THE FACTORS THAT INFLUENCE HEALTH SCIENCE STUDENTS’ VENDING MACHINE CHOICES

Thesis

Presented in Partial Fulfillment of the Requirements for the Degree Master of Science in the Graduate School of The Ohio State University

By

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The college years are often the first time that students living away from home are faced with many different food choices. Most students are transitioning to independent living and are thus making their own food choices, which often results in poor eating habits that increase their chances of becoming overweight or obese.

College students tend to snack frequently and have a vast array of snack food alternatives, so snacks are considered an important target for intervention to improve overall diet quality. Furthermore, no consideration has been given in the literature to factors influencing university students’ decisions to choose healthy or unhealthy snacks.

The purpose of this study was to determine the factors that influence Health Science college students’ choice of vending items. The specific objectives were to determine if the factors (cost, nutritional value, selection, taste, convenience, stress, friends, boredom, nutritional cues, and hunger) influenced Health Science college students’ choice of vending items, and to determine if
there were differences in the factors based upon gender, division, energy balance, and frequency of buying vending items.

The accessible population of this study included all current Health Science college students enrolled in the School of Allied Medical Professions who chose to complete the online survey between May 29th and June 18th 2009. Of the 1,682 potential respondents, 210 respondents started the survey and 173 respondents completed the survey for a response rate of 10.3% and a completion rate of 82.4%. The respondents were all 18 years or older with females making up 67.6% (N=142), males making up 14.8% (N=31), and 17.6% (N=37) of respondents skipping the question, making the total respondents 82.4% (N=173).

The results indicated that the students’ vending choices were influenced by cost, nutritional value, selection, taste, convenience due to time and location, stress, joining their friends, boredom, reading nutritional cues, and hunger. The three most influential factors affecting vending choices were taste, hunger, and selection.

In terms of gender, female Health Science students’ vending purchases were most influenced by selection, nutritional value, taste, convenience due to location, stress, joining their friends, boredom, and nutritional cues, while male
Health Science students’ vending purchases were most influenced by convenience due to time and hunger.

In terms of division, HIMS students were most influenced by cost and convenience due to time and location. Medical Dietetics students were most influenced by nutritional value. Circulation Technology students were most influenced by selection, nutritional cues, and hunger. Radiological Science students were most influenced by taste. Other students were most influenced by stress. Athletic Training and Circulation Technology students were most influenced by joining their friends. Athletic Training and the “other” students were most influenced by boredom.

In terms of energy balance, Health Science students trying to stay the same weight were most influenced by nutritional value, selection, taste, convenience due to time, joining their friends, and nutritional cues. Those trying to lose weight were not influenced by any of the factors, and those not trying to lose weight were most influenced by cost, convenience due to location, stress, boredom, and hunger.

In terms of frequency, Health Science students that bought vending items once a week were most influenced by boredom, twice a week were most
influenced by convenience due to time and location, once a month were not
influenced by any of the factors, and once or twice a year were most influenced
by cost, nutritional value, selection, joining their friends, nutritional cues, and
hunger.

The results of this study indicate that through effective education and
promotional efforts using these influencing factors, students can be steered toward
healthy vending snack selections that positively influence their nutritional intake.
This will lower the incidence of college students becoming overweight or obese
and in turn, prevent or deter diet-related diseases in their future.
ACKNOWLEDGEMENTS

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FIELD OF STUDY

Major Field: Allied Medicine
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CHAPTER 1
INTRODUCTION

Background

In the United States, greater than 12 million students, the majority of whom are between 18 and 24 years of age, are enrolled in 3,600 colleges and universities (3). Researchers estimate the prevalence of obesity in US college students to have increased from 12% in 1991 to as high as 36% in 2004. This is of concern, because obesity in adolescence is the leading predictor of obesity in adulthood (1). The period between the end of high school and the end of college is a critical time to intervene and educate young adults on the importance of developing and maintaining healthy behaviors (6).

