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Categorizing Vending Machine Snacks at GSU for Metabolic Syndrome Dietary Recommendations

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ABSTRACT

CATEGORIZING VENDING MACHINE SNACKS AT GSU FOR METABOLIC SYNDROME DIETARY RECOMMENDATIONS

By

ALLIE GRIMM MICHELI

APRIL 24, 2017

INTRODUCTION: Metabolic Syndrome is a group of disorders, abdominal obesity, high triglycerides, low HDL cholesterol, high blood pressure, and high fasting blood sugar, that increases the risk of cardiovascular diseases which is currently the leading cause of death in the US. Healthy eating behaviors are one modifiable risk that can prevent and even reverse some metabolic disorders. In college settings, vending machines are a popular way for students to access snacks between classes. However, frequently, nutritional information is not visible to students who use vending machines to purchase snacks.

AIM: The purpose of this capstone was to identify snacks and their nutritional composition from one classroom building at Georgia State University, in order to develop a preliminary informational brochure about healthy vending machine options.

METHODS: Data on snacks were collected from 9 of vending machines in GSU's Classroom South Building. The student investigator took pictures of all snack vending machines and recorded specific names, location, and nutritional content (calories, total fat, saturated fat, carbohydrates, sodium, fiber, and glycemic load when available) on an Excel spreadsheet. Excel was used to compute very simple statistics.

RESULTS: Of the 64 snacks found in Classroom South's vending machines, 14 snacks contained less than 200 calories, and 21 snacks contained less than 140mg of sodium. Only 5 snacks contained appropriate amounts of calories, sodium, and saturated fat that meet healthy snacks guidelines. These snacks are Go Lite! popped chips, Popcorners white cheddar, goodness knows cranberry almond, Popcorners cheesy jalapeno, and Kind bar caramel almond.

DISCUSSION: Based on the findings, a brochure will be produced communicating the healthy vending machine options. Future evaluations on the brochure will be needed to understand the acceptability of use for students, faculty and staff to promote healthy snack choices at vending machines.

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SYNDROME DIETARY RECOMMENDATIONS

by

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B.S., GEORGIA COLLEGE AND STATE UNIVERSITY

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of Georgia State University in Partial Fulfillment
of the
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APPROVAL PAGE

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Author's Statement Page

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Allie Micheli
Signature of Author

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Introduction

The leading cause of death in the United States in 2014 was heart disease (CDC, 2016c). However, behavioral risk factors are the actual leading causes of death that lead to heart disease (Mokdad, Marks, Stroup, & Gerberding, 2004). In 2000, those actual leading causes of death were tobacco use, poor diet and physical inactivity, and alcohol consumption.

Metabolic syndrome is a group of specific disorders that increase the risk for heart disease and other health conditions (National Institutes of Health, 2016). The specific factors are abdominal obesity, high triglycerides, low HDL cholesterol, high blood pressure, and high fasting blood sugar. To be diagnosed with metabolic syndrome three of these risk factors must be present (National Institutes of Health, 2016).

Obesity is defined as having a body mass index (BMI) over 30, and overweight is considered as a BMI between 25 and 30 (CDC, 2015). Additionally, abdominal obesity is determined by measuring waist circumference (WC) (Harvard Health, 2005). Women with a WC of 35 inches and men with a WC of 40 inches have abdominal obesity. In the United States, more than a third of the adult population is obese, and approximately another third of the adult population is considered overweight (CDC, 2015). Obesity is also a significant economic burden costing our country billions of dollars to treat those affected. Type 2 diabetes, which is also a specific disorder within metabolic syndrome, is often caused by obesity. It is now well established that Type 2 diabetes, hypertension, and hyperlipidemia can be managed through proper dietary intake.

Young adulthood is defined as persons in their late teens or early twenties. Undergraduate college students are a specific population of young adults that may be faced with multiple life stressors as the transition to independence takes place. Moving away from home, they are faced

with making their own decisions, such as food choices. For students who live on campus, dining halls provide a variety of food selections. Beyond dining halls, vending machines are common across college campuses because they are convenient and inexpensive; students often make their food selections based on what is convenient and inexpensive. A study by Brown, Flint, & Fuqua, 2014 found that nearly 75% of students bought food or drinks from the vending machines on campus (Brown, Flint, & Fuqua, 2014). In 2012, 6.6% of the vending machine industry's profit came from college and university campuses (Brown et al., 2014). However, it is well established that the majority of choices in vending machines are of low nutritional value.

The food choices available and accessible to students can strongly influence the choices they make. Schools have been identified as an important location for an intervention to promote healthier food options (Grech & Allman-Farinelli, 2015). The Centers for Disease Control created the Common Community Measures for Obesity Prevention project with recommendations to prevent obesity (Brown et al., 2014). One of these recommendations was that schools, colleges, and universities “implement and enforce policies that increase the availability of healthy foods, including...vending machines.”

The current capstone is informed by the Host, Agent, Vector, Environment (HAVE) model. The HAVE model was originally developed for better tracking and prevention of infectious diseases (Gordis, 2014) which is commonly used to describe how a disease moves throughout a population (Gordis, 2014). The model outlines how human interaction with their environment that contains and transmits the infectious agent can be interrupted to prevent disease. The HAVE model has been increasingly adopted for use in chronic disease prevention. For example, in tobacco control, the HAVE model has been used to inform public health practice and policies to prevent tobacco-related diseases by focusing on host behaviors, attitudes, and

perception (host); regulating tobacco and tobacco-related products and their marketing (agent); better tracking of the tobacco industry tactics (vector); and promoting tobacco-free policies (environment).

In applying the HAVE model to address and prevent metabolic syndrome through proper diet and nutrition, the host is the consumer who utilizes the vending machines. On college campuses, this includes the students, faculty, and staff. The agent includes the snack products available for purchase in the vending machines. The vector includes the vending machine company, as well as the specific companies that supply the products. The environment includes policies of the campus with regards to what is provided, as well as, where vending machines are located.

Research Questions:

1. What snacks are currently available through vending machines at GSU campus?
2. What is the nutritional content of the snacks?
3. What proportion of snacks offered would provide healthy options that would help to address and prevent metabolic syndrome?

The purpose of this capstone is to produce a preliminary educational pamphlet that can be provided to consumers of vending machine products, as well as, inform future intervention research.

