Effect of nutrition education on food and beverage choices of adolescent female dancers

Marie Ann Williams

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Effect of Nutrition Education on Food and Beverage Choices of Adolescent Female Dancers

by

Marie Ann Williams

Thesis

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Dietetics and Human Nutrition Program
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in

Human Nutrition

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Abstract

Lifestyle choices affect the risk of obesity and ill-health among youth. This study determined whether providing nutrition education to adolescent females enrolled in dance classes influenced their beverage and food choices. It was hypothesized that providing six 10-minute nutrition education sessions for three weeks to adolescent dancers would increase their healthy beverage and food choices. Sixteen girls (12-18 years), from two dance studios in Kingsport, Tennessee, completed this pre-test/post-test study. After nutrition education, soda consumption reduced by 7.7%; sugar sweetened beverages (excluding sodas) reduced by 23%; intakes of fruits and vegetables were enhanced by 5.6% and 21%, respectively. Paradoxically, home-cooked meals and breakfast consumption on dance practice days were reduced by 12.5% and 6.2%, respectively. Although some improvements in beverage and food choices were evident, these changes were not statistically significant due to the small sample size. The current study provides a framework for future studies on providing lifestyle education.
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Chapter 1: Introduction and Background

Introduction

Active children and adolescents need a healthy diet to provide adequate nutritional intake for proper growth, development, and disease prevention (Gidding et al., 2006). Children and adolescents should also engage in 60 minutes of physical activity on most or all days of the week for overall health and well-being. This activity should include aerobic, muscle strengthening, and bone strengthening activities (Office of Disease Prevention and Health Promotion [ODPHP], 2008). Ballet, tap, jazz, and other advanced dances are examples of physical activities that offer aerobic, muscle strengthening, and bone strengthening activities for adolescent females.

Despite the efforts to address obesity, the increased percentage of children classified as overweight or obese is a concern for practitioners. It is well known that lifestyle and dietary choices promote obesity among America’s youth (Barlow, 2007; Gidding et al., 2006; Nurul-Fadhilah, Teo, Huybrechts, & Foo, 2013). The classifications of being overweight and obese are based on the Center for Disease Control and Prevention (CDC) or World Health Organization (WHO) growth charts. For example, a child aged 2 to 20 years old in the 85th to 95th percentile would be classified as overweight, and a child ≥ 95th percentile would be classified as obese. Today, approximately 17% of all children aged 2 to 19 years old are classified as obese in the United States of America (CDC, 2014). Obesity rates for school-age children and adolescents have reached the highest levels in the past 50 years at 21% for females aged 12 to 19 years old. In addition, 33.8% of all females aged 12 to 19 years old are considered overweight or obese (Ogden, Carroll, Kit, & Flegal, 2014). Obesity among children and adolescents results from multiple factors and includes poor eating habits and physical inactivity (Shepherd et al., 2006;
Stang, 2008). Many barriers can prevent children and adolescents from making healthy food choices, such as time constraints, social pressure, and food costs, but nutrition education can promote behavioral modifications and increase healthy food choices (Gidding et al., 2006; Yeh et al., 2008).

Assessing the nutritional status of children and adolescents is important for monitoring growth and development. A complete assessment of nutritional status includes anthropometric values for children and plotting height and weight ratios on the CDC or the WHO growth charts (Stang, 2008). The nutritional status, dietary intake, and physical activity level are used to determine if individuals are meeting the recommended dietary values. The United States Department of Agriculture (USDA) dietary recommendations were specified in the *Dietary Guidelines for Americans (DGA) 2015–2020* (ODPHP, 2015) report and are a collection of the dietary recommendations by the Institute of Medicine (IOM) and the Academy of Pediatrics. The Food and Nutrition Board of the IOM and the Academy of Pediatrics have developed dietary recommended intakes and recommended dietary allowances based on estimated energy requirements for specific age groups and average daily nutrient requirements for the population (Ainsworth et al., 2000; Gerrior, Juan, & Basiotis, 2006). These standards were developed using age, height, weight, sex, and activity levels to determine nutrient needs. The recommended daily calorie intakes for females aged 12 to 18 years old who are physically active are in the range of 2,000 to 2,400 calories and the corresponding recommended fruit and vegetable intakes are 2 cups of fruits and 2 ½ to 3 cups of vegetables daily (Gerrior et al., 2006; ODPHP, 2015; See Appendix A: *DGA Recommendations*).

Eating a variety of healthy foods provides the necessary nutrients for growth and development among children and adolescents. Diseases, such as cardiovascular disease, cancer,
diabetes, and Alzheimer’s disease, have been shown to have an increased risk of developing when a diet is not rich in healthy foods such as fruits and vegetables. Fruits and vegetables offer antioxidant and anti-cancer properties for disease prevention (Liu, 2003).

Adequate fluid intake is also essential for growth, development, and proper hydration during and after moderate to vigorous physical activity. The 2005 IOM recommendations for fluid intake for females aged 9 to 13 years old is approximately 1.6 L (7 cups) from total beverages. The recommendation for females aged 14 to 18 years old is 1.8 L (8 cups) from total beverages (IOM, 2005). The evaluation of dietary recalls of the 1977 to 1978 Nationwide Food Consumption Survey, USDA 1994 to 1996 Continuing Survey of Food Intakes by Individuals, and more recently National Health and Nutrition Examination Survey (NHANES) data from 2005 to 2006 suggest that plain water intake changed little over this time period (Sebastian, Wilkinson Enns, & Goldman, 2011). These surveys found that 25% to 28% of fluid intake comes from the moisture in foods, 28% to 33% from drinking plain water, and 44% from all other beverages. These amounts suggest that between 2.2 cups and 2.5 cups of plain water by females aged 9 to 13 years old and 2.4 cups to 2.7 cups by females aged 14 to 18 years old are consumed on a daily basis.

Additionally, in order to prevent dehydration, fluid needs vary by activity intensity. The American College of Sports Medicine, Committee on Nutrition and the Council on Sports Medicine and Fitness, National Federation of State High School Associations (NFHS), and Sports Medicine Advisory Committee support the recommendation of plain water for fluid replacement for normal conditions of exercise and physical activity (NFHS, 2015; Sawka et al., 2007; Schneider & Benjamin, 2011). Certain circumstances that permit the use of sports drinks, such as Gatorade®, include vigorous activities lasting more than 1 hour in duration or events in
extreme heat. The general guidelines from the Academy of Nutrition and Dietetics for adolescents involved in light to moderate physical activity include 10 to 14 ounces (1.25 cups to 1.75 cups) of cool water 1 to 2 hours before exercise, 10 to 12 ounces (1.25 cups to 1.5 cups) of cool water 10 to 15 minutes before the activity, and 4 to 6 ounces (0.5 cup to 0.75 cup) of cool water every 15 to 20 minutes during the activity. For athletes who are required to weigh before and after vigorous activities, 16 to 24 ounces (2 to 3 cups) of cool fluids are needed for every pound of weight lost. For most physical activity, normal meals and beverages should restore fluid balance (Sawka et al., 2007; Spear 2005).

Nutrition education that targets specific behaviors for modification and emphasizes the importance of healthy eating and physical activity is a recommendation for the prevention of obesity in children (Barlow, 2007; Van der Horst et al., 2007). These behaviors include: limiting sugar-sweetened beverages (SSBs), limiting foods consumed away from home and encouraging family mealtimes, consuming the USDA recommended amount of fruits and vegetables, eating breakfast, consuming appropriate portion sizes, limiting screen time, incorporating moderate to vigorous physical activity for at least 60 minutes per day, and encouraging adequate sleep (Barlow, 2007; Reedy & Krebs-Smith, 2010).

Dance academies in Northeast Tennessee promote physical activity to young females by offering dance classes with moderate to vigorous activity at least one day per week. Children can enroll in multiple classes as they progress through the stages of dance competency, increasing the duration and number of days per week of moderate to vigorous activity. The dance classroom provides a convenient location for nutrition education. Nutrition education as a treatment for childhood obesity has been supported in literature for behavioral change (Barlow,
The American Heart Association considers the family and home life as the first step of intervention for the prevention of childhood obesity (Gidding et al., 2006).

**Statement of the Problem**

According to the NHANES survey for data collected during the years 2011 and 2012, approximately 33.8% of females aged 12 to 19 years old were classified as overweight or obese (Ogden et al., 2014). Genetic and environmental factors contributed to the prevalence of obesity in children. Lifestyle choices, such as dietary intake and beverage choices, have been shown to increase the risk of obesity among youth (Gidding et al., 2006; Shepherd et al., 2006; Stang, 2008). Studies show that most children aged 9 to 18 years old consume SSBs and energy drinks in excess (Barlow, 2007; Branum, Rossen, & Schoendorf, 2014; Han & Powell, 2013; Keast et al., 2013); have low plain water intake (Sebastian et al., 2011); consume an increased number of meals away from home (Barlow, 2007; CDC, December 2014; Powell & Nguyen, 2013); do not meet the recommended dietary intakes of fruits and vegetables (Kim et al., 2014; Kimmons, Seymour, & Blanck, 2009; Krebs-Smith, Guenther, Subar, Kirkpatrick, & Dodd, 2010; National Cancer Institute [NCI], 2014); skip meals (Nurul-Fadhilah et al., 2013; Smith et al., 2010); consume excessive calories from fats and sugars (Keast, Fulgoni, Nicklas, & O’Neil, 2013; Krebs-Smith et al., 2010; NCI, 2014; Reedy & Krebs-Smith, 2010); and do not meet the recommended physical activity level needed for overall health, well-being, and disease prevention (Vadiveloo, Zhu, & Quatromoni, 2009).

**Objective of This Study**

The objective of this study was to determine if a nutrition education program would result in healthy food choices and behaviors. In order to accomplish this goal, nutrition education
targeted behavior change, and education handouts (Appendix B: Educational Handouts) offered recipes and recommendations for healthy eating. The handouts were provided to the dancers during the education sessions. Examples of serving sizes were used for illustration purposes during the sessions. It was hypothesized that providing 10-minute nutrition education sessions during dance classes for 3 weeks (totaling six education sessions) and providing handouts with the nutrition information discussed in the class for adolescents to review with parents or guardians would increase healthy food and beverage choices.
Chapter 2: Literature Review

The Eastern Michigan University and PubMed electronic databases were used for this literature review. Criteria for inclusion for the search included (a) full text publications from the years 2004 to 2015; (b) publications in the English language; (c) publications involving children aged 12 to 18 years old; and (d) publications including key words: obesity prevention, physical activity, childhood, adolescents, hydration, beverage consumption, skipping breakfast, sugar-sweetened beverages (SSBs), energy drinks, dietary intake, nutrition education, dance, or fruit and vegetable intake. Statistical information from the United States Department of Agriculture (USDA) and Center for Disease Control and Prevention (CDC) reports was also used in the literature review. Additional full text publications and references from the years 2000 to 2017 were used as references throughout this paper.

Prevention of Childhood Obesity

An expert committee was formed in 2005 to revise the 1998 recommendations on prevention, assessment, and treatment of child and adolescent obesity (Barlow, 2007). The committee was formed from 15 national health care organizations, including the American Medical Association, the Health Resources and Services Administration, and the CDC. After reviewing the most recent literature, this committee concluded that the following topics were of significance in relationship to childhood obesity: consumption of SSBs, meals outside of home, fruit and vegetable intake, skipping breakfast, and an imbalance of energy intake and energy expenditure. A review of literature supports targeting these factors for obesity prevention and optimum health for physically active children and adolescents.
Sugar-sweetened beverages and plain water intake. The intake of SSBs has been identified as a risk factor for obesity in children and adolescents (Barlow, 2007). Some fruit juices, sodas, sports drinks, lemonade, and sweet tea are examples of SSBs. In recent years, the introduction of energy drinks has significantly contributed to the overconsumption of these beverages in children. These beverages can contain excessive amounts of carbohydrates, caffeine, herbs, vitamins, proteins, amino acids, and other ingredients such as carnitine (NFHS, 2015; Schneider & Benjamin, 2011). The ODPHP for the United States does not currently have recommendations for caffeine intake for children (Gerrior et al., 2006). Without a standard for comparison, the effects of adolescent consumption of these beverages have not been fully examined.

Studies suggest children and adolescents consume more SSBs and energy drinks than plain water (Barlow, 2007; Branum et al., 2014; Han & Powell, 2013). A brief report from the USDA Food Surveys Research Group showed plain water consumption is low in adolescent years (Sebastian et al., 2011). To determine national fluid intake, responses of the first day from the National Health and Nutritional Examination Survey (NHANES) 2005–2008 database from 16,564 people aged 2 and older were evaluated. It was found that 75% of female adolescents aged 12 to 19 years old consumed plain water on a given day, and the average intake was only 3.1 cups per day. Additionally, Park, Blanck, Sherry, Brener, and O’Toole (2012) conducted a cross-sectional national survey, the National Youth Physical Activity and Nutrition Survey to evaluate the factors associated with high school students’ low plain water intake in the United States of America. The study was conducted by the CDC and included a questionnaire on physical activity, dietary intake, and behavioral questions. The study was a three-stage cluster sample and was designed to be nationally representative. The survey was self-administered and
included 11,049 students in ninth through twelfth grades after exclusion for any missing data. The questionnaire did not ask the participants to quantify their consumption (bottle or glass of water) and only considered frequency of consumption. Regarding plain water intake, based on logistic regression analysis, the results were categorized into low water intake of <3 times per day (approximately 3.4 cups per day) and adequate intake of >3 times per day. The results found approximately 55% of female high school students consumed plain water less than 2 times per day and 45% consumed plain water 3 times per day or greater.

Han and Powell (2013) also evaluated the responses from the NHANES database from 1999 to 2008 and used trend and cross-sectional analyses for demographic and socioeconomic variables to track changes over time. The first 24-hour dietary recalls were used. Adolescents were identified as aged 12 to 19 years old, and 8,922 adolescent participants were included. The prevalence of SSBs consumed by adolescents decreased from 87% to 77% from 1999 to 2008. The prevalence of soda intake decreased from 70% to 51%, and calories from sodas decreased from 383 to 286 calories. Grouping sports drinks and energy drinks together showed an increase in the amount of adolescents consuming these drinks, and tripled from 4% of adolescents to 12% during this time. Calories from sports and energy drinks increased from 127 to 167 calories per day. Overall, SSB consumption slightly decreased over time, but coffee and energy drink intake increased for children and adolescents during the same time period.