Against current dietary recommendations, college students typically consume a diet lacking in fruits, vegetables, and dairy products, and high in fat, sodium, and sugar (1). Furthermore, their diets do not meet the recommendations of the National Cancer Institute, the American Heart Association, the Dietary Guidelines for Americans, and the Institute of Medicine to limit saturated fat and
trans fatty acid intake (3). Generally in good health, young adults often are ambivalent about their future health and the role that nutrition plays. Because of their lack of chronic medical problems, there has been little focus on 18-24 year-olds. Interventions aimed at this age group have the potential of influencing future generations because 18-24 year-olds are at an age when many start families and pass nutrition habits on to their children (36).

College students represent a readily accessible population in whom assessment and intervention are feasible and are important for affecting positive changes in dietary behaviors (3). Dietary practices that contribute to excessive fat intake need to be identified, so that public health interventions targeted at modifiable dietary behaviors may be implemented. Among the potential dietary behaviors that could contribute to high fat intake is the consumption of snack foods (21).

Understanding university students’ snacking behavior has therefore become a priority (24). College students often select snacks from vending machines due to the convenience. These machines offer a variety of food products. However, little is known regarding the factors that influence the students’ choices from the vending machines. Therefore if students eat large
amounts of their food from vending machines, it is important to better understand the factors that influence their choices.

**Statement of the Problem**

College students typically do not consume adequate nutrition during their college years. Additionally, they continue to consume non-nutrient dense foods in the form of vending snacks. Most college students select vending snacks that taste good and are familiar to them such as candy bars or chips (10-14). It is important to understand the factors that influence college students’ snacking selections, because then promotion of healthy vending snacks can become more effective, and hopefully lead to healthier snacking in the future (3).
Purpose of the Study

The purpose of the study is to determine the factors that influence health science college students’ choice of vending items. The specific objectives of the study are:

1. To determine if the factors (cost, nutritional value, selection, taste, convenience, stress, friends, boredom, nutritional cues, and hunger) influence Health Science college students’ choice of vending food items.

2. To determine if there are differences in the factors (cost, nutritional value, selection, taste, convenience, stress, friends, boredom, nutritional cues, and hunger) that influence Health Science college students based upon gender, division, energy balance, and frequency of buying.

Significance of the Problem

The vending industry is extensive on college campuses; it is estimated that 30% of the daily energy intake in college students comes from vending snacks (33). Because a significant amount of nutrient intake comes from vending machines, it is important to understand what influences the students’ choices of this food.
Also, there is a significant community drive to improve the vending choices and to educate the students on their choices. Without knowing the factors affecting student choice from vending, the nutrition education provided may not be targeted correctly.

**Definition of Terms Encountered in this Study**

**BMI** (body mass index): A person's weight in kilograms divided by their height in meters squared. The BMI describes the body weight relative to height and it correlates strongly with the total body fat content.

**OVERWEIGHT**: An adult who has a BMI between 25 and 29.9.

**OBESITY**: An adult who has a BMI of 30 or higher.

**NUTRIENT DENSE FOODS**: Foods that give you the nutrients you need with relatively fewer calories than other choices in the same food group.

**ENERGY DENSE NUTRIENT POOR**: Foods high in sugar and fat such as refined white breads, pasta, pastries, processed lunch meats and cheeses, ice cream, candy, soda, potato chips and corn chips.
CHAPTER 2
REVIEW OF LITERATURE

Introduction

This section provides an overview of the information that is currently found in the literature related to overall college students eating patterns, college students snacking patterns, and college students and vending machines.