Review of Literature

Metabolic Syndrome

Metabolic Syndrome increases one's risk of mortality from cardiovascular disease and all causes of death (Ford, Giles, & Dietz, 2002). Prevalence of metabolic syndrome in the United States is unknown, but Ford and colleagues attempted to establish the prevalence based on the National Health and Nutrition Examination Survey (NHANES) using the data from 1988-1994. The researchers used the NHANES data to look at the factors associated with metabolic syndrome which are abdominal obesity, high triglycerides, low HDL cholesterol, high blood pressure, and high fasting blood sugar. It was estimated that approximately 22 percent (24 percent when age adjusted) of US adults have metabolic syndrome. When adjusted for race, Mexican Americans have the highest prevalence at 31.9 percent. Using NHANES data from 2007-2012, it was reported that the prevalence of metabolic syndrome in US adults increased to 34.2 percent (Moore, 2017). These results do not include all US adults but are from a representative sample, and the results show metabolic syndrome is highly prevalent.

The prevalence of metabolic syndrome in US adolescents aged 12 to 19 was 4% in 2010 with an increasing trend for the future (Okosun, Boltri, Lyn, & Davis-Smith, 2010). The association between metabolic syndrome and obesity in children has not been studied as extensively as the association in adults, but research has shown that childhood obesity increased risk for metabolic syndrome in adulthood (Okosun et al., 2010).

Because metabolic syndrome is increasing in prevalence and has high socioeconomic costs, it is considered a global health burden and worldwide epidemic (Okosun, Annor, Esuneh, & Okoegwale, 2013). Okosun and colleagues conducted a study on metabolic syndrome and health-related quality of life using NHANES data. The researchers found that it is associated

with poor overall health, poor physical health, and poor mental health (Okosun et al., 2013).

Metabolic syndrome can be managed and prevented through lifestyle changes including diet and physical activity (Grundy et al., 2005). Diet should be low in saturated fats, trans fats, cholesterol, sodium, and sugars.

Impact of poor diet on health

Public health professionals should be concerned with the dietary behaviors of Americans because poor diet is associated with five of the ten leading causes of death which include heart disease, certain types of cancer, stroke, diabetes, and atherosclerosis (Bidlack, 1996). CDC states that 20 to 40 percent of deaths from each cause could be prevented and one of the prevention strategies is a healthier diet (CDC, 2016a). In 1990, thirty percent of health care expenditures in the United State were related to poor diet (Bidlack, 1996). These conditions and the huge amount of money they require could be reduced and prevented by improving diet.

A proper and healthy diet has been proven to delay and even prevent many chronic diseases (Morris & Rorie, 1997). In a study using NHANES data from 2003-2006, researchers found that over half of the study population did not eat a healthy diet (Loprinzi, Smit, & Mahoney, 2014). Additionally those who did not eat a healthy diet had less favorable health markers, such as high LDL cholesterol and insulin.

Establishing a healthy diet in children and adolescents is important. There is a wealth of evidence that establishes health behaviors developed in early life continue to adult life (Fisk et al., 2011). Studies have also shown that increases in BMI in adolescents persists through adulthood (Okosun et al., 2010). Therefore, interventions that promote health eating in early life can influences behaviors for a life time having the greatest impact. Decreasing dietary fat, being aware of caloric intake, and increasing consumption of nutrient dense foods such as fruits and

vegetables could reduce obesity and the prevalence of chronic diseases that are impacted by diet (Bidlack, 1996).

Diabetes

As the prevalence of obesity in the US continues to increase, so will the prevalence of diabetes. In 2010, 25.8 million Americans were living with diabetes, which rose to 29.1 million in 2012 (American Diabetes Association, 2016). Diabetes is a serious illness, ranking as the seventh leading cause of death in the US in 2010. A person with diabetes has blood glucose levels that are higher than normal (CDC, 2016b). A1C is a blood test that provides a person's average blood glucose levels (NIH, 2014). Normal A1C level is below 5.7 percent, while an A1C level of 6.5 percent or higher indicates diabetes is present. Their blood glucose levels are higher because insulin, a hormone made in the body, is not functioning properly (CDC, 2016b). The pancreas is responsible for making insulin which helps glucose enter the cells in our bodies. Glucose comes from the food we eat and is used by our bodies as energy. The bodies of people with diabetes either do not make any insulin (type 1) or cannot properly use or make enough insulin (type 2). Type 1 diabetes is referred to as an autoimmune or genetic disease, meaning it most likely cannot be prevented. It can be managed through healthy eating and physical activity, as well as insulin injections. In contrast, risk factors for type 2 diabetes include age, obesity, family history, physical inactivity, and ethnicity. Most people with type 2 diabetes also take an oral medication which controls their blood glucose levels. While there is no cure for diabetes, a significant amount of research has accumulated to document that Type 2 diabetes is reversible through proper diet and exercise (CDC, 2016b).

Individuals with diabetes can utilize the glycemic index and glycemic load to manage their blood sugar (Harvard Health, 2015). Glycemic index (GI) tells us how fast or slow the food

increases blood sugar. A low GI identifies a slow and steady release of glucose while a high number on the index signifies a rapid release. Someone with diabetes or trying to lose weight would want to concentrate on foods that are lower on the index. High GI foods are ideal for recovery after a long and intense workout. However, GI does not explain the entire picture. Glycemic load (GL) takes into account the total carbohydrates in a serving. In addition to telling you how fast or slow glucose enters the bloodstream, GL also describes how much glucose enters the bloodstream. For example, watermelon's GI is 80, but the GL is only five because there are only six grams of carbohydrates. To find GL you multiply the GI value by the total grams of carbohydrates in a serving and divide by 100. According to the Glycemic Load Foundation, it is advised to keep your daily GL below 100 ("The Glycemic Load (GL)," n.d.). This means meals should be between 20 and 25 and one daily snack should be between 10 and 15.

It has long been in question whether the use of the glycemic index (GI) and glycemic load (GL) are beneficial in weight loss and obesity prevention (Esfahani, Wong, Mirrahimi, Villa, & Kendall, 2011). Esfahani and colleagues conducted a review of the literature to examine the use of GI and GL diets in weight loss studies and reported their findings. One of their findings is the concept of "a calorie is a calorie." Several trials randomized participants into different diet groups that had different compositions of fat, protein, and carbohydrates. Each trial found that there was significant weight loss in each diet group, and concluded that the distribution of macronutrients did not make a difference. Another finding of the review was that low GI and GL diets might successfully reduce weight and body mass index (BMI) in children and adolescents. Esfahani and colleagues located three studies of this kind, all of which reported similar findings. When randomized to a reduced fat diet and low GL and GI diet, the low GL and

GI groups lost more weight or had greater reductions in BMI than the reduced fat diet groups. These studies, however, were not long-term, and with only three studies, the evidence is limited. The researchers went on to identify twenty GI/GL studies with adult participants. In this group of studies, only four reported statistically significant weight loss as compared to the control group which was a low-fat diet or high GI/GL diet. Other studies had no significant weight loss findings for the low GI/GL diet. In summary, the researchers state that the findings are not consistent but believe that low GI/GL diets have positive effects on the body. The researchers suggest long-term, large randomized controlled clinical trials in the future to determine if a low GI/GL diet is beneficial for weight loss.