The responses from the NHANES database from the years 1999 through 2010 found that the intake of soda, energy drinks, and coffee among children and adolescents contributed to the caffeine intake of children and adolescents (Branum et al., 2014). In the study, the first 24-hour survey was used, and caffeine intake was estimated by the average caffeine intake from foods and beverages in milligrams per day (mg/day) by demographic characteristics and caffeine
source. In order to track the trend of caffeine intake over time, those with responses of “no caffeine intake” for the first day of responses were also followed over time. The results of the study concluded that children aged 12 to 16 years old have decreased caffeine consumption over the years. In 1999-2000, the average intake was 80.6 mg of caffeine per day. By 2001–2002, the consumption rate dropped to 61.2 mg/day and has remained fairly constant through 2009–2010, which showed an average of 64.3 mg of caffeine per day. Adolescents aged 17 to 18 years old consumed an average of 124.4 mg/day in 1999–2000, but the level decreased to 105 mg/day in 2001–2002. Since then, caffeine intake has remained fairly constant, and 2009–2010 data showed an average consumption of 96.1 mg of caffeine per day. The main contributors of caffeine have changed over time for these age groups. For children aged 12 to 16 years old, consumption of coffee increased from 5.1% of total caffeine intake per day in 1990–2000 to 12.2% in 2009–2010. Although soda consumption decreased from 64.6% in 1999–2000 to 45.8% in 2009–2010, energy drinks have rapidly increased from 0.6% in 2001–2002 to 3.0% in 2009–2010. For the 17 to 18 year old age group, coffee contribution to caffeine increased from 15.0% in 1999–2000 to 28.6% in 2009–2010. The caffeine from soda intake decreased from 62.3% to 39.9% per day, and caffeine from energy drinks increased from 0.1% to 2.2% per day in 2009–2010.

The latest data regarding adolescents’ consumption of energy drinks and soft drinks in 2010 to 2011 showed an increase of energy drink consumption since 2008 (Terry-McElrath, O’Malley, & Johnston, 2014). Personnel from the University of Michigan administered the “Monitoring the Future” survey to 8th, 10th, and 12th grade students to assess energy drink, soft drink, and substance use among adolescents. The survey found an average of 32% of all children in 8th, 10th, and 12th grades consume at least one energy drink per day. In addition, an average of
47% of the students consumed at least one soft drink per day. These studies suggest a need for nutrition education to decrease consumption of SSBs and energy drinks by children and adolescents and promote plain water consumption.

**Meals outside of home.** Consuming meals away from home has also been identified as a factor for childhood obesity (Barlow, 2007). Powell and Nguyen (2013) reviewed the 2-day dietary recall records of children and adolescents from the 2003 to 2008 responses of the NHANES database and found that consuming meals outside the home contributed to excessive intake of energy, fat, and sodium. Two days of 24-hour dietary recall data from 4,699 adolescents, 12 to 19 years old were used to determine the average daily intake of energy, sugar, sodium, fat, and saturated fat. During the study, the location of the meals was examined and classified as fast food restaurant, full-service restaurant, and restaurant with no additional information. The participants were also asked if they consumed the meal away from home or if the meal was purchased and taken home. Additionally, beverage choice at meals, total calories of energy, sugar, fat, and saturated fat of the food items were also evaluated. Reviewing the first day of food records independently, the study revealed that 42% of all adolescents from age 12 to 18 years old had a meal at a fast food restaurant and 25% of these fast food meals were consumed away from home; the remaining 17% were purchased and consumed at home. Additionally, 18% of the adolescents had a meal at a full-service restaurant and 15% of these full-service meals were consumed away from home; the remaining 3% were purchased and consumed at home. The study also found that on day two of the survey, 35% of adolescents had a meal from a fast food restaurant, and 15% of these meals were consumed away from home; the remaining 20% were purchased and consumed at home. Additionally, 12% of meals were at a full-service restaurant and 9% of these meals were consumed away from home; the remaining
3% were purchased and consumed at home. The study compared the dietary intake from meals at home to meals from fast food restaurants (whether eaten in the home or away from home) and found that meals from fast food restaurants provided an additional 310 calories, and meals from full-service restaurants provided an additional 267 calories per day. Sugar-sweetened beverage consumption and soda consumption also increased with meals from restaurants. Fast food restaurants accounted for the consumption of an additional 91 grams (3.2 oz) of SSBs, and full-service restaurants accounted for a consumption of 143 grams (5.0 oz) of SSBs more than foods prepared at home. Soda consumption increased by 163 grams (5.7 oz) and 107 grams (3.8 oz) for fast food and full-service restaurants respectively.

Additionally, Poti and Popkin (2011) of the Department of Nutrition at the University of North Carolina reviewed the dietary records from the Nationwide Food Consumption Survey 1977–1978, three surveys from the Continuing Survey of Food Intake by Individuals 1989–1998, and two surveys from the NHANES database of the 2003–2006 dietary recalls. The surveys differed in the number of dietary recalls from 2 to 3 days of records. Therefore, the study only included the first 2 days of dietary intake. Of the participants, a total of 29,219 were aged 2 to 18 years old. Energy intake by food location and consumption location were reviewed. Overall, for children aged 2 to 18 years old, the percentage of calories per day eaten away from home increased from 23.4% in 1977 to 33.9% in 2006, an increase of an average of 255 calories per day. Similarly, the percentage of meals eaten at home decreased from 74% in 1977 to 63% in the year 2006. Fast food provided 13% of total energy intake in the year 2006, an increase from 10% from the 1994–1998 data. Further evaluation for adolescents aged 13 to 18 years old found that food consumption at full service restaurants accounted for 6% of daily energy intake in 1994–1998 and 7% in 2003–2006 reports. Additionally, fast food contributions to energy intake
as a measure of calories per day increased from 15% in 1994–1998 to 17% in the 2003–2006 records. The studies presented suggest a need for nutrition education to decrease the number of meals eaten away from home. Intervention to encourage meal preparation at home and healthy food choices when eating away from home should be included in nutrition education.

**Fruit and vegetable intake.** The majority of America’s youth are not meeting the recommended dietary intakes of fruits and vegetables (Barlow, 2007). Krebs-Smith et al. (2010) examined the food records of 23,633 participants from the years 2001 to 2004 from the NHANES database. In this study, the available 24-hour recalls given during the initial interviews were used for the estimation of dietary intake of fruits and vegetables. The intake values were compared to the *Dietary Guidelines for Americans (DGA)* 2005 national recommendations and the researchers also used the USDA’s MyPyramid database food guidance system to evaluate the responses. Out of all of the participants examined, 1,077 were between 9 and 13 years of age, and 1,298 were between 14 and 18 years of age. The sedentary activity level was used to determine a reference for the minimum amount of recommended fruits and vegetables based on the caloric intake for these age groups. At this level of activity, a minimum dietary intake of 1.5 cups of fruits for females aged 9 to 13 years old and 2 cups for females aged 14 to 18 years old is recommended. It is also the recommendation to consume 0.75 cups of whole fruits each day for both age groups. The minimum daily recommendation of vegetables for females aged 9 to 13 years old is 1.5 cups and for females aged 14 to 18 years old is 2.5 cups daily. The study found that an overwhelming majority of females did not consume the minimum recommended amounts of fruits and vegetables. Reportedly, 80.6% of females aged 9 to 13 years old and 84.8% of females aged 14 to 18 years old did not consume the minimum
recommended amounts of fruits. The percentage of these children who did not meet the minimum recommended amounts of vegetable intake was 94.6% and 98.6%, respectively.

Additionally, a review of the 2003 to 2004 responses from the NHANES database also found that children were not consuming the recommended servings of fruits and vegetables (Kimmons et al., 2009). The results from two non-consecutive days of 24-hour recalls of dietary intake were averaged to estimate intake of fruits and vegetables. These values were compared to national recommendations of “food groups to encourage” from the DGA 2005 and the USDA MyPyramid recommendations for daily fruit and vegetable intake based on age, sex, and physical activity level. Of the 3,672 participants qualifying for inclusion, 1,667 male and female adolescents were aged 12 to 18 years old. Data from the participants were grouped in to categories of race and body mass index (BMI) percentiles from CDC growth charts. The responses for dietary intake of vegetables were also compared to individual caloric recommendations based on the DGA 2005 guidelines and were subdivided into categories to include: dark green, orange, legumes, starchy, and other vegetables. The recommended amount of fruits for children and adolescents was 2 cups, and the recommended amount of vegetables was 2.5 cups per day for the designated caloric intake range. The subdivided vegetable recommendation was based on weekly consumption. For example, dark green vegetables were to be consumed 3 cups per week, orange vegetables 2 cups per week, legumes 3 cups per week, and starchy vegetables 3 cups per week. The results from the surveys found that the median intake of fruits by all adolescents between the age of 12 and 18 years old was only 0.51 cup per day, and the intake of vegetables was only 0.72 cups per day when fried potatoes were removed from this category. In addition, only 49% of the adolescents reviewed had consumed whole fruits; the main fruit sources were “fruit containing items” such as yogurts, cakes, pies, and other
mixtures with fruits. Only 6.2% of adolescents consumed enough fruits to meet the USDA national recommendations. The results also revealed that only 5.8% met the recommended intake of vegetables, and that percent decreased to 2.2% when fried potatoes were removed from this category. When grouped into subcategories, the major contributors to vegetable intake were found to be fried potatoes, tomato products (pasta sauces, pizza, and salsa), and the other vegetables category (including tomatoes, cabbage, celery, cucumber, lettuce, onions, peppers, green beans, cauliflower, mushrooms, summer squash) based on the DGA 2005 subcategories (ODPHP, 2005).

Another study compared responses from multiple NHANES survey cycles (2003 to 2004, 2005 to 2006, 2007 to 2008, and 2009 to 2010) and showed a slight increase in fruit and vegetable intake from 2003 to 2010 among children (Kim et al., 2014). The national recommendations for fruit and vegetable intake from the DGA 2010 were used as the reference to compare participants’ recall entries. The total fruit category included all fruits consumed and 100% fruit juice. Intake levels were converted to cup equivalents per 1,000 calories based on the Healthy People 2020 (HP2020) objectives to increase fruit and vegetable consumption for all age groups. At the time of the study, the HP2020 recommended an increase of fruits from 0.5 cup equivalents per 1,000 calories to a target of 0.9 cup equivalents per 1,000 calories and an increase of vegetables from 0.9 cup equivalents per 1,000-calories to 1.1 cup equivalents per 1,000 calories by the year 2020 nationally. After reviewing one day of the survey responses, the study found the mean intake of fruit for all children aged 12 to 18 years old was 0.43 cup equivalents in the 2003–2004 recalls and 0.46 cup equivalents in the 2009–2010 recalls. The intake equated to less than 1 cup of fruits for a 2,000-calorie range per day of children aged 12 to 18 years old. The study also found that the vegetable intake for this age group was 0.55 cup
equivalents in the 2003–2004 responses and 0.60 cup equivalents in the 2009-2010 responses. These equate to slightly over 1 cup for a 2,000-calorie range per day for the age group. Although the review found that fruit and vegetable intake had increased from the 2003–2004 responses to the 2009–2010 responses, the fruit and vegetable dietary intake levels were still well below the HP2020 target and below the previous recommendations of 0.5 cup equivalents per 1,000 calories and 0.9 cup equivalents per 1,000 calories for fruits and vegetables, respectively.

An additional review by the National Cancer Institute (NCI, 2014) of the most recent responses in the NHANES database concur that fruit and vegetable intake has increased over time though below the recommended levels. Dietary intake was estimated by the NCI method that used the probability of consumption with logistic regression models and two 24-hour dietary recalls as the average consumption per day. Dietary recalls from the database of the 2007 to 2010 NHANES responses for 1,594 females aged 9 to 18 years old were compared to the recommendations by the DGA 2010. Responses for fruit and vegetable intakes were found to be below the recommended levels of 2 cups of fruit per day and 2.5 to 3 cups of vegetables per day. The study revealed that 75.5% of 9 to 13 year old females recorded fruit intakes that were below the DGA 2010 recommended fruit amounts. Only 11.9% of females from this age group consumed the recommended intake of fruits. The remaining 12.6% of females consumed amounts above the recommendations. The average intake of total fruits was found to be 1.07 cup equivalents. The study also found that the majority of females aged 14 to 18 years old (85.2%) consumed less than the recommended daily fruit intake. Only 8.09% of this population met the recommendations for fruit consumption. The remaining 6.76% of this age group consumed fruits above the recommended amounts. The average intake of total fruits was found to be 0.79 cup equivalents for this age group. The study found that 83.8% of females aged 9 to 13 years old
and that 98.4% of females aged 14 to 18 years old consumed lower amounts of vegetables per day than what the *DGA 2010* recommended. The percentage of these females who consumed the recommended daily intake of vegetables was 16.1% of females aged 9 to 13 years old and 1.25% aged 14 to 18 years old. Females who consumed amounts higher than the recommendations were found to be 0.17% for those between the ages of 9 and 13 years and 0.31% aged 14 to 18 years old. The average vegetable intake was found to be 1.04 cup equivalents for females aged 9 to 13 years old and 1.12 cup equivalents for females aged 14 to 18 years old. These studies indicate a need for nutrition education to encourage fruit and vegetable intake among youth.