College Students Eating Patterns

The eating habits of college students are a popular topic among researchers (1-24, 26). The college years are often the first time that students living away from home are faced with many different food choices. Most students are transitioning to independent living and are thus making their own food choices, which often results in poor eating habits (1). Food consumption patterns of college students are of concern because students tend to skip meals, eat diets excessively low in energy, and avoid or eat inadequate amounts of certain types of nutritious foods such as dietary fiber, fruits, and vegetables. College
student eating patterns also include above the recommended intakes of total and saturated fat, sugar, and sodium (1-7, 9-15, 18-20, 26). Female students often consume intakes of calcium, iron, and vitamin A below the Recommended Daily Allowance (18). Currently, although the guidelines advise that only 20% of energy come from solid fats, alcohol, and added sugars for boys/men in the 19-30 year-old age group, intake of these foods constitutes 39-42% of total daily energy (2).

Findings from the few studies conducted on the nutrient intake of US college students consistently indicate that the majority of college students do not meet recommendations for daily fruit and vegetable intake (6). In one study by Racette et al., researchers collected information from a dietary questionnaire to assess whether students were meeting the guidelines established by the 5-A-Day campaign to eat at least 5 fruits and vegetables daily; limiting fried food intake to a maximum of 2 times during the previous week; and limiting intake of high-fat fast food to a maximum of 2 times during the previous week. The researchers found that at the beginning of freshman year, 70% of the students ate fewer than 5 fruits and vegetables daily, and more than 50% ate fried food at least 3 times during the previous week. At the end of sophomore year, consumption of fruits
and vegetables and high-fat foods did not appear to change, whereas fried food consumption declined (3). Unhealthy eating patterns appear to be common among students during the first two years of college, so future studies are needed to identify behavioral patterns in need of improvement and the means to promote healthy eating on college campuses.

Another study by Racette et al. was conducted on college students from freshman through senior year assessing whether students were meeting the guidelines established by the 5 A Day campaign. Less than 33% of the participants consumed the recommended 5 servings of fruits and vegetables during freshman or senior assessments. Additionally, 50% of the students consumed fried and high-fat fast foods at least twice during the previous week. By senior year, 71% continued to eat fewer than the recommended daily servings of fruits and vegetables (4). Similarly, Brunt, Rhee, and Zhong conducted a diet variety questionnaire of 3 days and found that the fruit group was the most limited food with 33% reporting 1 or fewer daily servings. Additionally, 17% reported 1 or fewer daily servings in the meat category and 10% reported consuming 1 or fewer foods from each of the categories of grains, vegetables, and dairy products.
Not surprisingly, the majority (95%) of students consumed at least 2 servings of discretionary sweets or fats (1).

Adams & Colner found that 25% of 18-24 year-old students consume 5 or more fruits and vegetables daily. This is approximately 3% lower than the population as a whole (6). These percentages indicate that there is room for improvement in college students’ dietary variety (1). College students need to be able to identify nutritious foods and practice healthful dietary habits that encourage intake of a wide variety of foods. According to Racette et al., data from the National College Health Assessment and the College Health Risk Behavior Survey indicate that dietary patterns of many college students do not meet the recommendations of health professionals (4).

Adams & Colner state that efforts should be taken to increase the nutritional intake in college students (6). It is important to include variety in the diet, because consuming many different foods from each group increases the likelihood of meeting current dietary recommendations (1). Health promotion efforts should be targeted toward college students to help them understand the importance of healthy eating habits.
One study by Brown, Dresen, and Eggett compared the Food Guide Pyramid intake of college students according to their participation in a campus meal plan. Participation in the prepaid campus meal plan appeared to offer modest nutritional benefits to students through increased servings of foods from fruit, vegetable, and meat groups. Not surprisingly, for all food groups the mean intakes were less than recommended (5). These findings are cause for concern because there is ample data suggesting that fruit and vegetable consumption may be protective against most cancers and cardiovascular disease (9).

There is a gap in the literature concerning whether knowledge of dietary guidelines translates into improved eating behaviors, particularly among the high-risk college student age group. It is reported that 75% of a group of university students agreed or strongly agreed that knowing the nutrient content of food is important for a healthful diet and nutritional well-being (26).