As mentioned in Esfahani and colleagues' review, there are some studies of low GI/GL diets on preventing obesity and facilitating weight loss with both children and adults. For this literature review, there will only be a review of one study from each demographic to highlight some of the strengths and weaknesses of using GI and GL as a method of weight loss.

Hispanic children have a greater prevalence of obesity and metabolic syndrome which would lead to type 2 diabetes (Mirza et al., 2013). Mirza and colleagues conducted a long-term, randomized clinical trial comparing a low GL diet with a low-fat diet in 113 Hispanic children and adolescents. The study only included self-identified Hispanic children who were seven to fifteen years old, who were otherwise healthy, but had a body mass index (BMI) greater than the 95th percentile for age and sex. Over a four year period, there were six low GL diet groups and six low-fat diet groups, occurring at different times. The groups were followed for two years. Participants were randomized into the GL or low-fat diet groups. The intervention consisted of a twelve-week nutrition course on their designated diet, recipes, food lists, and physical activity sessions. Height, weight, and waist circumference were measured, and the participants did

dietary recall at their follow-up visits. Both groups had a significant decrease in BMI, but there was not a significant difference between the two groups. Both diets produced effective weight loss results for obese Hispanic youth.

Fabricatore and colleagues conducted a randomized control trial with 79 obese adults who had been diagnosed with type 2 diabetes. The researchers wanted to compare a low GL diet to a low-fat diet in this population because the current research has inconsistent findings on which is more effective in weight loss (Fabricatore et al., 2011). The diet was part of a lifestyle program that also included exercise and therapy. Participants were instructed on behavioral and cognitive skills, physical activity recommendations, and how to follow their designated diet. Weight was the primary measure, but height, waist circumference, and blood pressure were also measured. Both GL and low-fat diet groups reported weight loss, but there was not a significant difference in the decrease between the two groups. Based on these studies, a low GL diet does not increase weight loss as compared to a low-fat diet, but a low GL diet may be an effective diet to lose weight.

Hypertension

About sixty percent of people who have diabetes also have high blood pressure (“High Blood Pressure (Hypertension) Information | cdc.gov,” n.d.). High blood pressure, which is also called hypertension, means that the pressure of the blood in the blood vessels is higher than it should be. Hypertension is defined as having blood pressure greater than 140/90 mm Hg. Hypertension can significantly damage the heart and also harm the brain and kidneys. About 75 million adults in the U.S. have high blood pressure, and that increases the risk of heart disease and stroke which are also risks of obesity. Medications can be used to lower blood pressure, but lifestyles changes can also help to do so. Eating a healthy diet that is low in sodium, saturated

fat, and cholesterol along with being active can help control blood pressure. The American Heart Association (AHA) recommends eating no more than 2,300 milligrams of sodium per day to lower blood pressure (“The American Heart Association’s Diet and Lifestyle Recommendations,” n.d.). It would be ideal to reduce sodium intake to 1,500 milligrams per day to reduce blood pressure further.

Hypertension is a major risk factor for cardiovascular disease and its possible outcomes (Kannel, 1996). These outcomes include cardiac failure, stroke, coronary heart disease (CHD), and peripheral artery disease. CHD is the most common and lethal outcome of cardiovascular disease that is attributable to hypertension. Severity of hypertension is proportional to the risk of angina, myocardial infarction, and sudden death which are caused by CHD. Therefore, it is extremely important to manage hypertension and lower blood pressure.

Hyperlipidemia

Hyperlipidemia is an umbrella term that covers several conditions, but the most common conditions are low HDL cholesterol and high triglycerides (“Hyperlipidemia,” n.d.). The body produces cholesterol, but these levels can fluctuate based on genetics or diet. HDL cholesterol is considered good cholesterol and high levels help remove cholesterol from the arteries. LDL cholesterol is the bad alternative that causes blockages. Therefore, low HDL and high LDL cholesterol can lead to heart disease and stroke. Ideally, LDL cholesterol should be less than 100 milligrams per deciliter (mg/dL) and HDL cholesterol should be 60mg/dL or higher (“Cholesterol Fact Sheet|Data & Statistics|DHDS|CDC,” n.d.). 73.5 million adults in the US have high LDL cholesterol (“High Cholesterol Facts | cdc.gov,” n.d.). Medication may be prescribed to treat hyperlipidemia, but it can also be managed with a healthy diet and physical activity. Food choices should be low in cholesterol and saturated fat. To reduce saturated fat

intake, it is recommended to reduce red meat and dairy intake. A high fiber diet can also help lower cholesterol. It is recommended by AHA that someone trying to lower cholesterol should limit saturated fat intake to no more than five or six percent of total daily calories (“The American Heart Association’s Diet and Lifestyle Recommendations,” n.d.).

College Students

The transition to independent living during college years is important because the students will make eating decisions (Deshpande, Basil, & Basil, 2009). Food choices can have a lasting impact on someone’s health, and several studies have shown that college students make poor food choices. Factors effecting students’ food choices include high stress and low nutrition knowledge.

One study found that 70 percent of a sample of freshmen college students ate less than five fruits and vegetables a day, and 50 percent ate fried or fast food at least three times a week (Racette, Deusinger, Strube, Highstein, & Deusinger, 2005). The college students from that study were followed, and 70 percent gained weight from the beginning of freshmen year to the end of sophomore year. Some studies have found that on average, college students gain two to seven pounds in their first year (Hoffman, Policastro, Quick, & Lee, 2006). This weight generally is retained throughout their college years because they continue with the same diet and physical activity habits (Byrd-Bredbenner et al., 2012).

Students have been viewed as solely responsible for their college weight gain, but the environments in which students live during college have recently been studied as well (Byrd-Bredbenner et al., 2012). The Social Cognitive Theory (SCT) explains that health behaviors are developed through the environment the individual lives in as well as their individual beliefs (DiClemente, Salazar, & Crosby, 2013). Using SCT researchers have studied the college food

environments and determined that if healthier choices were more readily available, it would be easier for college students to maintain a normal body mass index (Byrd-Bredbenner et al., 2012). Dining halls are usually blamed for weight gain, but other aspects of the food environment such as vending machines could be a major contributor (Pelletier & Laska, 2013).