**Skipping of breakfast.** The consumption of breakfast is another aspect in the prevention of childhood obesity. Children who skip meals, particularly breakfast, have a higher risk of becoming overweight or obese as seen in a study of 236 (132 adolescent females and 104 adolescent males) children in Kota Bharu, Kelantan, the northeast region of Malaysia (Nurul-Fadhilah et al., 2013). A questionnaire evaluating food frequency and dietary behaviors, along with some open-ended questions, was distributed to participants. An additional quantitative food frequency questionnaire was developed and validated during the study to help participants recall the previous year of food consumption and to record usual frequency and portion sizes. Physical activity levels were assessed by a validated computer-based questionnaire in order to evaluate activity during the past year. Body adiposity was measured with a dual energy X-ray absorptiometry device, and anthropometric measurements (weight, height, waist to hip circumference) were also recorded. The BMI of each child was calculated and recorded on standardized World Health Organization (WHO) growth charts. The study noted that 17.4% of female adolescents in the study were classified as overweight according to their BMI. The study found that female adolescents who ate breakfast more frequently measured lower in body weight,
BMI, waist circumference, and percentage of body fat. For example, adolescent females who ate
breakfast more than five days per week weighed an average of 5 kg less and had 4.8 cm lower
waist circumference than those who ate breakfast less than five days per week. In addition, the
calculated BMI of participants showed a difference of 1.7 kg/m$^2$ between those who consumed
breakfast more than five days per week compared to those who consumed breakfast less than
five days per week. The results of the study suggest that children who frequently skip or
irregularly eat breakfast have higher total body adiposity and abdominal obesity.

Additionally, a national study completed in Australia focused on the long-term effects of
skipping breakfast during childhood and found similar results (Smith et al., 2010). In 1985, the
Australian Schools Health and Fitness Survey involved a questionnaire on diet and physical
activity for children 7 to 15 years old in 109 primary and secondary schools. A follow-up study,
the Childhood Determinants of Adult Health, located 5,170 of the original participants for new
data collection in 2004 to 2006 and a new questionnaire was given. Approximately 30%
completed the follow-up questionnaire, totaling 2,248 participants. The surveys examined the
demographics, diet, and physical activity of those who completed the questionnaires. Dietary
intake for the specific age groups was compared to recommendations of the Australian Guide to
Healthy Eating. Anthropometric values were also recorded at each survey, and BMI was
calculated. Results indicate that those who skipped breakfast during childhood and adulthood
had higher waist circumferences by an average difference of 4.7 centimeters. Of the participants
that completed the study, 1,164 were female. The study found that 11.1% of females skipped
breakfast during childhood, compared to 9.3% of males. Of the female participants, 4.5%
skipped breakfast during both childhood and adulthood. Nearly 32% of children (male and
female) who skipped breakfast as a child were classified as overweight or obese during
childhood. Similarly, 18.5% of those who skipped breakfast during both childhood and adulthood were considered overweight or obese during childhood. As adults, 20.3% of adults classified as overweight or obese had skipped breakfast as a child, and 11.6% of those who skipped breakfast during both childhood and adulthood were overweight or obese. These studies support the fact that nutrition education should include the importance of breakfast consumption as part of a healthy diet. In contrast, a recent study of adults suggested skipping breakfast may be a way to decrease daily caloric intake for some weight management patients. A study involving 16 undergraduates at Cornell University found that those who did not eat breakfast actually had a net deficit of 408 calories per day (Levitsky & Pacanowski, 2013). Further research on the validity of this conclusion and the relevance to dietary patterns during childhood is needed.

**Imbalance of energy intake and expenditure.** America’s youth are consuming more energy-dense and low-nutrient foods. Krebs-Smith et al. (2010) evaluated the intake of energy from fats, sugars, and alcohol from the responses of the NHANES database, 2001 to 2004, and evaluated the intake of energy from fats, sugars, and alcohol. Discretionary calories were defined as additional calories needed to meet the total recommended energy requirements for weight maintenance for most children. The maximum discretionary energy allowance from the *DGA 2005* for children aged 9 to 18 years old in the active category was used as a comparison for intake. The active category was used to compare actual dietary intake to the maximum allowable intake for the age groups. The maximum discretionary energy allowances per day from the recommendations of the *DGA 2005* for females aged 9 to 13 years old is 290 calories and 362 calories for females aged 14 to 18 years old. When compared with these recommendations, 92.0% of females aged 9 to 13 years old exceeded the maximum discretionary
calories from sugars and consumed 36 grams of sugar, and 97.7% had discretionary caloric intake above recommendations from solid fats and consumed 19 grams of solid fats. It was also found that 92.4% of females aged 14 to 18 years old exceeded the energy allowances from solid fats and consumed 22 grams of solid fats, and 86.7% had a daily caloric intake above the recommendations from sugars and consumed 48 grams of sugars. This study implied that the sources for excessive energy intake included solid fats and sugars. Reducing the amount of energy-dense foods consumed per day could decrease the prevalence of obesity in childhood.

To further examine children’s caloric intake, Keast et al. (2013) also analyzed the dietary responses from the NHANES database from 24-hour recalls of dietary intake interviews from the years 2003 to 2006. The study reviewed the food intake of 7,332 children aged 2 to 18 years old, and the foods were categorized to examine food sources of major food groups, including carbohydrates, protein, fats, and sugars. The USDA Dietary Sources of Nutrients database was used to refine the food groups and input foods into these categories. For analysis of estimated calorie needs, the actual intake was compared to the recommendations of the DGA 2010. For weight management and proper growth and development of children, the DGA 2010 recommended reducing certain foods and beverages, such as foods with added sugars or excessive amounts of fat, sodium, and calories. This study found that children between the ages of 2 and 18 years old had these food groups contributing significant amounts of added calories, carbohydrates, fats, and sugars to their daily intake. The average energy intake for children aged 2 to 18 years was 2,072 calories. The two groups of food sources that provided the most energy in the diet were (a) milk and (b) cake/cookies/quick bread/pastry/pie. These groups provided 7% of the total energy intake each, totaling 14% daily. The study also found that crackers/popcorn/pretzels/chips contributed 6.0% of calories daily and fruit drinks/-ades
(Gatorade®, PowerAde®) provided 5.1% of calories daily. These food groups (excluding milk) were considered “foods to limit” in the DGA recommendations and together contributed 18.1% of the daily caloric intake for children. Soft drinks and sodas accounted for the highest contribution to carbohydrates at 10.5% of energy, and candy/sugars/sugary foods contributed another 8.3% of energy from carbohydrates. These top two categories added to the cake/cookies/quick bread/pastry/pie food group, along with fruit drinks/-ades and crackers/popcorn/pretzels/chips groups, contributed 38.8% of daily energy intake from carbohydrates. Whole fruits only contributed 3.9% of energy from carbohydrates. The two food categories that provided the most energy from fat were cheese at 9.3% and popcorn/pretzels/chips at 8.4% of energy from fat. The cake/cookies/quick bread/pastry/pie group also added 7.5% of daily fat intake. The highest contributors of total sugar sources were soft drinks and sodas, accounting for 19.2% of energy from sugar intake. Candy/sugars/sugary foods ranked second at 12.7% and fruit drinks/-ades at 11.4% of sugar sources. The cake/cookies/quick bread/pastry/pie food group contributed 8.6% daily, and these categories combined contributed approximately 52% of daily energy intake from sugars. Whole fruits only contributed 5.5% of total sugar intake. The average daily intake of sugar was 142 grams. The average daily intake of foods with added sugars was 91.9 grams and contributed to 18% of the daily calorie intake for children. Approximately 56% of this intake was from sodas and soft drinks, candy/sugars/sugary foods, fruit drinks/-ades, and cake/cookies/quick bread/pastry/pie food groups.

Reedy and Krebs-Smith (2010) further reviewed dietary recalls from 2005 to 2006 in the NHANES database for food sources for total energy intake and 2003 to 2004 responses for calories from solid fats and added sugars, and similar results were found. The USDA’s
MyPyramid Equivalents Database Version 2.0 was used to determine the contributions of energy from foods. Dietary recalls from the first day of interviews were used in this study. Energy intake and energy from sugars and fats were evaluated by specific age and sex. Based on DGA 2005, discretionary calories were set at the low activity level for each age and sex group for the study. The discretionary caloric range used for comparison was 267 to 362 calories, based on daily caloric intake. The highest contributor of energy for all children aged 9 to 13 years old relative to the discretionary caloric allowance was found to be grain desserts (donuts, cakes, cookies, granola bars), accounting for 145 calories or 7.1% of daily intake. For all adolescents aged 14 to 18 years, soda contributed the most energy per day and accounted for 226 calories or 9.3% of daily intake. Grain desserts were also found to be the leading source of the solid fats category for all children aged 9 to 13 years and contributed 11.4% of daily intake. Pizza was the highest contributor of solid fats for adolescents aged 14 to 18 years old, accounting for 14.7% of daily intake. Examining the dietary intake for the added sugars category, soda was the top source for all children aged 9 to 18 years old and contributed 117 to 197 calories (30.7% to 44.5%) of daily intake. Specific foods of energy intake from solid fats and added sugars are considered “empty calories.” Based on the DGA 2005 recommendations, soda, fruit drinks, dairy desserts, grain desserts, and pizza were examples of the foods to reduce and limit in order to reduce the risk of obesity. The study found that these food items contributed approximately 16% of empty calories daily for females aged 9 to 18 years old, totaling 355 calories for females aged 9 to 13 years old and 385 calories for females aged 14 to 18 years old.

A review of responses from the NHANES database from 2007 to 2010 was previously described (NCI, 2014). The review found that 96.1% of children aged 9 to 13 years old and 87.7% of adolescents aged 14 to 18 years old consumed levels above the recommendation for
energy from solid fats. These studies indicate quality, healthy diets are lacking for children and adolescents. Nutrition education should focus on improving food choices and stress the importance of a healthy diet.

**Intervention**

According to the latest data available in the year 2008, 6.5 million children are involved in afterschool programs, such as dance, sports, and boys and girls clubs, suggesting that these locations provide an ideal location for health promotion (Story, Kaphinst, Robinson-O’Brian, & Glanz, 2008). Secondly, evidence suggests that combining strategies for intervention in children is a high priority for obesity prevention, such as repeated measures and data collection at follow-up sessions (Wu et al., 2013). Many children and adolescents spend several days a week at afterschool activities and can offer an opportunity for nutrition education. Providing nutrition education sessions and handouts of the information covered in the sessions to encourage review of the information and family involvement can have a positive impact and is supported in the literature (Gidding et al., 2006). The current study location and study approach has not been found in literature and combined the recommended strategies for health promotion.

**Study Rationale**

The current study attempted to determine if nutrition education at afterschool activity locations would affect dietary and beverage intake of female adolescents. This study combined intervention strategies, such as repeated exposure to nutrition information, collection of follow-up data from a questionnaire, and handouts of the nutrition information covered in the education sessions sent home with the adolescents to share with their families. Prevention of childhood obesity begins by understanding the barriers that affect the dietary intake of America’s youth and
promoting healthy eating habits early in life. Studies indicate a need for nutrition education for children and adolescents on the importance of a healthy diet. Limiting SSBs and promoting the consumption of plain water; encouraging home-prepared meals; increasing consumption of fruits and vegetables; avoiding skipping meals, in particular breakfast; and promoting healthy food choices when eating out were the focus of nutrition education for this study.
Chapter 3: Methodology

Study Design

This was a quasi-experimental design study. The objective of this study was to determine if a nutrition education program would result in healthy food choices and behaviors. In order to accomplish this goal, nutrition education targeted behavior change to decrease sugar-sweetened beverage (SSB) and energy drink consumption, increase plain water intake, decrease fast food/restaurant food consumption and encourage home-cooked meals, increase fruit and vegetable intake, and increase breakfast consumption.

Hypothesis

It was hypothesized that providing 10-minute nutrition education sessions during dance classes for 3 weeks and providing handouts with the nutrition information discussed in class to review with parents or guardians would increase healthy food and beverage choices.

The specific aims of the study were to decrease SSB and energy drink consumption, increase plain water consumption, decrease meals away from home, increase fruit and vegetable intake, and decrease the number of participants who skip breakfast. In order to evaluate these specific aims, a questionnaire (Appendix C: Participant Questionnaire) was given prior to the intervention. The responses to dietary intake on the questionnaire, such as SSB and energy drink intake, plain water intake, meal preparation, fruit and vegetable intake, and breakfast consumption were considered the baseline values. Following the three weeks of nutrition education sessions, the questionnaire was given again and the responses were compared to the baseline values to assess any changes in dietary intake.
Participants

Based on priority power analysis for statistical significance, approximately 60 to 70 adolescent females from two separate dance studios in Kingsport, Tennessee, were recruited to participate in the study. The inclusion criteria for the participants were as follows: female dancers who were currently enrolled in advanced dance classes and who were taking a minimum of two classes per week during the study; the participants were 12 to 18 years old. The exclusion criteria for study included any dancer younger than 12 years, older than 18 years, and male students. These dancers were excluded due to the low enrollment at the dance studios chosen for the study and because they did not meet the requirement of enrollment in the minimum of 2 classes per week. Additionally, nutritional recommendations by the Dietary Guidelines for Americans are based on age, sex, and activity level. The excluded children had different nutritional requirements than the female subjects between the age of 12 and 18 years old (ODPHP, 2015).

Materials and Methods

Research site assent forms (Appendix D: Research Site Assent Form), parental informed consent forms (Appendix E: Parent/Guardian Informed Consent Form), participant informed consent forms for those 18 years old (Appendix F: Participant Informed Consent Form), and participant assent forms (Appendix G: Participant Assent Form) were distributed. The primary investigator developed the study questionnaire, and a small sample size at a dance studio was used to test validity prior to the study. A guide, also developed by the primary investigator, provided explanation of the questions and was used to ensure that participants understood the questions correctly and gave the study consistency (Appendix H: Guide to the Questionnaire). Following the nutrition education sessions, the same questionnaire was repeated during Week 6.
to evaluate any changes in dietary intake. The primary investigator, a qualified registered dietitian, developed the educational handouts. These handouts contained nutritional requirements based on the *Dietary Guidelines for Americans (DGA) 2015* recommendations, healthy snack foods, and tips to prepare quick healthy meals. The material on the handouts was adapted from information and presentations from the *DGA 2015* (ODPHP, 2015), Academy of Nutrition and Dietetics (2014), and KidsHealth.org, which was developed by Nemours, a non-profit children’s health organization (Kids Health, 2014).