A cross-sectional study by Kolodinsky et al. was done to investigate self-reported eating patterns of 200 college students. An internet-based survey was used to identify how closely respondents followed the *Dietary Guidelines for Americans 2005*, and whether their eating patterns were related to their knowledge of dietary guidance. It was observed that for fruit, dairy, protein, and
whole grains, increased knowledge is related to increased likelihood of meeting dietary guidelines. Moreover, when asked about individual food choices, nutrition knowledge was related to making more healthful choices in every case. This suggests that guidelines such as the *Dietary Guidelines for Americans 2005* in conjunction with effective public awareness campaigns may be a useful mechanism for promoting change in what foods consumers choose to eat (2).

Brown, Dresen & Eggett explain that we must create an environment to make healthy positive changes. The early years of college are an important time to encourage individuals to develop a healthy lifestyle, and to provide interventions for individuals who could do better. The dietary habits young adults establish as they leave home may have a long-lasting impact on their own health or the health of their future families (5, 18). Healthy dietary selections at the college level may also reduce future chronic diseases (1, 3-7, 9, 12-13, 16, 19, 21, 23, 25, 28, 36).

Different demographics play a role in the nutrition consumption of college students. Research indicates that there are gender and racial differences in fruit and vegetable intake. U.S. men consume fewer fruits and vegetables than do women, and fruit and vegetable intake among Mexican American college students
is consistent with the trend. Research also suggests that the nutritional habits of Caucasian and African American college students differ, where Caucasians were more likely to eat three regular meals, read labels, and consume fiber (6).

Adams & Colner explain that full-time college students were more likely than part-time students to have higher fruit and vegetable consumption. African American students reported significantly lower fruit and vegetable consumption than did Caucasian or Asian students, and both African American and Hispanic students consumed fewer fruits and vegetables than did multiracial and other racial/ethnic groups. In addition, students who were single or in a committed relationship reported significantly lower fruit and vegetable consumption than did students who were separated/divorced/widowed. Students who lived in residence halls reported greater fruit and vegetable intake than did students living in other campus housing, off campus, or with parents. Students who lived in fraternity or sorority houses reported a higher intake than did students living off campus, which could be a result of consuming nutritious meals provided by a hired house cook (6).
College Student Snacking Patterns

Little is known about the context of snacking in adolescents (10). What is known is that one characteristic students use to select snacks is taste. According to Montone et al., an assumption within the college community is that students prefer chips, candy, and soda to fruit, trail mix, and bottled water as snack food (14). Savige et al. agrees with Montone et al., and explain that snacking is commonly associated with undesirable health outcomes and dietary patterns. Since adolescents select snacks based on taste over nutrition, they more often choose sugary and salty snacks over healthier alternatives. According to their study, 87-88% of American adolescents consume at least one snack per day, with snacks contributing approximately 25% of their daily energy intake (10).

Brunt, Rhee, and Zhong agree with Savige et al., and Montone et al., that college students prefer unhealthy to healthy snacks. In their study of college students, 95% of all respondents reported consuming fatty, sugary, and salty snacks (1). Silliman, Rhodas-Fortier, & Neyman found that 63% of college students snack one to two times per day, 26% three to four times per day, and 4% four or more times per day. Boredom was the most frequently cited reason for snacking (9). College students tend to snack frequently and have an array of
snack food choices in cafeterias, so snacks are considered an important target for intervention to improve overall diet quality (12).

Savige et al. found that snacking among adolescents and young adults occurs more often in younger than older subjects, more often in urban than rural residents, and more often in subjects from families with higher incomes and education levels. In addition, females were more likely than males to report that they often snacked on the run, while hanging out with friends, and while doing homework or working. In contrast, males were more likely than females to report daily snacking on the way to or from school and in the middle of the night (10). A study by Silliman, Rhodas-Fortier, & Neyman found that men state partying as a reason to snack more frequently than women, and women state emotional reasons more frequently than men. While most students snack on chips, crackers, or nuts; men snack on fast foods more and on ice cream, cookies, and candy less frequently than women (9).