Vending Machines

One factor associated with obesity is excess energy consumption from food with insufficient physical activity (Caruso, Klein, & Kaye, 2014). Snacking is one factor that leads to the excess energy consumption. Snacks are typically sweet, salty, and fatty foods. Vending machines have been a known source of unhealthy snack options. Improving the food environment, such as providing more nutrient rich snack options in vending machines, is recommended for reducing the prevalence of obesity. Several interventions have studied what is currently in most vending machines and ways to increase the purchases of nutritious foods in vending machines.

To study the food environment on college campuses, Byrd-Bredbenner and colleagues assessed the snacks available in vending machines on eleven college campuses throughout the United States (Byrd-Bredbenner et al., 2012). Researchers determined the buildings with the highest traffic flow and collected data from the student union, library, and two to five percent of total buildings on campus that were identified as high traffic. In the selected buildings one snack vending machine was surveyed on the main floor, if available. All snacks in the machine were recorded and then categorized as salty, cookies, candy bars, candy, crackers, trail mix, pastries and cakes, beef jerky, fruit leather, granola bars and cereal, and gum. Salty snacks were the most common at 30 percent of total categorized snacks, followed by candy at 17 percent and candy bars at 12 percent. The researchers also did a Snack Quality Score based on nutritional value and

found that the snacks available were not nutrient dense. The majority of snacks were more than 200 calories per package and high in fat. Less than half of the snacks met a healthy score. Byrd-Bredbenner and colleagues concluded that vending machines on college campuses contribute to a poor food environment, and food environmental changes could be made to contribute to healthier lifestyles of students.

To determine how often students use vending machines on college campuses Pelletier and colleagues conducted a survey at a community college and public university (Pelletier & Laska, 2013). The survey was limited to students living off campus because the researchers did not want to include students who had a prepaid meal plan, which is primarily purchased by student who live on campus. The survey included a question that reported the number of days per week that the participant bought food from a vending machine on campus. Almost half of the survey respondents reported that they utilized the vending machines for a snack on campus at least once per week. While buying snacks was not the most frequent on campus purchase, vending machines are still highly utilized. Therefore this study concluded that the snacks available in vending machines should promote healthy lifestyles.

Grech and Farinelli conducted a systematic literature review to identify vending machine interventions that encourage healthier choices. Twelve intervention studies were included in this review. Settings of the studies included work sites, universities, and schools. The interventions included point-of-purchase nutrition information, altered availability of healthier choices, and pricing strategies; some studies used more than one intervention strategy. Techniques for point-of-purchase nutrition information included a traffic light labeling code labeling snacks as “low calorie” or “low fat” to inform consumers of healthier options. Five of the eight studies that used point-of-purchase nutrition information experienced significant increases in the purchase of

healthier snack options. Another strategy observed in the literature was increasing the proportion of healthy snacks. This strategy was successful in increasing sales of healthier snacks in five interventions. Price reductions on healthier snacks were observed in five studies, and all five studies had significant increases in the sale of discounted healthier options. This review of the literature determined that interventions can be successful in increasing the consumption of healthier snacks from vending machines.

A study by Brown and colleagues aimed to determine the effects of adding nutrition information to the vending machines on a college campus (Brown et al., 2014). Five vending machines in high traffic areas on the campus were selected to observe. First the snacks were assessed by calories, total fat, and saturated fat. Then during a two-week period sales were tracked in those five machines as baseline data. The vending machines items were then categorized with color-coded stickers based on the red, yellow, or green traffic light. The categorization was based on dietary guidelines set by the United States Department of Agriculture (USDA). The red sticker identified snacks with more than 250 calories per serving and/or more than 40 percent of calories from fat and/or more than 10 percent of calories from saturated fat. The yellow sticker identified snacks with less than 250 calories but 30-39 percent of calories from fat and/or five to nine percent of calories from saturated fat. The green sticker meant the snack contained less than 250 calories but had less than 30 percent of calories from fat and/or less than five percent of calories from saturated fat. Stickers were placed next to the food item in the vending machines, and a larger sticker was placed on the vending machine to describe the color code. In addition marketing posters were placed throughout the campus. Vending sales were tracked for another two weeks after the educational materials were in place. There were some limitations to this study such as only using five vending machines, but the

results indicated the need for further research. Overall, there was a decrease in sales of the red-stickered items and an increase in sales of the green-stickered items. These results show that a simple educational intervention can be effective in increasing the consumption of healthier vending machine options.

Healthy Snack Guidelines

According to the United States Department of Agriculture's (USDA) Smart Snack Guidelines for snacks in elementary, middle, and high schools, a snack should be less than 200 calories and saturated fat should be less than ten percent of calories ("National School Lunch Program and School Breakfast Program," 2013). According to Food and Drug Administration (FDA), for a food to be considered low sodium, the food label standard is 140 mg or less per serving (Nutrition, 2016).

Methods

Georgia State University is a public university with multiple campuses. The setting of this research is GSU's main Atlanta-based urban campus. In 2016, about 53,000 undergraduate and graduate students were enrolled at all GSU campuses. There were 32,082 students specifically at the downtown Atlanta campus. Additionally there are over 3,500 faculty and staff members at GSU. GSU is the most ethnically diverse university in Georgia.

For the purposes of this capstone, vending machines in Classroom South were observed. Classroom South is one of the buildings where there is a high volume of students primarily due to its location on Decatur Street. Classroom South has six floors with a total of nine snack vending machines. The student investigator conducted direct observations of the snack vending machines using cell phone camera (see figures 1 and 2). Using the pictures, the student investigator recorded specific snacks that were available in the vending machines, which made

up the data in an Excel spreadsheet. Because nutritional content was not readily visible on the snacks in the vending machine, the researcher reviewed the manufactures' websites to collect nutritional content of the snacks by size of package.

A literature review was conducted using PubMed and other online resources such as AHA, CDC, and Harvard Health to gain information about Diabetes, Hypertension, Hyperlipidemia. Guidelines for total daily GL consumption were obtained from the Glycemic Load Foundation. Guidelines to prevent and manage hypertension and hyperlipidemia were obtained through AHA. In addition, FDA and USDA provided guidelines for healthy snack nutritional contents.