The primary investigator recorded the height and weight of each participant to ensure the accuracy of the measurements. A calibrated portable stadiometer was used to measure heights and weights of the participants. To protect the privacy of the participant and to avoid any embarrassment, the recording of this data occurred in a separate area of the studio, and a privacy screen was used. Each participant’s body mass index (BMI) was calculated from these measurements for group analysis and compared with standard values for classification of obese, overweight, normal, or underweight from the Center for Disease Control and Prevention (CDC) growth charts (CDC, 2014; See Appendix I: CDC Growth Charts).

The responses to the questionnaire were compiled into Microsoft Excel and imported into IBM SPSS 23 for statistical analysis. The mean, standard deviation, range, minimum, and maximum were calculated from the responses of the pre-education and post-education questionnaires. Any outliers were identified with a box plot and removed in SPSS before data analysis. Non-parametric tests (exact sign tests) were used to determine any significant change in pre-education and post-education values for SSB intake, energy drink intake, plain water intake, meal location, fruit vegetable intake, breakfast skipping per week, and the consumption of energy-dense foods. A *p* value of <.05 was considered statistically significant for all values.
Plain water intake was compared to the 2005 Institute of Medicine (IOM) daily recommendations, and fruit and vegetable intakes were compared to the *DGA 2015* recommendations as well as baseline values.

This study expected to find that, prior to nutrition education, SSB, energy drink, and plain water intake was similar to nationally reported values. In addition, this study expected to find that fast food and restaurant consumption was frequent, fruit and vegetable intake was below the *DGA* recommendations, and the skipping of breakfast was also prevalent among this age group. The brief nutrition education given in the study was expected to decrease SSB and energy drink consumption, increase plain water consumption and home-cooked meals, improve fruit and vegetable intake, and decrease breakfast skipping for this age group.

**Procedure**

The managing director of each dance studio signed and returned a site assent form (Appendix J: Signed Research Site Assent Form) during the approval process. The study protocol was approved by The Human Subjects Review Committee at Eastern Michigan University (Appendix K: UHSRC Approval Letter). The study was six weeks in duration for both studios. Refer to Figure 1 for the flowchart of procedure.
<table>
<thead>
<tr>
<th>Week 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruitment of participants, all forms were distributed to those students who met the criteria, and the participant assent form was reviewed to provide study details.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant consent forms, parental consent form, and participant assent forms were collected. The questionnaire was given during class time for baseline dietary values. Participants’ height and weight were recorded by the primary investigator.</td>
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</table>

<table>
<thead>
<tr>
<th>Week 3, 4, &amp; 5</th>
</tr>
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<tbody>
<tr>
<td>Ten minute nutrition education sessions took place at the beginning of each dance class. The educational handouts were reviewed during the sessions and participants were to take them home for review with parents and guardians.</td>
</tr>
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<table>
<thead>
<tr>
<th>Week 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants were given the questionnaire again at the beginning of the class to assess any dietary changes following the education sessions.</td>
</tr>
</tbody>
</table>

*Figure 1.* Flowchart of procedure.

During week 1, the dance students were recruited for the study (Appendix L: Recruitment Speech). Consent forms were distributed to those dancers who met the inclusion criteria. Students who were 18 years old received a participant informed consent form. Students who were 17 years old or younger received a participant assent form and a parent/guardian informed consent form. During the second week of dance classes, all consent and assent forms were collected. Students who were 17 years old or younger were required to have both the assent form and the parental consent form signed and returned. The dancers’ heights and weights were recorded at this time and the questionnaire was distributed. Each participant marked the questionnaire with her name initials and age. Once the questionnaire was collected, a key was made with the child’s name initials and a corresponding numeric identifier for coding purposes. This key was stored in a password-protected computer that also had an updated version of anti-virus software. The primary investigator had sole access to the personal computer, which
was located at her residence. The completed questionnaires were stored in a locked filing
cabinet also at the primary investigator’s residence for the duration of the study.

During Weeks 3, 4, and 5, 10-minute nutrition education sessions were provided at the
beginning of two scheduled dances per week. The nutrition education handouts were provided to
the dancers during the education sessions. The nutrition education sessions consisted of a review
of the educational handouts, a promotion of healthy eating habits, and answering of any
questions the dancers may have regarding the information on the handouts. Participants took
these handouts home to review with parents or guardians. Examples of serving sizes were used
for illustration purposes during the sessions. The students who did not meet the study criteria
were excused from the nutrition education sessions. During Week 6, the questionnaire was
administered again to assess any changes in dietary intake from the dancers’ baseline responses.

In order to protect against any adverse effects of nutrition education for this age group,
the primary investigator, a registered dietitian, monitored any comments made by participants
during the nutrition education sessions that could signify a potential concern for eating
disorders. If a participant made any comment that could signify the warning signs of eating
disorders, the participant would be excused from continuing the study and the principal
investigator provided the parents or guardians with a toll-free number for assistance
and information from the National Eating Disorder Association (2016).
Chapter 4: Results

In this study, the participation rate for both studios was lower than expected. The total number of students in the two levels of dance class was 71 for both studios. Of those students, only 32 were eligible for the study based on the inclusion criteria. Twenty students returned signed consent forms, but only 16 dancers completed the study for analysis. Figures 2 and 3 illustrate the participation for each studio.

**Figure 2.** Participant enrollment for Holloway dance studio. This figure illustrates the two separate dance class levels offered at Holloway and the number of participants for each.

**Figure 3.** Participant enrollment for Centre for Performing Arts dance studio. This figure illustrates the two separate dance class levels offered at The Centre for Performing Arts and the number of participants for each.
The average age of the participants was 14.6 years ($SD = 2.2$, range: 12–18 years). The average height for the participants was 62.7 inches ($SD = 2.7$, range: 57.5–67.5 inches), and average weight was 118.7 lbs. ($SD = 24.7$, range: 81.6–157.4 lbs.). The average body mass index (BMI) was calculated at 21.1 ($SD = 3.7$) kg/m$^2$ for the group. Based on Center for Disease Control and Prevention (CDC) growth charts (see Appendix I), 31.3% of the participants were classified as overweight ($\geq 85^{th}$ percentile and $\leq 95^{th}$ percentile), and the remaining 68.8% were classified as normal weight ($\leq 85^{th}$ percentile and $\geq 5^{th}$ percentile). No participants were considered obese based on BMI and CDC growth charts ($\geq 95^{th}$ percentile).

A review of responses found that 12 of 16 dance participants (75%) had dance classes at least 3 days per week and 10 of the 16 participants (63%) had five or six dance classes per week. In addition, 9 of 16 (56%) participants had additional physical activities (besides dance classes) during the week, with a minimum of 1 day per week and a maximum of 5 days per week. In total, 31% of all participants had dance or another physical activity 4 or 5 days per week.

Prior to nutrition education and following education, the means for soda beverage consumption were 2.6 ($SD = 2.2$) and 2.4 ($SD = 2.2$) beverages per week, respectively. Though the difference was not found to be statistically significant ($p = .147$) by a non-parametric sign test, there was a reduction of 7.7% of the average number of beverages consumed. See Figure 4 for illustration. The maximum soda consumed by a participant prior to education was nine beverages per week and the maximum consumed by a participant following nutrition education was seven beverages per week. Few participants responded with soda container size on the questionnaire; therefore, a measurement of the amount of soda consumption could not be determined.
On an average, participants consumed 6.6 ($SD = 5.8$) sugar-sweetened beverages (SSBs) per week prior to nutrition education. Following nutrition education, the average SSB intake was reduced to 5.1 ($SD = 3.4$) beverages per week. The difference was not shown to be statistically significant ($p = .774$) by a non-parametric sign test, though there was a reduction of 23% of the average number of beverages consumed. See Figure 5 for illustration. The maximum number of SSBs consumed (not including soda) by a participant showed a reduction from 21 beverages prior to nutrition education to 10 beverages per week as seen from the post-education responses.
Figure 5. Average SSB intake per week. This figure illustrates the average number of SSB consumed per week from pre-education and post-education responses, not including soda. Results are shown as mean and SD. Note. The questionnaire did not specify size or amount for analysis.

When soda beverage totals were combined with all other SSB totals for a more accurate presentation of all beverages consumed by the participants, results showed that, prior to education, an average of 6.8 ($SD = 5.3$) beverages were consumed per week. Following education, an average of 6.3 ($SD = 4.9$) beverages were consumed. The average number of beverages consumed was reduced by 7.4%, though this was not statistically significant ($p = .581$), as determined by a non-parametric sign test. See Figure 6 for illustration. The maximum number of total SSBs consumed showed a reduction from 18 beverages prior to nutrition education to 16 beverages per week as seen from the post-education responses.
Analysis of participant energy drink consumption found that only one of the 16 participants (6.3%) consumed energy drinks prior to nutrition education. The maximum number of energy beverages consumed prior to education was two beverages per week. In the review of the post-education questionnaire, a total of three participants (18.8%) consumed energy drinks during the week. The maximum number of energy beverages consumed from the post-education questionnaire was found to be 12 beverages. The responses were not further analyzed in SPSS for mean, standard deviation, and any means comparison from baseline values and post-education due to the lack of responses recorded.

Prior to education, the average intake of plain water was found to be 3.9 ($SD = 2.9$) cups per day. Following education, the average intake of plain water was calculated to be 3.9 ($SD = 3.1$) cups per day. A non-parametric sign test found that the mean difference from pre-education responses and post-education responses was zero ($p = 1.000$). See Figure 7 for illustration. Analysis of the pre-education questionnaire responses found a maximum of 10 cups per day of plain water was consumed. Following education, a maximum of 14 cups per day of plain water was consumed.
was consumed. Additionally, 12.5% of participants did not consume plain water on the day of the pre-education questionnaire, and this rose to 18.8% from the post-education questionnaire.

**Figure 7.** Average plain water intake per day. The average cups consumed was determined from the questionnaire, which asked each participant to estimate the cups of plain water consumed and planned to consume for the day. This figure compared the pre-education and post-education responses. Results are shown as mean and SD. *Note.* IOM (2005) does not provide a recommendation for plain water intake per day. The estimated average amount consumed by the age group of this study is 2.2 to 2.7 cups/day.

Analysis of the questionnaire responses found that, prior to nutrition education, 50% of participants consumed home cooked meals on a dance practice. Analysis of the post-education responses found that only 37.5% of the participants consumed a home-cooked meal on the day of the questionnaire. See Figure 8 and Figure 9 for illustration.
To evaluate dietary intake, the questionnaire asked participants to estimate the amount of fruits and vegetables they had already consumed during the day and then to estimate the amount of fruits and vegetables they planned to consume later in the day. These totals were combined
and used to evaluate the expected fruit and vegetable intakes for the day. At the time of the study, 2 cups of fruits per day was the recommendation from the *Dietary Guidelines for Americans (DGA)* 2015 for this age group and 2½ to 3 cups of vegetables was the recommendation for this age group. Prior to education, 63% of dancers did not meet the recommendations for fruit intake per day. Following nutrition education, 44% of dancers did not meet the recommendations for fruit intake per day. From the pre-education questionnaire responses, the average fruit intake was found to be 1.8 (SD = 1.4) cups per day. Following nutrition education, the average fruit intake was found to be 1.9 (SD = 1.4) cups per day. Although the average fruit intake improved by 5.6%, the change was not statistically significant (p = .774), as determined by a non-parametric sign test. See Figure 10 for illustration. Prior to education, 75% of participants did not meet the recommendations of vegetable intake per day. Following nutrition education, 63% did not meet the recommendations for vegetable intake per day. The average vegetable intake was found to be 1.4 (SD = 1.2) cups pre-education and 1.7 (SD = 1.3) cups post-education. Although the average vegetable intake was enhanced by 21%, the difference was not statistically significant (p = .267). See Figure 11 for illustration.
Figure 10. Average fruit intake on a dance practice day. The average cups consumed was determined from the questionnaire, which asked each participant to estimate the cups of fruits consumed and planned to consume for the day. This figure compared pre-education and post-education responses. Results are shown as mean and SD.

Figure 11. Average vegetable intake on a dance practice day. The average cups consumed was determined from the questionnaire, which asked each participant to estimate the cups of vegetables consumed and planned to consume for the day. This figure compares pre-education and post-education responses. Results are shown as mean and SD.

Data analysis of the questionnaire responses showed that three participants skipped breakfast the day of the questionnaire prior to education and four participants skipped breakfast
the day of the questionnaire following nutrition education. Figure 12 illustrates that 18.8% of participants skipped breakfast on a dance practice day prior to nutrition education and 25% of participants skipped breakfast at post-education. On average, participants skipped 2.3 \((SD = 2.1)\) days of breakfast per week before education classes and 1.8 \((SD = 1.8)\) days after nutrition education. See Figure 13 for illustration. This difference was not statistically significant \((p = .549)\).

![Figure 12. Percent of participants who skipped breakfast on the day of the questionnaire.](image)

This figure shows the percentage of participants who skipped breakfast on the day of the questionnaire. This figure compares pre-education and post-education responses. Results are shown as a percentage.
Figure 13. Average number of days of skipped breakfasts per week. This figure shows the average number of days breakfast was skipped during the week of the questionnaire. This figure compares pre-education and post-education responses. Results are shown as mean and SD.

Although decreasing energy-dense food intake was not a specific aim of this study, the questionnaire assessed the consumption of these foods by the participants. To evaluate the consumption of energy-dense foods (i.e., DGA recommended “foods to limit”), the questionnaire asked participants to record the types of foods they consumed on the day of the questionnaire. The categories were as follows: baked goods (cake, pastry, donuts, cookies, quick breads, muffins, granola bars); candies (candy bars, hard candy, soft candies, gummy candies); fruit desserts (cobbler, fruit pies, fruit cakes); and foods (pizza, hamburger, french fries, potato chips, buttered popcorn). The questionnaire did not account for serving size or frequency of each item per day, only if the food item was eaten on the day of the questionnaire. The average number of energy-dense foods items eaten on a dance practice day from all categories based on the values from the pre-education questionnaire was found to be 2.4 (SD = 1.6) items. The average number of energy-dense food items eaten on a dance practice day from all categories based on the values from the post-education questionnaire was found to be 2.3 (SD = 1.5) items, a 4.2% reduction from the pre-education average intake. This reduction was not statistically significant (p = .267),
as determined by a non-parametric sign test. See Figure 14 below. French fries were found to be the most consumed food item with 7 of the 16 (43.8%) participants consuming them on a given day. French fry consumption increased to 8 of the 16 (50%) participants following nutrition education.