Literature is mixed on whether snacking leads to overeating or undereating in college students. Some researchers found that frequent eating helps appetite control, thus preventing overeating at meals. One study by Kirk found that spreading energy intake over the day into five eating occasions (three meals and
two snacks) rather than three meals results in a flatter profile of hunger throughout the day, so that hunger is less likely to build up before main meals, thus helping to prevent gorging at meals (15). In contrast, Levitsky, Halbmaier, & Mrdjenovic found that snacking may contribute to excessive weight gain because “humans do not appear to ‘calorically compensate’ for food that is consumed between meals” (13).

The literature on food selection is not conclusive on what motivates college students to choose healthier snacks, but some evidence suggests that mere exposure to foods tends to increase preference and consumption. In a study of factors influencing snack choices of college students in Newcastle, Australia, many respondents said they would change to healthier snacks if they had health problems or if they gained weight. Other factors influencing snack choices were environment, availability of the snacks, stress, health problems/weight gain, and social activity (24). Another factor that is important when choosing a snack is portability. Some students may need to eat on the go and will avoid snacks that do not fit this criteria.

Buscher, Martin, & Crocker found that students consider taste, cost, convenience, and energy value when choosing a snack. They also found that
students tend to choose healthier snack foods when advertising messages emphasize the nutritional properties of foods. Messages that emphasize the benefits of a healthful food choice should be effective in promoting healthful eating because they provide the consumer with clear and specific benefits of choosing the healthful food (12).

It has been argued that consumers need to be informed about the calories in the menu items because without this information they have little awareness of the number of calories in the foods they are purchasing (20). In a study by Burton et al., survey results showed that levels of calories, fat, and saturated fat in less-healthful restaurant items were significantly underestimated by consumers. Actual fat and saturated fat levels were twice consumers’ estimates and calories approached two times more than what consumers expected. The authors explain that most consumers are unaware of the high levels of calories, fat, saturated fat, and sodium found in many menu items. Provision of nutrition information could potentially have a positive impact on public health by reducing the consumption of less-healthful foods (25). In a focus group of sixteen students, six were regularly exposed to nutrition labels while ten were part of the control group. Four of the six students regularly exposed to the nutrition labels reported changes
in their purchases as a result of the labels. One female student, now aware of the calorie count for many foods she normally purchased, switched to what she understands to be healthier purchases. In contrast, two males in the study noticed the nutrition labels but did not make purchase decisions on the basis of the information (19). If the nutrition information is available to the consumer, those monitoring or wanting to improve their diets may use the information (26).

In a study evaluating the effect of calorie labeling on vending machine sales, Bergen et al. found labeling to have an effect on sales only when accompanied by a promotional poster (22). Likewise, French et al. found low-fat labeling in vending machines to influence sales only when the labeling was provided in tandem with an educational poster (21). These results suggest that modest promotional efforts may prompt consumers to give nutrition information greater consideration in the food selection process (20).

**College Students and Vending Machines**

The vending industry is a $30 billion-a-year industry employing 700,000 people who work at an estimated 13,500 companies. One-hundred million Americans will use one of seven million vending machines each day.
Approximately 16.3% of all vending machines are located in schools and colleges (30). Among the potential dietary behaviors that could contribute to high fat intake is the consumption of snack foods. Vending machine snacks are a prime example of foods that are pervasive in diverse community settings such as worksites and secondary schools. Research has shown that more than 1.5 million vending machines were located at these sites in 1998. Industry-wide vending sales increased by 5.6% in 1998 to $23.3 billion (21). In the year 2000, $25.62 billion was generated by the vending industry, a 4.8% increase from 1999 (27).