Data points for each snack identified in the vending machine included size of package in ounces, total calories, total fat in grams, saturated fat in grams, total carbohydrates in grams, sodium in milligrams, and dietary fiber in grams. Glycemic load was recorded if it was available on the International Tables of Glycemic Index and Glycemic Load Values (Atkinson, Foster-Powell, & Brand-Miller, 2008). These tables provide GI and GL for most common whole foods such as fruits, meats, and etcetera. Upon examination, it was determined that only a few of the identified vending snacks were included in the tables.

Using the nutritional information, mean, median, and range were calculated for each snack using Microsoft Excel. In addition, the Sort function in Excel was utilized to determine the snacks with the highest and lowest amounts of calories, total fat, saturated fat, total carbohydrates, and sodium. Next, the student researcher conducted one sort that included calories, sodium, and saturated fat (smallest to largest) to determine the healthiest snacks based on healthy snack guidelines.

Results

Classroom South Vending Machine Number and Location

Within Classroom South building, there were nine snack vending machines. Floors one, two, and three each had two snack vending machines. These two snack vending machines were side by side on all three floors. Floors four, five, and six each had one snack vending machine. All nine vending machines are centrally located, next to the bathrooms. They are in between the main hallway and the student lounge area. To get to the stairs and elevators, students must walk past the vending machines. The vending machines are located in the same place on all six floors of Classroom South. Table 1 shows where each snack was located. The researcher visited Classroom South two months after the initial assessment to observe the vending machines. Snacks remained the same in this second assessment.

Ranking of Snacks by Calories

The five snacks with the least amount of calories from lowest to highest were Jack Link's beef steak, Go Lite! popped chips, Good Natured Vegetable Crisps, Good Health veggie stix, and Popcorners cheesy jalapeno. The five snacks with the greatest amounts of calories from highest to lowest were Reese's large bag, M&Ms peanut large bag, Raisinets large bag, Freshley's jumbo honey bun, and Snickers bag of minis.

Ranking of Snacks by Total Fat and Saturated Fat

The five snacks with 0 grams of total fat and saturated fat were Sour Patch, Sweetarts ropes, sour gummy worms, Black Forest organic gummy bears, and Welch's fruit snacks. The snacks with the most amount of total fat were Reese's large bag, M&Ms peanut large bag, Snickers bag of minis, Freshley's jumbo honey bun, and Raisinets large bag. The snacks with the

most saturated fat are Raisinets large bag, Reese's large bag, M&Ms peanut large bag, Freshley's jumbo honey bun, and Snickers large bag.

Ranking of Snacks by Total Carbohydrates

The snacks with the least amount of total carbohydrates are Jack Link's beef steak, Go Lite! popped chips, Lance salted peanuts, Kind bar caramel almond, and Good Health veggie stix. The snacks with the most amounts of carbohydrates are Welch's fruit snacks, Raisinets large bag, Black Forest organic gummy bears, M&Ms peanut large bag, and sour gummy worms.

Ranking of Snacks by Sodium

The five snacks with the least amount of sodium, starting with the lowest amount, are Black Forest organic gummy bears, Skittles, Go Lite! popped chips, M&Ms peanut, Goodness Knows cranberry almond. The five snacks with the most sodium, starting with the highest amount, are Snyder pretzel pieces buffalo wing, Takis, Cheez-its, Act II butter lovers popcorn, and Cheetos jalapeno cheddar. Kind bar caramel almond, M&Ms peanut large bag, Act II butter lovers popcorn had the most fiber, and eleven snacks contained zero grams of dietary fiber.

Ranking of Snacks by GL

The snacks with the lowest GL, based on what the researcher was able to find, are Lance salted peanuts, M&Ms peanut, Lay's potato chips, Doritos nacho cheese, Ruffles cheddar and sour cream, and the snacks with the highest GL are Raisinets large bag, Reese's large bag, Skittles, Act II butter lovers popcorn, and Famous Amos chocolate chip cookies.

Healthy Guidelines- Calories

Only 14 snacks contained 200 calories or less. For all 14 of those snacks with 200 calories or less, all of their saturated fat amounts were less than ten percent of the calories. These snacks are, from least amount of calories to 200 calories, Jack Link's beef steak, Go Lite popped

chips, Good Natured vegetable crisps, Good Health Veggie stix, Popcorners white cheddar, goodness knows cranberry almond, Popcorners cheesy jalapeno, Rice Krispy treat, Cloverhill mini blueberry muffins, Nature Valley crunchy oats and honey, kind bar caramel almond, Poptart strawberry, Lance whole grain cheddar cheese crackers, and Chex Mix traditional.

Healthy Guidelinse- Sodium

According to the FDA's low sodium standard, only 21 of the 64 snacks in the vending machine contained 140mg of sodium or less. These snacks are, from lowest sodium content to 140mg, Black Forest organic gummy bears, Skittles, Go Lite popped chips, M&Ms peanut, goodness knows cranberry almond, Sour Patch, Welch's fruit snacks, Rasinets large bag, sour gummy worms, M&Ms peanut large bag, Mrs. Mays cashew crunch, Calbee Wholecuts lightly salted, Nutter Butter bites, Twix, food should taste good tortilla chips, Snicker, kind bar caramel almond, Calbee Wholecuts salt and vinegar, Popcorners cheesy jalapeno, Popcorners white cheddar, Calbee Wholecuts bacon and cheddar. Of the 21 snacks with 140mg of sodium or less, only five contained less than 200 calories. These snacks are Go Lite! Popped chips, Popcorners white cheddar, goodness knows cranberry almond, Popcorners cheesy jalapeno, and Kind bar caramel almond.

All of the nutritional values collected for all Classroom South vending machine snacks are available in Table 2.

For each nutritional value, the maximum and minimum values were much higher and lower than the mean, so it was important to record these values. For example, the mean for sodium was 270.36mg, but the maximum value was 855mg, and the minimum was 0mg.

Univariate analysis of nutritional values of all vending machine snacks is available in Table 3.

Discussion and Conclusion

Discussion of Research Questions

1. What snacks are currently available through vending machines at GSU campus?

In Classroom South's nine vending machines, there were a total of 64 different snacks available. The snacks were available in multiple vending machines; there was not one snack that was only available on a single machine. Snack vending machines are easily accessible in Classroom South and being in the same location on all floors makes them easier to locate for student, faculty, and staff. Types of snacks were candy and salty or sweet snacks. A list of all snacks and where they are located is available in Table 1.

2. What is the nutritional content of the snacks?

The exact nutritional values of the snacks in Classroom South's vending machines are found in Table 2. Overall, the nutritional content of the snacks is poor and very few snacks meet healthy snack guidelines that were discussed in the literature review. Vending machines provide students, faculty, and staff convenient and fast snack options. Therefore, GSU should take careful consideration of what goes into the vending machines on campus.