![Figure 14](image)

**Figure 14.** Average number of energy-dense foods consumed on the day of the questionnaire. This figure show the average number of food items consumed on a dance practice day from pre-education and post-education responses. Results are shown as mean and SD. Note. The questionnaire did not account for serving size or number of each individual item consumed per day, only if the food item was eaten on the day of the questionnaire. The average item count is represented in this figure.

In conclusion, although the average vegetable intake improved by 21% between pre-education and post-education responses and the average SSB consumption (excluding sodas) reduced by 23% between pre-education and post-education responses, the specific differences for the study variables measured before and after nutrition education were not found to be statistically significant. The hypothesis that nutrition education during dance classes for 3 weeks and providing handouts for parent/guardian review would increase healthy food and beverage choices on dance practice days, cannot be supported by the current study.
Chapter 5: Discussion, Recommendations for Future Research, and Conclusion

Discussion

Lifestyle choices, such as dietary intake and beverage choices have been shown to increase the risk of obesity among youth (Gidding, 2006; Shepherd et al., 2006; Stang, 2008). The objective of this study was to determine if a nutrition education program would result in healthy food choices and behaviors on dance practice days. The specific aims of the study were to decrease sugar-sweetened beverage (SSB) and energy drink consumption, increase plain water consumption, increase home-cooked meals, increase fruit and vegetable intake, and to decrease the number of participants who skipped breakfast on dance practice days.

Previous research showed that the overweight and obesity rate was about 33.8% among female adolescents aged 12 to 19 years old (Ogden et al., 2014). The current study found similar results with 31.3% of the participants classified as overweight.

The total SSB intake reduced from an average of 6.8 beverages consumed per day to 6.3 beverages consumed per day, although this was not statistically significant. Future studies should attempt to identify all beverages consumed for an accurate evaluation of daily intake of fluids. Additionally, the current study did not emphasize the nutritional content of the most common SSBs consumed by this age group or the health implications of their consumption during childhood. Incorporating an “intent to change” section on the questionnaire may have given an indication for the progress of the nutrition education sessions. For example, Isoldi and Dolar (2015) focused on attendees of a boys and girls club and tested pre-knowledge of the sugar content of commonly consumed SSBs and a follow-up questionnaire tested knowledge following an education workshop. A total of 128 children participated, which included a survey to assess
beverage intake, baseline knowledge of sugar content of common SSBs, and attitudes regarding SSB consumption. In addition to sugar content knowledge, the final questionnaire asked the participants if they “intended” to drink fewer SSBs following the workshop. The study found 32.8% of the 10 to 14 year old males and females “strongly agreed” and 44.8% “agreed” to drink fewer SSBs because of the intervention. Although the study was based on “intent,” the participants’ overall knowledge of sugar content improved by nearly 50% overall.

The current study found that, following the intervention, there was no change in plain water intake per day. Participants in this study already consumed 3.9 cups per day, which is higher than the nationally estimated amounts of 2 to 3 cups per day (IOM, 2005). Following the nutrition education, 81.2% of participants consumed water on a given day. In comparison, previous data showed that only 75% of female adolescents consumed plain water on any given day (Sebastian et al., 2011). Thus, nutrition education for increasing the intake of plain water did not further increase the water intake of the participants significantly; however, the active female dancers consumed more on average than national levels.

The current study also found that, prior to education, 50.0% of participants consumed a home-cooked meal on a dance day. A review of the post-education questionnaire responses found that home-cooked meals accounted for 37.5% of meals on a dance day. The small sample size of the current study and a high frequency of after school activities may have had an effect on the outcome. According to the most recent data in 2011 by the U.S. Census Bureau (2014), 57% of all children aged 6 to 17 years old participate in some kind of extra-curricular activity; approximately 29% were involved in dance and 35% were involved in sports activities. The current study found that 75% of participants were engaged in dance classes 3 days per week and 31% had dance or another physical activity 4 or 5 days per week. Furthermore, approximately
48% of married families had both parents in the workforce for the year 2016, according to a press release from the United States Department of Labor (2017). This data could support the claim that time constraints can make home-cooked meal frequency difficult for American families and could offset any benefit accrued from the nutrition education in planning meals.

According to the most recent national averages, fruit and vegetable intake were slightly above 1 cup in each category (NCI, 2014). In contrast, the current study found that, following education, the fruit and vegetable intake was an average of 1.9 cups and 1.7 cups, respectively. Although, these levels are still below the DGA 2015 recommendations of 2 to 3 cups (ODPHP, 2015), the values are better than national averages. A larger sample size and increased parental involvement may have rendered a more positive impact on adolescent fruit and vegetable intake. Additionally, a food diary or dietary recall may have produced more reliable reporting from participants.

Jorgensen, Jorgensen, Aarestrup, Due, and Krolner (2016) found that parents with medium to high participation in the study activities had a greater impact in increasing the fruit and vegetable intake of seventh graders than those with little or no participation. This study took place in Denmark as part of a nationwide school outreach program. The study recruited a total of 1,121 seventh grade students from 20 schools. The parental outreach was extensive and included newsletters, activities, student-parent meetings, and school activities to promote fruit and vegetable intake. The study found that fruit and vegetable intake improved by 47.5 grams and 95.2 grams, respectively, with medium to high participation from parents. This study did not offer such an intensive parental outreach and did not significantly increase fruit and vegetable intake. Encouraging more parental involvement and providing a method of feedback could have had a positive effect on the type of meal preparation and food choices for adolescents.
Prior to education, an average of 2.3 days of breakfasts were skipped. Following nutrition education, an average of 1.8 days of breakfasts were skipped. However, breakfast intake on the day of the questionnaire showed a negative trend and the results did not support the study aim to increase breakfast consumption on dance practice days. The percentage of participants who skipped breakfast on the day of the questionnaire changed from 18.8% prior to education and 25.0% following nutrition education. The current study’s results were also higher than national data, which indicated that 11.4% of females (9 to 13 years old) and 16.1% (14 to 19 years old) skip breakfast according to the most recent National Health and Nutritional Examination Survey (NHANES) data from 1999 through 2006 (Deshnukh-Taskar et al., 2013). The small sample size and short duration of the education sessions could have accounted for the study results. Future studies should emphasize the importance of a healthy breakfast during childhood.

In addition to encouraging fruit and vegetable intake, the current study also discussed the foods to reduce and limit based on recommendations from United States Department of Agriculture (USDA) dietary guidelines. As previously discussed, the current study found that adolescents consumed energy-dense foods, such as baked goods and french fries, on a daily basis. Interestingly, the average intake of energy-dense foods was slightly reduced following education; however, in the “foods” category (pizza, hamburger, french fries, potato chips, buttered popcorn) the consumption of french fries and pizza increased in conjunction with fast food meals. Cohen, Sturm, Scott, Farley, and Bluthenthal (2010) found that nutrition education that promoted “healthy items” should be secondary to discouragement of “unhealthy items” such as cookies and sweets, in an effort to decrease the prevalence of obesity. The study interviewed 2,767 adults in Los Angeles County and Southern Louisiana via telephone. The study
A questionnaire targeted specific food items (fruits, vegetables, candy, cookies, salty snacks, and alcohol) and estimated caloric intake from the given serving sizes. Participants who consumed more than five servings of fruits and vegetables did not have a significant reduction in the discretionary calories consumed by cookies, candy, salty snacks, soda, and alcohol. The average intake of discretionary calories was 438 calories from Los Angeles County and 617 calories from Southern Louisiana. When alcohol was removed, these reduced by 90 calories for males and 25 calories for adult females. This was found to be 1.61 times more and 2.10 times more, respectively, than the 267-discretionary calorie recommendation. An additional fruit serving only decreased the calories from these foods and beverages by 17 calories. The study suggested that fruit and vegetable intake did not displace those foods and beverages, only that more fruits and vegetables were consumed. A larger sample size for the current study may have shown similar results.

In another study in Benghazi City, Libya, researchers examined the nutritional impact of nutrition education with 111 females and 76 males between the age of 14 and 21 years old (Sachithananthan, Buzgeia, Awad, Omran, & Faraj, 2012). In this cross-sectional study, participants were given a questionnaire to complete and a 24-hour dietary recall in order to assess dietary intake. A pre-test/post-test design was used to determine if weekly nutrition education presentations would impact nutritional status of the participants. Following three months of education, females noted a significant reduction of chocolate, chips, breads, and fast foods, and males noted a reduction of bread, chocolate, and cereals. Similarly, the current study results found a positive trend in fruit and vegetable intake, and the consumption of energy-dense foods had a downward trend following nutrition education. This suggests that nutrition education that also recommended foods to limit or avoid could have an impact on overall dietary
intake. Although the current study showed an improvement of energy-dense food consumption, a stronger emphasis on the food items’ nutrition content may have produced a larger impact on the diet of adolescent dance students.

Nutrition education is one strategy to reduce the prevalence of childhood obesity. The current study aimed to improve the eating habits and beverage choices of active adolescent females and with the small sample size, short duration of the education sessions, and perhaps an insufficient outreach of parental involvement, the study results were not statistically significant.

**Recommendations for Future Research**

This study had several limitations. First, the small sample size made it difficult to facilitate the group nutrition education sessions as intended and to extrapolate the data into population results. Secondly, decreasing the number of sessions to one per week would have increased the number of participants and allowed younger females to participate. Third, increasing the duration of the study beyond three weeks of education sessions could have increased the array of topics covered and provided time for the use of props and examples to illustrate the information, such as sugar and fat display tubes of typical food and drink items. Finally, encouraging more parental involvement and providing a method of feedback could have had a positive effect on the type of meal preparation and food choices for adolescents.

**Conclusions**

Childhood obesity is an ongoing concern for parents and practitioners around the world. Nutrition education targeting specific behaviors is one form of intervention. Engaging children and adolescents at functions, such as after-school activities, can be a convenient platform for intervention. Although some improvements in food and beverage choices were seen, the results
of specific study aims were not found to be statistically significant. In conclusion, the current study found trends in decreased consumption of SSBs and slight advances in vegetable intake after nutrition education, and provides a framework for future studies in this area.
References


APPENDICES
Appendix A: *DGA* Recommendations

**Table 1 – Recommended Macronutrient and Sodium Intake**

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Female 9-13</th>
<th>Female 14-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein (grams)</td>
<td>34</td>
<td>46</td>
</tr>
<tr>
<td>Carbohydrates (grams)</td>
<td>130</td>
<td>130</td>
</tr>
<tr>
<td>Fats (% of calories)</td>
<td>25-35</td>
<td>25-35</td>
</tr>
<tr>
<td>Sodium (mg)</td>
<td>&lt;2200</td>
<td>&lt;2300</td>
</tr>
</tbody>
</table>

Adapted from:

**Table 2 – Recommended Caloric Intake per day**

<table>
<thead>
<tr>
<th>Gender / Activity Level</th>
<th>Female / Moderately Active</th>
<th>Female / Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 - 13</td>
<td>2,000</td>
<td>2,200</td>
</tr>
<tr>
<td>14 - 18</td>
<td>2,000</td>
<td>2,400</td>
</tr>
</tbody>
</table>

Adapted from:

**Table 3 – Recommended Fruit and Vegetable Intake per Caloric Intake**

<table>
<thead>
<tr>
<th>Caloric Level</th>
<th>2,000</th>
<th>2,200</th>
<th>2,400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits</td>
<td>2 cups</td>
<td>2 cups</td>
<td>2 cups</td>
</tr>
<tr>
<td>Vegetables</td>
<td>2 1/2 cups</td>
<td>3 cups</td>
<td>3 cups</td>
</tr>
</tbody>
</table>

Adapted from:
Appendix B: Educational Handouts

Nutrition and Physical Activity

- What you eat affects your performance in class!
- Your body needs and combination of carbohydrates, proteins, essential fats, and fluid to do its best.
- Supplies energy, build muscle, tissue repair, and hydrate.
- Plan ahead and pack healthy snacks.
- Timing matters! Before and after!
- What does the body need?
  - Whole grains
  - Fruits and Vegetables
  - Lean Meats / Complete Proteins
  - Low-Fat Dairy
- 1 – 2 hours before healthy snack
  - High carbohydrate, low sugar
  - Low fat, low fiber
  - Good protein
- After practice
  - High carbohydrate and protein
  - Good Fats
  - Little Salty
  - Lots of fluids

Water Recommendations

- 10 – 14 ounces (1.25 to 1.75) cups of cool water 1 to 2 hrs before class
- 10 – 12 ounces (1.25 to 1.5 cups) 10 to 15 min. before class
- 4 – 6 ounces (0.5 cups to 0.75 cups) every 15 to 20 min. during class
- 9 to 13 years – 1.6 L (7 cups) per day
- 14 to 18 years – 1.8 L (8 cups) per day

How much should I eat?

- Fruits 2 cups per day
- Vegetables 2 ½ to 3 cups per day

What should I avoid?

- Sugar-sweetened beverages and soft drinks
- Eating out and away from home most days of the week
- Skipping breakfast
- Larger portion sizes

Eating Breakfast is Essential

- Make breakfast part of your EVERYDAY routine!

Keep up with Physical Activity!

- USDA recommends 60 minutes of moderate to vigorous activity most days of the week for good health

Sleep

- Get 9 to 11 hours of sleep at night

Adapted from: eatright.org and kidshealth.org/teens/

60
Recipes and Ideas to Enjoy!

**Update the Cereal Cabinet.** Chose whole-grain cereal — the fiber helps you feel full. Chose cereals with 10 grams of sugar or less. A cup of cereal, \(\frac{1}{2}\) cup of low-fat milk, and half a banana will give you the energy to keep going all morning.

**PB & Berries.** Spread 2 tablespoons of peanut butter on a whole-grain English muffin. Serve with a cup of strawberries — they help you feel full longer than jelly does.

**Protein Power.** Here’s a midweek energy boost: A whole-grain waffle with 1 tablespoon of peanut butter, plus a medium-sized orange, and a hardboiled egg on the side.