Not only are vending machines ubiquitous, but the foods choices offered in snack vending machines are largely high in fat. Approximately one-fourth of vending sales in 1998 were attributed to candy, chips, crackers, and cookies (21). One study of vending machines in secondary schools showed that only 27% of vending machines offered a low-fat snack such as pretzels, while 60% offered candy bars and 57% offered chips (21). Vending machines offer a convenient venue for examining environmental nutrition intervention strategies such as product availability and promotional marketing. A limitation in the literature has been the lack of studies comparing promotional strategies with regard to modifying food purchases (21). Increasing the availability of healthful
alternatives and providing nutritional information are potential methods of changing the environment to potentially improve customers’ dietary behaviors. In a study by Fiske & Weber Cullen, a positive impact on sales was seen with the presence of promotional materials, so simple environmental changes in vending machine selections may be a realistic means of promoting healthier food choices without the loss of revenue for the vending machine owners (27).

The following variables were positively associated with current and intended low-fat vending snack choices: higher ranked importance of snacks with fewer calories and less fat, desire to choose a healthful snack, and interest in monitoring body weight. Among adolescents only, more frequent vending machine users were less likely to choose or plan to choose a low-fat vending snack (28). Demographic variables were not largely associated with low-fat snack choices, however, females and older youth reported more frequent low-fat vending snack choices and greater intention to choose a low-fat vending snack than males or younger youth (28).

In a study by Kille, the Henry County Heart Health Coalition and Maumee Valley Vending collaborated to determine whether a 5-a-day labeling program on vending machines would increase consumption of heart healthy foods
by worksite employees. An evaluation from March through September 2003 indicated an 80% increase in the sale of heart healthy items and a 14% increase in 5-a-day items (29).

**Summary**

Research regarding the eating habits of college students is in agreement that their dietary intake is far from ideal. College students choose snacks based on cost, nutritional value, selection, taste, convenience, stress, friends, boredom, nutritional cues, and hunger. College students also tend to skip meals, eat diets excessively low in energy, avoid or eat inadequate amounts of certain types of nutritious foods such as dietary fiber, fruits, and vegetables, and consume above the recommended intakes of total and saturated fat, sugar, and sodium. This is of concern because poor nutritional intake increases their chances of developing chronic diseases as they grow older.
CHAPTER 3
METHODOLOGY

Introduction

This chapter will describe the methodology used to determine the factors that influence Health Science college students’ choice of vending items. Included are the study research design, population, instrumentation, data collection, and data analysis.

Purpose of the Study

The purpose of the study was to determine the factors that influence Health Science college students’ choice of vending items. The specific objectives of the study were:

1. To determine if the factors (cost, nutritional value, selection, taste, convenience, stress, friends, boredom, nutritional cues, and hunger) influence Health Science college students’ choice of vending items.
2. To determine if there were differences in the factors (cost, nutritional value, selection, taste, convenience, stress, friends, boredom, nutritional cues, and hunger) that influence Health Science college students’ based upon gender, division, energy balance, and frequency of buying.

**Research Design**

A descriptive research design utilizing a survey instrument was used to determine the factors influencing Health Science students’ vending machine choices.

**Population**

The population for this study consisted of Health Science college students in a Midwestern university who chose to complete the online survey. All students enrolled in the Health Sciences Program Spring Quarter 2009 were invited to participate in the study.
**Instrumentation**

A questionnaire was developed to measure the factors that influence college students’ vending machine choices. The factors were selected to be descriptive of items the literature suggested influenced vending machine and snack choices of students. Three behavioral and nutrition experts developed the instrument. The instrument was then field tested by three other behavioral and nutrition experts. Changes were made as suggested.

