, September 9). Runner's World. https://www.runnersworld.com/nutrition-weight-loss/a20850262/protein-for-runners-101/

[Salad]. (2018). Sharecare. https://www.sharecare.com/health/nutrition-and-weight-loss/article/diet-quality-calories-weight-loss

[Water bottles]. (2020, March 27). Wirecutter. https://www.nytimes.com/wirecutter/reviews/best-water-bottle/

**Figure A2:** *Qualitative Presentation*

# Whole vs. Processed

Minimally processed

Processed

Highly processed

# Carbohydrates

Starchy vegetables, fruits, whole grains, beans, and dairy

Most important

# Protein

Meat, fish and seafood, eggs, dairy, grains, beans, nuts, and seeds

Baked, grilled, or broiled

# Fats

Fatty fish, nuts and seeds, avocados, olives, and vegetable oils

Plant-based & Omega-3 fatty acids

# Micronutrients

Dark meats, leafy veggies & oysters for iron

Dairy products & leafy veggies for calcium

Sun exposure for vitamin D

# Hydration

Performance compromised in deficits of 2% of BW

BW/2 → oz per pound

# References


Havard T.H. Chan (Ed.). (n.d.). *Processed food and health*. Harvard T.H. Chan. Retrieved October 8, 2020, from https://www.hsph.harvard.edu/nutritionsource/processed-foods/

Kleiner, S. M. (n.d.). *Nutrition for female athletes*. BSCG. Retrieved October 8, 2020, from https://www.bscg.org/nutrition-for-female-athletes/

Loyola University Health System. (2014, September 2). Drinking too much water can be fatal to athletes. *ScienceDaily*.Retrieved October 8, 2020 from www.sciencedaily.com/releases/2014/09/140902143238.htm

NDTV Food Desk. (2020, September 21). *8 most hydrating drinks besides water*. NDTV Food. Retrieved October 8, 2020, from https://food.ndtv.com/food-drinks/8-most-hydrating-drinks-besides-water-1774730

Oxford University Press (Ed.). (2020, September). Oxford English dictionary. *Oxford Language Dictionaries Online*. Retrieved October 8, 2020, from https://languages.oup.com/research/oxford-english-dictionary/

Tiwari, A., Aggarwal, A., Tang, W., & Drewnowski, A. (2017). Cooking at home: A strategy to comply with U.S. dietary guidelines at no extra cost. *American Journal of Preventative Medicine*, *52*(5), 616-624. https://doi.org/10.1016/j.amepre.2017.01.017

Zawila, L. G., Steib, C.-S. M., & Hoogenboom, B. (2003). The female collegiate cross-country runner: Nutritional knowledge and attitudes. Journal of Athletic Training, 38(1), 67-74.


# Image References


[Carbohydrates]. (2019, January). Diabetes.co.uk. https://www.diabetes.co.uk/nutrition/simple-carbs-vs-complex-carbs.html

[Fats]. (n.d.). APWU. https://www.apwuhp.com/healthy-fats-vs-unhealthy-fats/

[Micronutrients]. (2019, June 20). Luxury Lifestyle Magazine. https://www.luxurylifestylemag.co.uk/food-and-drink/everything-you-need-to-know-about-micronutrients-to-stay-healthy/

[Protein]. (2020, September 9). Runner's World. https://www.runnersworld.com/nutrition-weight-loss/a20850262/protein-for-runners-101/

[Salad]. (2018). Sharecare. https://www.sharecare.com/health/nutrition-and-weight-loss/article/diet-quality-calories-weight-loss

[Water bottles]. (2020, March 27). Wirecutter. https://www.nytimes.com/wirecutter/reviews/best-water-bottle/