**Trail Mix.** Here’s a portable breakfast for those days when you eat on the run: Mix 23 almonds and 2 tablespoons of raisins with 1 cup of Multi Grain Cheerios, place in a plastic bag, and shake. Other add-ins: dark chocolate chips (for antioxidants), dried cherries, dried cranberries, pistachios (or other nuts for protein), granola.

**Parfait.** Layer vanilla yogurt and mandarin oranges or blueberries in a tall glass. Top with a sprinkle of granola. (Try Greek yogurt for more protein.)

**Mini Pizza.** Toast a whole-wheat English muffin, drizzle with pizza sauce and sprinkle with low-fat mozzarella cheese.

**Who Needs Ice Cream?** Fill a waffle cone with cut-up fruit and top with low-fat vanilla yogurt.

**Better Kabobs.** Put cubes of low-fat cheese and grapes on pretzel sticks. Use any fruit and cheese combo!

**Waffle up!** Toast a whole-grain waffle and top with low-fat yogurt and peaches.

**Perfect Combo!** Spread peanut butter on apple slices.

**Other Good Choices to Mix and Match**
- Baked potato with salsa and cottage cheese
- Oatmeal topped with fruit and nuts
- Turkey and lettuce roll ups
- Trail mix with dried fruit and nuts, such as pistachios

**Tips for making a quick and healthy family dinner:**

- Get everyone involved – have older kids to chop vegetables or make a salad and have the younger kids to set the table and gather drinks for dinner.
- Try to pick recipes with minimal ingredients and less cooking time during the busy week, such as baking chicken breast or grilling fish.
- Put that slow-cooker to use. Make a hearty stew that will be ready when you get home.

Resources:

*Adapted from eatright.org and kidshealth.org/teens/
Nutrition Counts

**Review**

1. *We need water to rehydrate*
2. *Plan snacks and meals ahead of time*
3. *Whole grains, fruits, vegetables, low-fat dairy, protein*
4. *2 cups of fruits and 2 ½ to 3 cups of vegetables a day*
5. *Avoid sodas, coffee drinks, sugar sweetened beverages, energy drinks*

**What are we eating? (A few local examples)**

- Chick fil A
- Pal’s
- McDonalds

**According to DGA 2015**

- Calorie Range 2000 to 2400
- 9 to 13 year olds need 34 grams of *protein*
- 14 to 18 year olds need 46 grams of *protein*

- 9 to 18 year olds need 130 grams of *carbohydrates*

- 9 to 18 year olds should not have more than 25% to 35% of our calories from *fat* (ex: 2000 calorie diet > 55 grams fat per day > 14 grams in four meals for the day)

- Maximum *sodium* recommended per day is 2200 to 2300 milligrams
What is in our foods?

### Chick Fill A

<table>
<thead>
<tr>
<th>Food Item</th>
<th>Calories</th>
<th>Fat (g)</th>
<th>Sodium (mg)</th>
<th>Sugars (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicken Nuggets 8 count</td>
<td>270</td>
<td>13</td>
<td>1060</td>
<td>N/A</td>
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<tr>
<td>Grilled Chicken Nuggets</td>
<td>140</td>
<td>3</td>
<td>530</td>
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<tr>
<td>Chicken Sandwich</td>
<td>440</td>
<td>18</td>
<td>1390</td>
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<tr>
<td>Grilled Chicken Sandwich</td>
<td>320</td>
<td>5</td>
<td>800</td>
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</tr>
<tr>
<td>Waffle Fries Medium</td>
<td>400</td>
<td>21</td>
<td>180</td>
<td>N/A</td>
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<tr>
<td>Coleslaw</td>
<td>360</td>
<td>31</td>
<td>280</td>
<td>16</td>
</tr>
<tr>
<td>Iced Tea Sweet Medium</td>
<td>130</td>
<td>N/A</td>
<td>10</td>
<td>32</td>
</tr>
<tr>
<td>Lemonade Medium</td>
<td>230</td>
<td>N/A</td>
<td>10</td>
<td>58</td>
</tr>
<tr>
<td>Coke Medium</td>
<td>170</td>
<td>N/A</td>
<td>55</td>
<td>46</td>
</tr>
<tr>
<td>Sprite Medium</td>
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<td>40</td>
<td>39</td>
</tr>
<tr>
<td><strong>Combo</strong></td>
<td><strong>800</strong></td>
<td><strong>34</strong></td>
<td><strong>1250</strong></td>
<td><strong>33</strong></td>
</tr>
</tbody>
</table>

### Pal's

<table>
<thead>
<tr>
<th>Food Item</th>
<th>Calories</th>
<th>Fat (g)</th>
<th>Sodium (mg)</th>
<th>Sugars (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junior Burger with Cheese</td>
<td>350</td>
<td>19</td>
<td>635</td>
<td>N/A</td>
</tr>
<tr>
<td>Big Pal with Cheese</td>
<td>663</td>
<td>42</td>
<td>850</td>
<td>N/A</td>
</tr>
<tr>
<td>Chipped Ham with Cheese</td>
<td>390</td>
<td>18</td>
<td>1735</td>
<td>N/A</td>
</tr>
<tr>
<td>Hot Dog</td>
<td>302</td>
<td>19</td>
<td>875</td>
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</tr>
<tr>
<td>Frenchie Fry Large</td>
<td>463</td>
<td>23</td>
<td>324</td>
<td>N/A</td>
</tr>
<tr>
<td>Iced Tea Sweet</td>
<td>187</td>
<td>N/A</td>
<td>N/A</td>
<td>52</td>
</tr>
<tr>
<td><strong>Combo</strong></td>
<td><strong>1313</strong></td>
<td><strong>65</strong></td>
<td><strong>1174</strong></td>
<td><strong>52</strong></td>
</tr>
<tr>
<td>McDonald's</td>
<td>Calories</td>
<td>Fat (g)</td>
<td>Sodium (mg)</td>
<td>Sugars (g)</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>----------</td>
<td>---------</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>Quarter Pounder with cheese</td>
<td>520</td>
<td>26</td>
<td>1110</td>
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<tr>
<td>Bacon CH Grilled Chicken Sandwich</td>
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<td>26</td>
<td>1720</td>
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<tr>
<td>Chicken Selects (3 Piece)</td>
<td>370</td>
<td>22</td>
<td>680</td>
<td>N/A</td>
</tr>
<tr>
<td>French Fries Medium</td>
<td>340</td>
<td>16</td>
<td>90</td>
<td>N/A</td>
</tr>
<tr>
<td>McCafe Mocha Small</td>
<td>340</td>
<td>11</td>
<td>150</td>
<td>42</td>
</tr>
<tr>
<td>Iced Tea Sweet Medium</td>
<td>180</td>
<td>N/A</td>
<td>10</td>
<td>45</td>
</tr>
<tr>
<td>Coke Medium</td>
<td>200</td>
<td>N/A</td>
<td>N/A</td>
<td>55</td>
</tr>
<tr>
<td>Combo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quarter Pounder with Cheese, Medium French Fries, Medium Coke</td>
<td>1060</td>
<td>42</td>
<td>1200</td>
<td>55</td>
</tr>
</tbody>
</table>

References:
http://www.chick-fil-a.com/Food/Menu
http://www.palsweb.com/#menu

More Tips and Tricks

- Fruit salad and graham crackers
- Apples and peanut butter
- Plain Popcorn
- Fruit slices and cream cheese dip
- Whole grain cracker and cheese slices
- Mini bagel and cream cheese and strawberries
- Toaster waffle with blueberries or other fruit and top with yogurt
- Homemade smoothie (yogurt, fruits or vegetables, almond milk, ice)
- Vegetable strips and low fat ranch dip

*Have snacks made in the morning and pack in a small cooler or lunchbox for after school.
Prepare dinners ahead of time.
**Tips and making a family meal on busy weeknights:**

- If you know you have a busy schedule, have some items cut and ready to start when you get home.
- Make a one-pot meal in the slow cooker or casserole. Make sure to pack it full of vegetables.
- Buy frozen ravioli and add a prepared sauce and pre-made salad from the grocery for a “home-cooked” meal.
- Make extra chicken breasts for steak the night before. The next day, add to a tossed salad and add a baguette for a simple meal.
- Making a stir-fry is a nice way to incorporate vegetables and have a quick meal ready. Have the rice already made or buy a box of the quick-cook rice to save time. Also, cut vegetables ahead of time and keep in the refrigerator to save even more time.
- Make extra batches or freeze meals ahead of time.

Resources:

- http://www.eatright.org/resource/food/nutrition/eating-as-a-family/make-a-homemade-dinner
### Nutrition Facts

8 servings per container  
**Serving size** 2/3 cup (55g)

<table>
<thead>
<tr>
<th>Amount per serving</th>
<th>Calories 230</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>% Daily Value</strong></td>
<td></td>
</tr>
<tr>
<td>Total Fat 8g</td>
<td>10%</td>
</tr>
<tr>
<td>Saturated Fat 1g</td>
<td>5%</td>
</tr>
<tr>
<td>Trans Fat 0g</td>
<td></td>
</tr>
<tr>
<td>Cholesterol 0mg</td>
<td>0%</td>
</tr>
<tr>
<td>Sodium 160mg</td>
<td>7%</td>
</tr>
<tr>
<td>Total Carbohydrate</td>
<td>13%</td>
</tr>
<tr>
<td>Dietary Fiber 4g</td>
<td>14%</td>
</tr>
<tr>
<td>Total Sugars 12g</td>
<td></td>
</tr>
<tr>
<td>Includes 10g Added Sugars 20%</td>
<td></td>
</tr>
<tr>
<td>Protein 0g</td>
<td></td>
</tr>
<tr>
<td>Vitamin D 2mcg</td>
<td>10%</td>
</tr>
<tr>
<td>Calcium 260mg</td>
<td>20%</td>
</tr>
<tr>
<td>Iron 8mg</td>
<td>45%</td>
</tr>
<tr>
<td>Potassium 235mg</td>
<td>6%</td>
</tr>
</tbody>
</table>

*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.*

---

### The My Plate is to help you visualize a healthy plate for menu planning and food choices throughout the day.

---

### Menu Planning

<table>
<thead>
<tr>
<th>Sample Menu Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meal</strong></td>
</tr>
<tr>
<td>Breakfast</td>
</tr>
<tr>
<td>Lunch</td>
</tr>
<tr>
<td>Snack</td>
</tr>
<tr>
<td>Dinner</td>
</tr>
<tr>
<td>Snack</td>
</tr>
<tr>
<td>Notes</td>
</tr>
</tbody>
</table>
20 Tips to Eat More Fruits and Vegetables

1. Use vegetables as pizza topping. Try broccoli, spinach, green peppers, tomatoes, mushrooms, and zucchini.
2. Mix up a breakfast smoothie made with low-fat milk and frozen strawberries and a banana.
3. Make a veggie wrap with roasted vegetables and low-fat cheese rolled in a whole wheat tortilla.
4. Try crunchy vegetables instead of chips for your favorite low-fat salad dressing for dipping.
5. Grill colorful vegetable kabobs packed with tomatoes, green and red peppers, mushrooms and onions.
6. Add color to salads with baby carrots, grape tomatoes, spinach leaves, or mandarin oranges.
7. Keep cut vegetables handy for mid-afternoon snacks, side dishes, lunchbox additions or a quick nibble while waiting for dinner. Ready to eat favorites: red, green or yellow peppers, broccoli or cauliflower florets, carrots, celery stick, cucumbers, snap peas or whole radishes.
8. Place colorful fruit where everyone can easily grab something for a snack on the run. Keep a bowl of fresh, ripe fruit in the center of the kitchen or dining table.
9. Get saucy with fruit. Puree apples, berries, peaches, or pears in a blender for a thick sweet sauce on grilled or broiled seafood or poultry, or on pancakes, French toast or waffles.
10. Stuff an omelet with vegetables such as broccoli, squash, carrots, peppers, tomatoes or onions and top with low-fat sharp cheddar cheese.
11. Add pineapple, apple, peppers, cucumbers, and tomatoes to sandwiches.
12. Wake up to fruit. Add fruit to your oatmeal, cereal, yogurt or toaster waffle.
13. Top a baked potato with beans and salsa or broccoli and cheese.
14. Microwave a cup a vegetable soup as a snack or with a sandwich for lunch.
15. Add grated, shredded or chopped vegetables such as zucchini, spinach and carrots to lasagna, meat loaf, mashed potatoes, pasta sauce, and rice dishes.
17. Stock your freezer with frozen vegetables to steam or stir-fry for a quick side dish.
18. Make your main dish a salad of dark, leafy greens and other vegetables. Add chickpeas or edamame.
19. Fruit on the grill: Make kabobs with pineapple, peaches and banana. Grill on low heat until fruit is hot and slightly golden.
20. Dip: Whole wheat pita wedges in hummus, baked tortilla chips in salsa, strawberries or apple slices in low-fat yogurt, or graham crackers in applesauce.

All information adapted from eatright.org
Review

- What you eat affects your performance in class!
- Foods supply energy, build muscle, tissue repair, and fluids to hydrate.
- How much fruits and vegetables do you need every day?
- Avoid sugar sweetened beverages (coffees, energy drinks, sodas, Gatorades), skipping meals, large portion sizes, and eating away from home.
- Eat breakfast every day.
- Get plenty of sleep.
- Plan ahead for busy days by preparing meals and snacks ahead of time.
- Make healthy choices if you eat out most days of the week.

- Calorie Range 2000 to 2400
  - 9 to 13 year olds need 34 grams of protein
  - 14 to 18 year olds need 46 grams of protein
  - 9 to 18 year olds need 130 grams of carbohydrates
  - 9 to 18 year olds should not have more than 25% to 35% of our calories from fat
  - Maximum sodium recommended per day is 2200 to 2300 milligrams

- Use My Plate to visualize and help plan meals throughout the week
- Prepare ahead of time for the busy days
Recital Day

Recital day is a great time to plan ahead and pack snack and meals that will keep you energized and hydrated for the whole day. Pack a cooler or lunchbox with what you need to make it through. Mix and match the items below.