3. What proportion of snacks offered would provide healthy options that would help to address and prevent metabolic syndrome?

Based on the healthy snack guidelines, the best snacks in the vending machines to address and prevent metabolic syndrome are Go Lite! Popped chips, Popcorners white cheddar, goodness knows cranberry almond, Popcorners cheesy jalapeno, and Kind bar caramel almond. These healthier options take into account calories, sodium, and saturated fat. Only 7.8 percent of snacks offered in Classroom South's vending machines meet healthy snack guidelines. Less than ten percent is not enough healthy options that can address metabolic syndrome. A preliminary

brochure was created promoting the selection of these five snacks to address and prevent metabolic syndrome. The brochure's aim is to increase selections of the healthier options. The brochure should be evaluated to test its effectiveness in doing so.

This research used the HAVE model to describe how human interactions with the environment could lead to chronic disease, or specifically metabolic syndrome in this capstone. The review of literature determined that our hosts, college students, commonly utilize the agent, vending machines, as a snack source because it is fast and inexpensive. The research of this capstone determined that there are multiple agents or vending machines available for students to use, containing a plethora of unhealthy snack options. GSU holds an important role in this model as the environment regarding campus policies of what is allowed in the vending machines. Should GSU want to change their policies about what is in the vending machines, they could contact the vendor, or the vending machine company, to request healthier snack options. While it is the vending machine company's responsibility to fill the machines at GSU, and the snack companies' responsibility to provide the snacks, GSU administration can have significant input as to what is made available to their students, faculty, and staff. Moreover, the University System of Georgia has underway many initiatives around campus well-being, of which nutrition is in need of focus and attention.

Strengths and Limitations

The original aim of this capstone was to categorize the vending machine snacks in GSU's Classroom South using the glycemic load (GL). Upon researching GL, the student investigator determined that most foods with a validated number are whole foods, such as bread or fruit, and not the snacks found in vending machines. This discovery is because specific validated methods are used to determine glycemic index and GL. Established lists are the only tool we have for

determining the GL. Using these established lists, the researcher was able to locate 23 GLs of the 64 vending machine snacks. At that point, the investigator and faculty mentors decided to expand this capstone to include hypertension and hyperlipidemia along with diabetes and examine the dietary guidelines recommended to manage and prevent these conditions.

The researcher established intra-rater reliability by visiting the vending machines a second time to observe the snacks available. However, only one researcher visited the vending machines and recorded the snacks, so this study did not establish interrater reliability.

One limitation of the study is that only Classroom South's vending machines were observed, and there are many other buildings on campus with vending machines. Another limitation is that the research did not observe what snacks student, faculty, and staff are choosing from the vending machines, only what is available. Further research should be conducted to determine the most popular snacks choices by watching what consumers select from the machines.

Recommendations

In addition to collecting research on what snacks consumers select from the vending machines, future research should test the acceptability of the brochure and then pilot the effectiveness of the brochure. The student investigator has created a preliminary brochure based on this research. The brochure promotes the selection of the five healthier snacks and discourages the selection of the snacks that were on the lists for five highest GL, calories, total fat, saturated fat, carbohydrates, and sodium. The investigator would propose testing the brochure messaging through focus groups to better understand whether the information is understandable and the presentation and mode of communication is acceptable. Also, future researchers could determine what impact the brochure has on vending machine snack selection

through behavioral observation data collection. A randomized control trial can be conducted by randomly selecting vending machines to place the brochures and collecting observational data across vending machines with and without the brochures. Outcomes would focus on whether the brochures were read by GSU community, and if so, whether it impacted vending machine selections. Vending machines with and without the brochure can be compared and having more than one rater would allow reliability statistics to be performed.

Conclusions

In this study, all vending machine snacks in GSU's Classroom South Building were recorded, as well as their nutritional values and where the snacks were located. Using Excel, the researcher was able to sort the nutritional value data to determine which snacks contained the highest and lowest amounts of calories, total fat, saturated fat, carbohydrates, and sodium. GL was recorded when it was available. The student investigator also conducted one sort that included calories, sodium, and saturated fat to determine the healthiest snacks based on healthy snack guidelines. The student investigator concludes that there are very few vending machine snack options that address and prevent metabolic syndrome. The student investigator created a preliminary brochure based on the research communicating the healthy options available.