The final questionnaire contained 11 items requesting students to state on a Likert scale how influential the items are on their selection of vending snacks. Potential responses included “all of the time”, “most of the time”, “some of the time”, and “never”. The questionnaire also included 3 items with the same Likert scale investigating more thoroughly why students make the choices they do, and 3 open ended items. Descriptive data regarding gender, weight program, and division were also requested. The Internal Review Board approved the study.
**Data Collection**

Data collection was conducted for two weeks. There are approximately 1,682 students in the Health Science Programs. An electronic written request was sent to all current students requesting their participation in the study. A statement of confidentiality was assured for the students. The survey was available through SurveyMonkey®, an online service designed for collecting survey data on the internet. The program was easily accessible through the internet, participants did not need to create an account or authenticate in order to participate in this study. No personally identifiable information about the participants was collected. An email was sent after one week to remind students to complete the online survey.

Confidentiality was secured through four areas of the program, including physical, network, hardware, and software features. The servers were kept in locked cages with surveillance and monitored staffing 24 hours a day, seven days a week. The software was coded in ASP and the latest patches are applied to all operating systems and application files. Data was backed up every night to a centralized backup system with offsite backups in the event of a catastrophe.
**Data Analysis**

The data was compiled automatically through SurveyMonkey\textsuperscript{R} and was formatted in a Microsoft Excel (version 2007, Microsoft Corp. Redmond, WA) spreadsheet to be easily converted into syntax. The syntax ran the Statistical Package for the Social Sciences (version 17) for statistical analysis of the data.

Descriptive statistics were used to summarize the demographic information and the item analysis from the data submitted from the students who participated in the study. Mean scores and percent of total were used to identify the factors influencing students’ vending machine choices. T-tests or analysis of variance (ANOVA) were conducted to determine differences in choice by various demographic items. Scheffe post hoc multiple comparisons were evaluated for any significant ANOVAS.
CHAPTER 4
RESULTS

Introduction

The purpose of this study was to determine the factors that influence health science college students’ choice of vending items. The specific objectives were to determine if the factors (cost, nutritional value, selection, taste, convenience, stress, friends, boredom, nutritional cues, and hunger) influenced Health Science college students’ choice of vending items, and to determine if there were differences in the factors based upon gender, division, energy balance, and frequency of buying vending items.

Results

The accessible population of this study included all current Health Science college students in a Midwestern university who chose to complete the online survey between May 29th and June 18th 2009. A total of 1,682 requests to complete the survey were sent out. Of the 1,682 potential respondents, 210 respondents started the survey and 173 respondents completed the survey for a
response rate of 10.3% and a completion rate of 82.4%. The respondents were all 18 years or older with females making up 67.6% (N=142), males making up 14.8% (N=31), and 17.6% (N=37) of respondents skipping the question, making the total respondents 82.4% (N=173). The breakdown of the gender of Health Science students is shown in Table 4.1

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<th>Gender</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>31</td>
<td>14.8</td>
</tr>
<tr>
<td>Female</td>
<td>142</td>
<td>67.6</td>
</tr>
<tr>
<td>Total responses</td>
<td>173</td>
<td>82.4</td>
</tr>
<tr>
<td>Missing responses</td>
<td>37</td>
<td>17.6</td>
</tr>
<tr>
<td>Total</td>
<td>210</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 4.1 Gender of Health Science students responding to a questionnaire

The respondents represented various divisions including Athletic Training, Circulation Technology, Health and Information Management Science (HIMS), Medical Dietetics, Medical Technology, Occupational Therapy, Physical Therapy, Radiological Science, Respiratory Therapy, and another category for other non-specified divisions. This question was skipped by 20.5% (N=43) of the
respondents making the total respondents 79.5% (N=167). The breakdown of the divisions of Health Science students is shown in Table 4.2.