**Tips and tricks to keep hydrated and nourished:**

- Pack plenty of **water** – account for the whole day
- Low-fat milk or chocolate milk
- Peanut butter crackers
- Pretzels
- Cheese sticks
- Granola bars
- 100% juice (vegetable or fruit)
- Beef jerky
- Turkey, ham or roast beef wraps or sandwiches (make sure to add some veggies)
- Fruits and vegetables (cut up and ready to eat) and dips
- Popcorn
- Whole grain cracker and cheese slices
- Nuts and seeds
- Make a mini-sandwich on an English muffin (lean ham, low-fat cheese, and cucumber)

- If you have to eat out, make low-fat, low calorie, and low sodium choices. Look over nutrition facts before you go. A heavy meal can slow gastric emptying.
- Between events, choose carbohydrates and proteins together: fruits with nuts or crackers or popcorn; wraps or sandwiches; or cheese and crackers.
- After the event, choose whole grain carbohydrates, good fats, some salt, and rehydrate with water.

**Tips for eating out on Recital Day:**

*Plan ahead, know the menu and make healthy choices.*

Plan ahead by eating a smaller meal at lunch or plan to take leftovers home.

Know the menu and look for words like bake, grill, and broil.

Eating slowly can help portion control.

Adapted from “Healthy Snacking in a Nutshell” and “Tips for Healthy Dining Out” and “Fueling Snacks to Take to Your Child’s Game” from entright.org
SERVING SIZE TIPS

**Grains**
- Bread – 1 slice or CD cover
- Dry cereal – 1 cup or baseball
- Cooked cereal / rice / pasta – ½ cup or ½ baseball
- Bagel – ½ piece or hockey puck
- Cornbread – bar of soap

**Proteins**
- Meat – 3 ounces or deck of cards
- Fish – 3 ounces or checkbook
- Peanut butter – 2 Tablespoons or ping-pong ball

**Fruits**
- Orange / apple / pear – 1 small or tennis ball
- Dried fruits (raisins, cranberries, etc.) – ¼ cup or golf ball

**Vegetables**
- Baked potato – 1 medium or computer mouse
- Vegetables raw, chopped, or salad – 1 cup or baseball
- Vegetables cooked – ½ cup or ½ baseball

**Dairy**
- Fat free or low fat milk or yogurt – 1 cup or baseball
- Cheese – 1 ½ oz natural cheese or 9 volt battery
- Ice cream – ½ cup or ½ baseball

**Oils**
- Butter or margarine – 1 teaspoon or postage stamp
- Oils or salad dressing – 1 teaspoon or standard cap on a 16 ounce water bottle

Source: eatright.org/kids
Portion Distortion
Appendix C: Participant Questionnaire

F, M, L Name Initials ___________ Age _____ (years)

1. Please indicate how many dance classes you have at this studio for each day of the week:

Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday
--------|--------|---------|-----------|----------|--------|---------

2. Check each day of the week you have other physical activities / sports NOT including dance class at this studio?

Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday
--------|--------|---------|-----------|----------|--------|---------

3. What time did you or will you eat your evening meal today? Circle the closest time.

3:00pm  4:00pm  5:00pm  6:00pm  7:00pm  8:00pm  9:00pm  10:00pm  11:00pm

4. Where was / will your evening meal prepared today? Circle one.

Home-cooked  Restaurant  Fast food  Other ___________

5. How many cups of fruit (NOT including fruit juice) did you have today? Circle the closest amount.

0  0.5  1.0  1.5  2.0  2.5  3.0  3.5  4.0 or more

6. How many cups of fruit (NOT including fruit juice) do you plan to have the rest of the day?

0  0.5  1.0  1.5  2.0  2.5  3.0  3.5  4.0 or more

7. How many cups of vegetables (NOT including potatoes) did you have today?

0  0.5  1.0  1.5  2.0  2.5  3.0  3.5  4.0 or more

8. How many cups of vegetables (NOT including potatoes) do you plan to have the rest of the day?

0  0.5  1.0  1.5  2.0  2.5  3.0  3.5  4.0 or more

9. How much plain water did you drink today (in cups)?

0  1  2  3  4  5  6  7  8  9  10  11  12

10. How much plain water do you plan to drink the rest of the day (in cups)?

0  1  2  3  4  5  6  7  8  9  10  11  12
F, M, L Name Initials ________  Age _____ (years)

11. Estimate how many sodas (please specify cans, bottles, or glasses) that you had each day this week? Please count all meals.

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
</tr>
</thead>
</table>

12. Estimate how many energy drinks (Red bull, Monster, etc) that you had each day this week? Please count all meals.

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
</tr>
</thead>
</table>

13. Estimate how many sugar-sweetened drinks that you had each day this week (Gatorade, sugar added fruit juices, Frappuccino, etc)? Please count all meals.

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
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</thead>
</table>

14. Did you eat breakfast today? This meal would be between the hours of 3 am and 10 am.

Yes  No

15. Check each day you skipped breakfast this past week?

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
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16. Did you eat or plan to eat any of the following foods today? Circle all that apply.

**Baked goods**
- Cake
- Pastry
- Donuts
- Cookies
- Quick Breads
- Muffins
- Granola Bars

**Candies**
- Candy Bars
- Hard Candy
- Soft Candies
- Gummy Candies

**Fruit Desserts**
- Cobbler
- Fruit Pies
- Fruit Cakes

**Foods**
- Pizza
- Hamburger
- French Fries
- Potato Chips
- Buttered Popcorn
Appendix D: Research Site Assent Form

RESEARCH @ EMU

Research Site Assent Form

Introduction
- You are being asked for permission to use your facility for a research study. Research studies are conducted by scientists or other researchers to answer questions and learn new things.
- The person in charge of this study is Marie Williams, Registered Dietitian, and graduate student at Eastern Michigan University. Throughout this form, this person will be referred to as the “investigator.” Her faculty adviser is Anahita Mistry, PhD.
- The purpose of this study is to determine if a nutrition education program will result in healthy food choices and behaviors on dance practice days.
- Please read this form carefully and ask any questions you have before signing the form.

Study Procedures
- You are being asked to provide the location for the study. The study will last 6 weeks at your facility. Each week the investigator will use 10 minutes of the beginning of each dance class with females aged 12 to 18 years old.

Confidentiality
- No personal information regarding the managers or teachers will be collected during this study.

Contact Information
- If you have any questions, you can contact the Principal Investigator, Marie Williams at mwill162@emich.edu or by phone at 423.246.0302. You can also contact Marie’s adviser, Anahita Mistry, PhD, at amistry@emich.edu or by phone at 734.487.5079.

Assent Statement
- By signing below, you indicate that you have read this form, that all of your questions have been answered to your satisfaction, and that you give permission to use the location for this research study.

Signatures

Name of Studio Director / Manager (print): ________________________________

Signature of Studio Director / Manager: _________________________ Date: _________

Signature of Investigator(s): ________________________________ Date: __________
Appendix E: Parent/Guardian Informed Consent Form

RESEARCH @ EMU

Parent / Guardian Informed Consent Form

This study is conducted as part of a Master of Science thesis for the School of Health Sciences at Eastern Michigan University. The person in charge of this study is Marie Williams, Registered Dietitian, and graduate student at Eastern Michigan University. Throughout this form, this person will be referred to as the “investigator.” Her faculty adviser is Anahita Mistry, PhD.

Purpose of the study
The objective of this study is to determine if a nutrition education program will result in healthy food choices and behaviors on dance practice days. In order to accomplish this goal, nutrition education will target behavior change to decrease fast food/restaurant consumption; decrease soda, sugar sweetened beverage, and energy drink consumption; increase plain water intake; and increase fruit and vegetable intake by offering recipes and recommendations for healthy eating. Additionally, nutrition education will encourage breakfast consumption and home-cooked family meals.

What will happen if my child participates in this study?

- The study will include females aged 12 to 18 years old and those enrolled in two or more dance classes per week.
- Week 1 - dance students meeting the criteria will be given an informed consent form for parents or guardians to sign and return the following week. Students aged 12 to 17 years old must sign and return an assent form. Students aged 18 years old will sign a participant informed consent form.
- Week 2 - consent forms will be collected and those students with permission will be given the questionnaire to complete at the beginning of class time. Participants will answer questions about dietary intake, beverage choices, and meal types. The dancers’ age, height, and weight will also be measured and recorded at this time.
- Week 3, 4, and 5 - the investigator will give ten minutes of nutrition education at the beginning of the scheduled dance class time. Students will engage in two sessions per week. The education handouts will be provided to the dancers during the education sessions to review during the education sessions. The handouts can be taken home for review with parents and guardians. Examples of serving sizes will be used for illustration purposes during the sessions.
- Week 6 - at the beginning of dance class, the questionnaire will be administered again to assess any changes in dietary intake from the dancers’ initial responses.
What are the anticipated risks for participation?
There are no anticipated physical or psychological risks to participation, however, to protect against any adverse effects of nutrition education for this age group, the primary investigator, a Registered Dietitian, will monitor any comments made by participants during the nutrition education sessions that could signify a potential concern for eating disorders. If a participant makes any comment that could signify the warning signs of eating disorders, the participant will be excused from continuing the study and the principal investigator will provide the parents or guardians with a toll free number for assistance and information from the National Eating Disorder Association (NEDA).

Height and weight of each participant will be recorded by the primary investigator, a qualified Registered Dietitian, to ensure accuracy of the measurements. To protect the privacy of the participant and to avoid any embarrassment, the recording of this data will occur in a separate area of the studio and a privacy screen will be used. Some of the survey questions may be personal in nature and may make your child feel uncomfortable. Your child does not have to answer any questions or participate in any part of the study that may make her feel uncomfortable or that she does not want to answer.

The primary risk of participation in this study is a potential loss of confidentiality. Any identifiable information, such as the use of the participants’ name initials, will be protected and this is explained in the section below.

Are there any benefits to participating?
There are no benefits to you directly with participation of this study; however, you and your child will be given nutrition information and tips for healthy food choices taught by a Registered Dietitian.

What are the alternatives to participation?
The alternative is not to participate.

How will my information be kept confidential?
We will keep your child’s information confidential by creating a coded system. Your child will record their name initials on the questionnaire. Once the questionnaire is collected, the investigator will create a key with the name initials and a corresponding numeric identifier for coding purposes. This key will be stored in the primary investigator’s password protected computer that also has an updated version of anti-virus software. All completed questionnaires will remain in a locked filing cabinet by the investigator for the duration of the study. We will make every effort to keep your child’s information confidential; however, we cannot guarantee confidentiality. There may be instances where federal or state law requires disclosure of your child’s records. There is also the potential risk with data sent across as emails or internet transactions.

Other groups may have access to your child’s research information for quality control or safety purposes. These groups include the University Human Subjects Review Committee, the Office of Research Development, or federal and state agencies that oversee the review of research. The University Human Subjects Review Committee provides oversight and protection of the people who participate in research studies.

The results of this research may be used for teaching or presented at a research conference or in scientific publications in an aggregate form. The results will also be submitted to the Graduate
School at Eastern Michigan University as part of a Master of Science thesis. Identifiable information will not be used for these purposes.

**Are there any costs to participation?**
Participation will not cost you or your child anything.

**Will my child be paid for participation?**
You or your child will not be paid to participate in this research study.

**Study contact information**
If you have any questions about the research, you can contact the Principal Investigator, Marie Williams at mwill162@emich.edu or by phone at 423.246.0302. You can also contact Marie’s adviser, Anahita Mistry, PhD, at amistry@emich.edu or by phone at 734.487.5079.

For questions about your child’s rights as a research subject, contact the Eastern Michigan University Human Subjects Review Committee at human.subjects@emich.edu or by phone at 734-487-3090.

**Voluntary participation**
Participation in this research study is you and your child’s choice. Your child may refuse to participate or leave the study at any time, even after signing this form, with no penalty or loss of benefits to which the participant is otherwise entitled. If your child wishes to leave the study, the information your child provided will be kept confidential. You may request, in writing, that any identifiable information be destroyed.

**Statement of Consent**
I have read this form and understand the nature of the research. I have had an opportunity to ask questions and am satisfied with the answers I received. I give my consent for my child to participate in this research study.

**Signatures**

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<th>Name of Parent / Guardian</th>
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The details of this research study have been supplied to the participant or parent / guardian and I have answered all his/her questions. I will give a copy of the signed consent form to the participant or parent.

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Appendix F: Participant Informed Consent Form

RESEARCH @ EMU

Participant Informed Consent Form

This study is conducted as part of a Master of Science thesis for the School of Health Sciences at Eastern Michigan University. The person in charge of this study is Marie Williams, Registered Dietitian, and graduate student at Eastern Michigan University. Throughout this form, this person will be referred to as the “investigator.” Her faculty adviser is Anahita Mistry, PhD.

Purpose of the study
The objective of this study is to determine if a nutrition education program will result in healthy food choices and behaviors on dance practice days. In order to accomplish this goal, nutrition education will target behavior change to decrease fast food / restaurant consumption; decrease soda, sugar sweetened beverage, and energy drink consumption; increase plain water intake; and increase fruit and vegetable intake by offering recipes and recommendations for healthy eating. Additionally, nutrition education will encourage breakfast consumption and home-cooked family meals.

What will happen if I participate in this study?
- The study will include females aged 12 to 18 years old and those enrolled in two or more dance classes per week.
- Week 1 - dance students meeting the criteria and aged 18 years old will sign and return this form.
- Week 2 – consent forms will be collected and those students with permission will be given the questionnaire to complete at the beginning of class time. Participants will answer questions about dietary intake, beverage choices, and meal types. The dancers’ age, height and weight will also be measured and recorded at this time.
- Week 3, 4, and 5 – the investigator will give ten minutes of nutrition education at the beginning of the scheduled dance class time. Students will engage in two sessions per week. The education handouts will be provided to the dancers during the education sessions to review during the education sessions. The handouts can be taken home for review with parents and guardians. Examples of serving sizes will be used for illustration purposes during the sessions.
- Week 6 – at the beginning of dance class, the questionnaire will be administered again to assess any changes in dietary intake from the dancers’ initial responses.