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Appendices

Figure 1



Floor 1, Vending Machine 1

Figure 2



Floor 1, Vending Machine 2

Table 1 Where Snacks were Located

| Snack | Floor 1 | | Floor 2 | | Floor 3 | | Floor 4 | Floor 5 | Floor 6 |
|---|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | Machine 1 | Machine 2 | Machine 1 | Machine 2 | Machine 1 | Machine 2 | Machine 1 | Machine 1 | Machine 1 |
| Big Texas cinnamon roll | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Buddy Bar | yes | yes | yes | yes | yes | yes | | yes | yes |
| Bugles | | yes | | yes | | yes | | | |
| Butter Lovers popcorn | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Calbee Wholecuts bacon and cheddar | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Calbee Wholecuts lightly salted | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Calbee Wholecuts salt and vinegar | yes | yes | yes | yes | yes | yes | | yes | |
| Cheetos crunchy | yes | | yes | | yes | | yes | yes | yes |
| Cheetos jalapeno cheddar | yes | | yes | | yes | | | yes | yes |
| Cheez-its | | yes | | yes | | | | | |
| Chex Mix traditional | yes | | yes | | yes | | | | yes |
| Clif chocolate chip bar | yes | yes | yes | yes | yes | yes | | | |
| combos cheddar pretzel | yes | | yes | | yes | | yes | yes | yes |
| Doritos nacho cheese | yes | | yes | | yes | | yes | | yes |
| famous amos chocolate chip cookies | | yes | | yes | | yes | | | |
| food should taste good sweet potato chips | | yes | | yes | | yes | | | |
| Freshley's jumbo honey bun | yes | | yes | | yes | | yes | yes | yes |
| Fritos Bar-B-Q | yes | | yes | | yes | | yes | yes | yes |
| Go Lite! Popped chips | yes | | yes | | yes | | | yes | yes |
| Good Health Veggie Stix | yes | | yes | | yes | | | yes | |
| Good Natured Vegetable Crisps | yes | | yes | | yes | | | yes | |
| goodness knows | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Grandma's sandwich cremes | yes | yes | | yes | yes | yes | | yes | |
| Jack Link's Beef steak | | yes | | yes | | yes | | | |
| Kar's Sweet and Salty | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Keebler soft batch cookies | yes | | yes | | yes | | | yes | |
| Keebler Elfin Crackers | yes | yes | yes | yes | yes | yes | | yes | |
| kettle brand potato chips sea salt | | yes | | yes | | yes | yes | | yes |
| kind bar carmel almond | yes | yes | yes | yes | yes | yes | | yes | yes |
| Knott's strawberry shortbread | yes | | yes | | yes | | yes | yes | yes |
| Lance salted peanuts | yes | yes | yes | yes | yes | yes | | yes | |
| Lance Whole grain cheddar cheese crackers | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Lance whole grain peanut butter crackers | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Lay's Classic potato chips | yes | | yes | | yes | | | yes | yes |
| M&Ms peanut | yes | | yes | | yes | | | yes | yes |
| M&Ms peanut large bag | | yes | | yes | | yes | | | |
| mini blueberry muffins | yes | | yes | | yes | | | yes | |
| Mrs. Mays cashew crunch | yes | yes | yes | yes | yes | yes | | yes | yes |
| Nature Valley biscuits | | | | | | | yes | | yes |
| Nature Valley crunchy oats and honey | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Nutter Butter bites | yes | | yes | | yes | | yes | yes | yes |
| Oreos | | yes | | yes | | | | | |
| organic gummy bears | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Popcorners cheesy jalapeno | yes | yes | yes | yes | yes | yes | | yes | |
| Popcorners white cheddar | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Poptart strawberry | yes | | yes | | yes | | | yes | |
| Pringles orinial | | yes | | yes | | yes | | | |
| Pringles sour cream and onion | | yes | | yes | | | | | |
| Quaker baked cheddar snack mix | yes | | | | yes | | | yes | |
| Raisinets large bag | | yes | | yes | | yes | | | |
| Reese's large bag | | yes | | yes | | yes | | | |
| Rice Krispy Treat | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Ruffles cheddar and sour cream | yes | | yes | | yes | | | | yes |
| Skittles | yes | | yes | | yes | | | yes | |
| Snickers bag of minis | | yes | | yes | | | | | |
| Snickers bar | yes | | yes | | yes | | | yes | |
| Snyder pretzel pieces buffalo wing | | yes | | yes | | yes | | yes | |
| sour gummy worms | | yes | | yes | | yes | | | |
| Sour Patch | yes | yes | yes | yes | yes | | yes | yes | yes |
| Sweetarts ropes | | yes | | yes | | yes | | | |
| Takis | | yes | | yes | | yes | | | |
| Twix | yes | | yes | | yes | | | yes | yes |
| Welch's fruit snacks | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Wheat Thins Toasted Chips veggie | yes | yes | yes | yes | yes | yes | | | yes |