What are the anticipated risks for participation?
There are no anticipated physical or psychological risks to participation, however, to protect against any adverse effects of nutrition education for this age group, the primary investigator, a Registered Dietitian, will monitor any comments made by participants during the nutrition education sessions that could signify a potential concern for eating disorders. If a participant makes any comment that could signify the warning signs of eating disorders, the participant will be excused from continuing the study and the principal investigator will provide the participant...
with a toll free number for assistance and information from the National Eating Disorder Association (NEDA).

Height and weight of each participant will be recorded by the primary investigator, a qualified Registered Dietitian, to ensure accuracy of the measurements. To protect the privacy of the participant and to avoid any embarrassment, the recording of this data will occur in a separate area of the studio and a privacy screen will be used. Some of the survey questions may be personal in nature and may make you feel uncomfortable. You do not have to answer any questions or participate in any part of the study that may make you feel uncomfortable or that you do not want to answer.

The primary risk of participation in this study is a potential loss of confidentiality. Any identifiable information, such as the use of the participants’ name initials, will be protected and this is explained in the section below.

**Are there any benefits to participating?**
There are no benefits with participation of this study; however, you will be given nutrition information and tips for healthy food choices taught by a Registered Dietitian.

**What are the alternatives to participation?**
The alternative is not to participate.

**How will my information be kept confidential?**
We will keep your information confidential by creating a coded system. You will record their name initials on the questionnaire. Once the questionnaire is collected, the investigator will create a key with the name initials and a corresponding numeric identifier for coding purposes. This key will be stored in the primary investigator’s password protected computer that also has an updated version of anti-virus software. All completed questionnaires will remain in a locked filing cabinet by the investigator for the duration of the study. We will make every effort to keep your information confidential; however, we cannot guarantee confidentiality. There may be instances where federal or state law requires disclosure of your records. There is also the potential risk with data sent across as emails or internet transactions.

Other groups may have access to your research information for quality control or safety purposes. These groups include the University Human Subjects Review Committee, the Office of Research Development, or federal and state agencies that oversee the review of research. The University Human Subjects Review Committee provides oversight and protection of the people who participate in research studies.

The results of this research may be used for teaching or presented at a research conference or in scientific publications in an aggregate form. The results will also be submitted to the Graduate School at Eastern Michigan University as part of a Master of Science thesis Identifiable information will not be used for these purposes.

**Are there any costs to participation?**
Participation will not cost you anything.

**Will I be paid for participation?**
You will not be paid to participate in this research study.
Study contact information
If you have any questions about the research, you can contact the Principal Investigator, Marie Williams at mwill162@emich.edu or by phone at 423.246.0302. You can also contact Marie’s adviser, Anahita Mistry, PhD, at amistry@emich.edu or by phone at 734.487.5079.

For questions about your rights as a research subject, contact the Eastern Michigan University Human Subjects Review Committee at human.subjects@emich.edu or by phone at 734-487-3090.

Voluntary participation
Participation in this research study is your choice. You may refuse to participate or leave the study at any time, even after signing this form, with no penalty or loss of benefits to which the participant is otherwise entitled. If you wish to leave the study, the information you provided will be kept confidential. You may request, in writing, that any identifiable information be destroyed.

Statement of Consent
I have read this form and understand the nature of the research. I have had an opportunity to ask questions and am satisfied with the answers I received. I give my consent to participate in this research study.

Signatures

________________________
Name of Participant

________________________  __________________________
Signature of Participant    Date

The details of this research study have been supplied to the participant. I will give a copy of the signed consent form to the participant.

________________________
Name of Person Obtaining Consent

________________________  __________________________
Signature of Person Obtaining Consent    Date
Appendix G: Participant Assent Form

Assent Form

Introduction
- You are being asked to participate in a research study. Research studies are conducted by scientists or other researchers to answer questions and learn new things.
- The researcher conducting this study is Marie Williams, Registered Dietitian, and graduate student at Eastern Michigan University. Throughout this form, this person will be referred to as the “investigator.” Her faculty adviser is Anahita Mistry, PhD. This study is conducted as part of a Master of Science thesis for the School of Health Sciences at Eastern Michigan University.
- The purpose of this study is to determine if a nutrition education program will result in healthy food choices and behaviors on dance practice days.
- Please read this form carefully and ask any questions you have before deciding to participate in this study.

Study Procedures
- If you agree to participate in this study, we will ask you to fill out a questionnaire that asks questions about the foods you eat, beverage choices, and meal types.
- Your participation will last for 6 weeks total. Week 1 will be recruitment for the study and assent and consent forms will be distributed and reviewed. During week 2, forms will be collected and participants will fill out the questionnaire. The investigator will also record your height and weight during this time. During week 3, 4, and 5 the investigator will give nutrition education sessions during the first 10 minutes of dance class for two classes per week. The education sessions will be reviewing nutrition handouts and these handouts will be distributed to take home for you to review with your parents or guardians. On the final week 6, the questionnaire will be given again to assess any changes in dietary intake from the initial responses.
- The alternative is not to participate in this study.

Risks
- There are no anticipated physical or psychological risks to participation, however, to protect against any adverse effects of nutrition education for this age group, the primary investigator, a Registered Dietitian, will monitor any comments made by participants during the nutrition education sessions that could signify a potential concern for eating disorders. If a participant makes any comment that could signify the warning signs of eating disorders, the participant will be excused from continuing the study and the principal investigator will provide the parents or guardians with a toll free number for
assistance and information from the National Eating Disorder Association (NEDA).

- Height and weight of each participant will be recorded by the primary investigator, a qualified Registered Dietitian, to ensure accuracy of the measurements. To protect the privacy of the participant and to avoid any embarrassment, the recording of this data will occur in a separate area of the studio and a privacy screen will be used.
- Some of the survey questions may be personal in nature and may make you feel uncomfortable. You do not have to answer any questions or participate in any part of the study that may make you feel uncomfortable or that you do not want to answer.
- The primary risk of participation in this study is a potential loss of confidentiality. Any identifiable information, such as the use of the participants' name initials, will be protected and this is explained in the confidentiality section below.

**Benefits**

- There are no benefits with participation of this study; however, you will be given nutrition information and tips for healthy food choices taught by a Registered Dietitian.

**Confidentiality**

- The investigator will do everything he/she can to protect your information. However, the investigator cannot guarantee complete confidentiality.
- We will keep your information confidential by creating a coded system. You will record their name initials on the questionnaire. Once the questionnaire is collected, the investigator will create a key with the name initials and a corresponding numeric identifier for coding purposes. This key will be stored in the primary investigator's password protected computer that also has an updated version of anti-virus software.
- All completed questionnaires will remain in a locked filing cabinet by the investigator for the duration of the study. We will make every effort to keep your information confidential; however, we cannot guarantee confidentiality. There may be instances where federal or state law requires disclosure of your records. There is also the potential risk with data sent across as emails or internet transactions.
- Other groups may have access to your research information for quality control or safety purposes. These groups include the University Human Subjects Review Committee, the Office of Research Development, or federal and state agencies that oversee the review of research. The University Human Subjects Review Committee provides oversight and protection of the people who participate in research studies.
- The results of this research may be used for teaching or presented at a research conference or in scientific publications in an aggregate form. The results will also be submitted to the Graduate School at Eastern Michigan
University as part of a Master of Science thesis Identifiable information will not be used for these purposes.

**Payments**
- You will not be paid to participate in this research study.

**Voluntary Participation**
- The decision to participate is up to you. You can refuse to participate in this study now or at any time. You can choose to participate and then, at any time during the study, choose to stop participating, even after signing this form, with no penalty or loss of benefits to which the participant is otherwise entitled.
- If you are 12 to 17 years old, your parents will also be asked to give permission for you to participate. Even if your parents let you participate, you can still refuse to participate.
- If you choose to participate and change your mind, you can ask the investigator to destroy all of your information collected. Please be aware that any published information cannot be destroyed.

**Contact Information**
- If you have any questions about the research, you can contact the Principal Investigator, Marie Williams at mwill162@emich.edu or by phone at 423.246.0302. You can also contact Marie’s adviser, Anahita Mistry, PhD, at amistry@emich.edu or by phone at 734.487.5079.
- If you have questions about your rights as a research participant, you can contact the Eastern Michigan University Human Subjects Review Committee (UHSRC) at 734-487-3090 or human.subjects@emich.edu. The UHSRC reviews and monitors research studies to make sure that participants’ rights are respected.

**Assent Statement**
- By signing below, you indicate that you have read this form, that all of your questions have been answered to your satisfaction, and that you agree to participate in this research study.

**Signatures**

Name of Participant (print): ________________________________

Signature of Participant: ___________________________ Date: _________

Signature of Investigator(s): ___________________________ Date: _________
Appendix H: Guide to the Questionnaire

Guide to the questionnaire

1. Place the number of dance classes you have each day for this dance studio only. Ballet would be one class, tap another, jazz, point, etc. For example, if you have ballet and point on Monday, you would write a 2 in the box under Monday. If you had jazz on Wednesday, you would write a 1 in the box under Wednesday.

2. Activities can include organized physical activities and sports such as other dance teams, color guard, volleyball, color guard, etc. Place a check mark in the box below the days you have these other activities from the previous question. Please leave this blank if you do not have other activities.

3. Evening meal refers to dinner or the last meal of the day

4. Evening meal preparation – home cooked meals are prepared at home with store bought ingredients; restaurant meals are prepared at restaurants NOT including fast food (examples include Olive Garden, Chop House, Cheddars, Fatz, Rush Street); fast food includes McDonalds, Pals, Chick fil A, Hardees, Arby’s, etc. Other can include: microwave meals, snacks, etc.

5. through 8. Please be aware these are two part questions, 5 and 6, 6 and 7, 7 and 8. Eaten so far and will eat at a later meal. Serving sizes for fruits and vegetables are as follows: 1 cup raw or cooked for most fruits and vegetables. Examples include: 1 whole apple or orange, 2 cups for raw spinach or leafy greens, 12 baby carrots or 2 medium carrots
If you have not eaten your evening meal or other snacks, please indicate if you plan to eat fruits or vegetables and how much.
Vegetables for this question do not include white potatoes (mashed, fried, baked, etc)
Choose the closest number.

9. through 10. Some examples of commonly used serving sizes for water include the following: (Show examples of water bottles and containers commonly used)

11. through 13. Soda, energy drink, and SSB consumption: how many do you have per day.
Please indicate the container (show examples of 12 oz can, 16 oz bottle, big chug at McD’s) (show examples of Red Bull, 5 hour energy shot, etc)

14. and 15. Breakfast would be a morning meal between hours of 3 am and 10 am; lunch would be considered a meal between 11 am and 2 pm; evening meal would be between the hours of 3 pm and 11 pm

16. Others foods may apply, please ask if you are unsure. Chips includes all chips and pretzels. Hamburger includes cheeseburgers, does not include veggie burgers. Buttered popcorn also include all popping corn, unless it is air-popped with no added salt or oils.
## Appendix I: CDC Growth Chart

### 2 to 20 years: Girls

#### Body mass index-for-age percentiles

<table>
<thead>
<tr>
<th>Date</th>
<th>Age</th>
<th>Weight</th>
<th>Stature</th>
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<th>Comments</th>
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*To Calculate BMI: Weight (kg) \* Stature (cm) \* Stature (cm) \* 10,000 or Weight (lb) \* Stature (in) \* Stature (in) \* 703

Published May 30, 2000 (modified 10/16/00).
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
http://www.cdc.gov/growthcharts
Appendix J: Signed Research Site Assent Forms

RESEARCH @ EMU

Research Site Assent Form

Introduction
- You are being asked for permission to use your facility for a research study. Research studies are conducted by scientists or other researchers to answer questions and learn new things.
- The person in charge of this study is Marie Williams, Registered Dietitian, and graduate student at Eastern Michigan University. Throughout this form, this person will be referred to as the “investigator.” Her faculty adviser is Anahita Mistry, PhD.
- The purpose of this study is to determine if a nutrition education program will result in healthy food choices and behaviors on dance practice days.
- Please read this form carefully and ask any questions you have before signing the form.

Study Procedures
- You are being asked to provide the location for the study. The study will last 6 weeks at your facility. Each week the investigator will use 10 minutes of the beginning of each dance class with females aged 12 to 18 years old.

Confidentiality
- No personal information regarding the managers or teachers will be collected during this study.

Contact Information
- If you have any questions, you can contact the Principal Investigator, Marie Williams at mwill162@emich.edu or by phone at 423.246.0302. You can also contact Marie’s adviser, Anahita Mistry, PhD, at amistry@emich.edu or by phone at 734.487.5079.

Assent Statement
- By signing below, you indicate that you have read this form, that all of your questions have been answered to your satisfaction, and that you give permission to use the location for this research study.

Signatures

Name of Studio Director / Manager (print): Dorothy Ratcliffe

Signature of Studio Director / Manager: ____________________________ Date: 10/11/16

Signature of Investigator(s): Marie Williams ____________________________ Date: 10/11/16
Research Site Assent Form

Introduction
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- The person in charge of this study is Marie Williams, Registered Dietitian, and graduate student at Eastern Michigan University. Throughout this form, this person will be referred to as the “Investigator.” Her faculty adviser is Anahita Mistry, PhD.
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Assent Statement
- By signing below, you indicate that you have read this form, that all of your questions have been answered to your satisfaction, and that you give permission to use the location for this research study.

Signatures

Name of Studio Director / Manager (print): Margaret Walling

Signature of Studio Director / Manager: [Signature] Date: 10/1/16

Signature of Investigator(s): [Signature] Date: 10/1/16
Appendix K: UHSRC Approval Letter
Appendix L: Recruitment Speech
Appendix M: Abbreviations List

ANOVA – Analysis of Variance

BMI – Body Mass Index

CDC – Center for Disease Control and Prevention

DGA – Dietary Guidelines for Americans

HP2020 – Healthy People 2020

IOM – Institute of Medicine

NCI – National Cancer Institute

NFHS – National Federation of State High School Association

NHANES – National Health and Nutritional Examination Survey

SPSS – Statistical Package for the Social Sciences

SSB – Sugar Sweetened Beverage

ODPHP – Office of Disease Prevention and Health Promotion

USDA – United States Department of Agriculture

WHO – World Health Organization