Table 2 Nutritional Values

| snack | size (ounces) | glycemic load | calories | total fat (grams) | saturated fat (grams) | total carbohydrate (grams) | sodium (milligrams) | dietary fiber (grams) |
|---|---------------|---------------|----------|-------------------|-----------------------|----------------------------|---------------------|-----------------------|
| Act II butter lovers popcorn | 2.75 | 34.65 | 312 | 10.4 | 5.2 | 49.4 | 650 | 5.2 |
| Big Texas cinnamon roll | 4 | | 400 | 18 | 9 | 38 | 410 | 2 |
| Black Forest organic gummy bears | 4 | | 390 | 0 | 0 | 93 | 0 | 0 |
| Bugles | 1.5 | | 220 | 13 | 11 | 25 | 450 | 1 |
| Calbee Wholecuts bacon and cheddar | 1.4 | | 210 | 13 | 1.5 | 22 | 140 | 1 |
| Calbee Wholecuts lightly salted | 1.4 | | 210 | 13 | 1.5 | 24 | 90 | 1 |
| Calbee Wholecuts salt and vinegar | 1.4 | | 210 | 12 | 1.5 | 23 | 135 | 2 |
| Cheetos crunchy | 2 | 17.9 | 300 | 20 | 3 | 26 | 500 | 2 |
| Cheetos jalapeno cheddar | 2 | | 320 | 20 | 3 | 26 | 580 | 2 |
| Cheez-its | 3 | | 450 | 24 | 6 | 51 | 690 | 2 |
| Chex Mix traditional | 1.75 | 24.5 | 200 | 6 | 1 | 36 | 370 | 2 |
| Clif chocolate chip bar | 2.4 | 23 | 250 | 5 | 1.5 | 45 | 150 | 4 |
| Cloverhill mini blueberry muffins | 2.5 | | 170 | 9 | 1.5 | 23 | 230 | 0 |
| combos cheddar pretzel | 1.7 | 17.3 | 238 | 8.5 | 5.1 | 32.3 | 510 | 1 |
| Doritos nacho cheese | 1.75 | 10.9 | 245 | 14 | 2 | 28 | 368 | 2 |
| famous amos chocolate chip cookies | 3 | 33 | 438 | 21 | 8.4 | 60 | 312 | 2.4 |
| food should taste good sweet tortilla chips | 1.5 | 16.5 | 210 | 10.5 | 0.75 | 27 | 120 | 1.5 |
| Freshley's jumbo honey bun | 5 | | 590 | 29 | 14 | 76 | 390 | 2 |
| Fritos Bar-B-Q | 2 | | 300 | 20 | 3 | 32 | 580 | 2 |
| Go Lite! Popped chips | 0.875 | | 80 | 3 | 1 | 11 | 25 | 2 |
| Good Health Veggie Stix | 1 | | 120 | 5 | 1 | 18 | 200 | 0 |
| Good Natured Vegetable Crisps | 1 | | 110 | 2 | 0 | 22 | 190 | 2 |
| goodness knows cranberry almond | 1.2 | | 150 | 7 | 1.5 | 21 | 40 | 2 |
| Grandma's sandwich cremes | 3 | | 420 | 19 | 6 | 59 | 270 | 2 |
| Jack Link's Beef steak | 0.8 | | 50 | 1 | 0 | 1 | 520 | 0 |
| Kar's Sweet and Salty | 3 | | 420 | 27 | 7.5 | 42 | 165 | 3 |
| Keebler soft batch cookies | 2.2 | 24.2 | 300 | 14 | 6 | 42 | 230 | 1 |
| Keebler Elfin Crackers | 2.12 | | 250 | 4 | 0.5 | 49 | 280 <1 | |
| kettle brand potato chips sea salt | 2 | | 300 | 18 | 2 | 32 | 230 | 2 |
| kind bar carmel almond | 1.4 | | 200 | 16 | 3 | 15 | 125 | 7 |
| Knott's strawberry shortbread | 3 | | 360 | 17 | 4 | 48 | 180 | 5 |
| Lance salted peanuts | 1.125 | 1.3 | 230 | 16 | 3 | 11 | 180 | 5 |
| Lance Whole grain cheddar cheese crackers | 1.5 | | 200 | 10 | 3.5 | 26 | 300 | 2 |
| Lance whole grain peanut butter crackers | 1.75 | 17.7 | 210 | 9 | 2 | 25 | 270 | 2 |
| Lay's Classic potato chips | 1.5 | 10.5 | 240 | 16 | 2 | 23 | 250 | 2 |
| M&Ms peanut | 1.74 | 9.9 | 250 | 13 | 5 | 30 | 25 | 2 |
| M&Ms peanut large bag | 5.3 | 29.7 | 750 | 39 | 15 | 90 | 75 | 6 |
| Mrs. Freshleys Buddy Bar | 3 | | 420 | 21 | 10.5 | 51 | 225 | 0.75 |
| Mrs. Mays cashew crunch | 2 | | 300 | 22 | 4 | 22 | 80 | 2 |
| Nature Valley biscuits | 1.35 | | 230 | 9 | 1 | 34 | 180 | 4 |
| Nature Valley crunchy oats and honey | 1.5 | | 190 | 7 | 1 | 29 | 180 | 2 |
| Nutter Butter bites | 1.75 | | 228 | 11 | 2.6 | 33 | 96 | 1 |
| Oreos | 4 | | 528 | 23 | 6.5 | 83 | 528 | 3 |
| Popcorners cheesy jalapeno | 1 | | 150 | 6 | 0.5 | 22 | 135 <1 | |
| Popcorners white cheddar | 1 | | 140 | 6 | 0.5 | 21 | 135 | 0.25 |
| Poptart strawberry | 1.76 | 24.64 | 200 | 5 | 1.5 | 38 | 170 <1 | |
| Pringles orinigal | 2.5 | | 375 | 22.5 | 6.25 | 37.5 | 375 | 2 |
| Pringles sour cream and onion | 2.5 | | 375 | 22.5 | 6.25 | 37.5 | 450 | 2 |
| Quaker baked cheddar snack mix | 4 | | 230 | 8 | 1.5 | 34 | 430 | 2 |
| Raisinets large bag | 5.5 | 71.5 | 673.3 | 28.4 | 17.7 | 113.4 | 53.2 | 3.5 |
| Reese's large bag | 5.3 | 47.7 | 773 | 57 | 17 | 83 | 536 | 5 |
| Rice Krispy Treat | 1.4 | 22.4 | 162 | 4 | 1 | 31 | 189 | 0 |
| Ruffles cheddar and sour cream | 1.5 | 13.5 | 240 | 15 | 3 | 23 | 280 | 2 |
| Skittles | 2.17 | 39.06 | 250 | 2.5 | 2.5 | 56 | 20 | 0 |
| Snickers bag of minis | 4.4 | | 585 | 29.5 | 11 | 74.8 | 303 | 2.6 |
| Snickers bar | 1.86 | 18.6 | 250 | 12 | 4.5 | 33 | 120 | 1 |
| Snyder pretzel pieces buffalo wing | 2.25 | | 315 | 16 | 7 | 38 | 855 | 0 |
| sour gummy worms | 4.5 | | 360 | 0 | 0 | 84 | 60 | 0 |
| Sour Patch | 2 | | 210 | 0 | 0 | 52 | 40 | 0 |
| Sweetarts ropes | 3 | | 300 | 0 | 0 | 71 | 183 | 0 |
| Takis | 2 | | 300 | 16 | 5 | 34 | 840 | 4 |
| Twix | 1.79 | 21.48 | 250 | 12 | 7 | 34 | 100 | 1 |
| Welch's fruit snacks | 5 | | 450 | 0 | 0 | 115 | 50 | 0 |
| Wheat Thins Toasted Chips veggie | 1.75 | 21 | 210 | 8 | 1 | 35 | 460 | 5 |

Table 3 Univariate Analysis of Nutritional Values for all Snacks in Vending Machines

| | GL | Calories | Total Fat | Saturated Fat | Carbohydrates | Sodium | Fiber |
|-----------|-------|----------|-----------|---------------|---------------|--------|-------|
| Mean | 23.95 | 294.8 | 13.5 | 4.07 | 40.95 | 270.36 | 2.01 |
| Median | 21.48 | 250 | 12.5 | 2.8 | 34 | 212.5 | 2 |
| Max Value | 71.5 | 773 | 57 | 17.7 | 115 | 855 | 7 |
| Min Value | 1.3 | 50 | 0 | 0 | 1 | 0 | 0 |
| Range | 70.2 | 723 | 57 | 17.7 | 114 | 855 | 7 |

Capstone Product: Informational Brochure

Pictured in this brochure are actual vending machines on GSU's campus. As we can see there are few healthy options. Contact Allie for more information on vending machines and how you can help make GSU's vending machines healthier!

A Capstone Submitted to the Graduate Faculty of Georgia State University in Partial Fulfillment of the Requirements for the Degree

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**What Snacks
Should I Eat
from the
Vending
Machines at
GSU?**

Outside/Cover page

Decreasing Prevalence of Metabolic Syndrome Through Healthier Snack Options

What is Metabolic Syndrome?

It is a group of disorders that increase the risk of heart disease and other health conditions. The disorders are abdominal obesity, high triglycerides, low HDL cholesterol, high blood pressure, and high fasting glucose. Metabolic Syndrome can be managed and prevented through a healthy diet among other lifestyle choices.

Poor diet is one of the leading contributors to death in the US, and the majority of vending machine choices are of low nutritional value. A snack should have less than 200 calories, 140mg of sodium, and saturated fat should be less than 10% of calories.



The Healthiest Options Available

- Go Lite! Popped chips
- Popcorners white cheddar
- Goodness knows cranberry almond
- Popcorners cheesy jalapeno
- Kind bar caramel almond

Freshley's honey bun and the large bags of candy are high in calories, total fat, and saturated fat so these would not be good options if you are watching your overall weight and cholesterol.

Snyder's pretzel pieces buffalo wing, Takis, Cheez-Its, Act II butter loves popcorn, and Cheatos contain the most sodium of all the vending machine snacks so these would not be a good option if you are watching your blood pressure.