<table>
<thead>
<tr>
<th>Division</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Athletic Training</td>
<td>6</td>
<td>2.9</td>
</tr>
<tr>
<td>Circulation Technology</td>
<td>3</td>
<td>1.4</td>
</tr>
<tr>
<td>HIMS</td>
<td>17</td>
<td>8.1</td>
</tr>
<tr>
<td>Medical Dietetics</td>
<td>27</td>
<td>12.9</td>
</tr>
<tr>
<td>Medical Technology</td>
<td>19</td>
<td>9.0</td>
</tr>
<tr>
<td>Occupational Therapy</td>
<td>37</td>
<td>17.6</td>
</tr>
<tr>
<td>Physical Therapy</td>
<td>32</td>
<td>15.2</td>
</tr>
<tr>
<td>Radiological Science</td>
<td>10</td>
<td>4.8</td>
</tr>
<tr>
<td>Respiratory Therapy</td>
<td>9</td>
<td>4.3</td>
</tr>
<tr>
<td>Other Divisions</td>
<td>7</td>
<td>3.3</td>
</tr>
<tr>
<td>Total responses</td>
<td>167</td>
<td>79.5</td>
</tr>
<tr>
<td>Missing responses</td>
<td>43</td>
<td>20.5</td>
</tr>
<tr>
<td>Total</td>
<td>210</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 4.2 Breakdown of the Divisions of Health Science students

In terms of energy balance, 173 respondents answered the question with 29.5% (N=62) trying to stay the same weight, 35.2% (N=74) trying to lose weight, 0.5% (N=1) trying to gain weight, and 17.1% (N=36) not trying to do anything about their weight. As stated above, the majority of respondents admitted to trying to lose weight and this data is consistent with the literature
where Brunt et al. states that “dieting is common among college students” (1).

Thirty-seven respondents (17.6%) skipped the question making the total respondents 82.4% (N=173). The breakdown of energy balance of the Health Science students is shown in Table 4.3

<table>
<thead>
<tr>
<th>Energy balance</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stay the same weight</td>
<td>62</td>
<td>29.5</td>
</tr>
<tr>
<td>Lose weight</td>
<td>74</td>
<td>35.2</td>
</tr>
<tr>
<td>Gain weight</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>I am not trying to do anything about my weight</td>
<td>36</td>
<td>17.1</td>
</tr>
<tr>
<td><strong>Total responses</strong></td>
<td>173</td>
<td>82.4</td>
</tr>
<tr>
<td><strong>Missing responses</strong></td>
<td>37</td>
<td>17.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>210</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 4.3 Breakdown of Energy Balance of Health Science students

Results showed that 7.1% (N=15) of respondents bought a vending item once a week, 1.4% (N=3) of respondents bought a vending item twice a week, 32.9% (N=69) bought a vending item once a month, 38.6% (N=81) of the respondents indicated that they only bought vending items once or twice a year, while 2.4% (N=5) indicated that they do not buy vending items at all. Thirty-
seven respondents (17.6%) skipped the question making the total respondents 82.4% (N=173). The breakdown of how often Health Science students bought vending items is shown in Table 4.4.

<table>
<thead>
<tr>
<th>Time</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Once a week</td>
<td>15</td>
<td>7.1</td>
</tr>
<tr>
<td>Twice a week</td>
<td>3</td>
<td>1.4</td>
</tr>
<tr>
<td>Once a month</td>
<td>69</td>
<td>32.9</td>
</tr>
<tr>
<td>Once or twice a year</td>
<td>81</td>
<td>38.6</td>
</tr>
<tr>
<td>Don’t buy vending items</td>
<td>5</td>
<td>2.4</td>
</tr>
<tr>
<td>Total responses</td>
<td>173</td>
<td>82.4</td>
</tr>
<tr>
<td>Missing responses</td>
<td>37</td>
<td>17.6</td>
</tr>
<tr>
<td>Total</td>
<td>210</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 4.4 Breakdown of how often Health Science students bought vending items

The respondents were pretty evenly dispersed when indicating whether they are more likely to purchase items from a vending machine if it contained healthier items. The results indicated that 23.3% (N=49) would do this all of the time, 26.2% (N=55) would do this most of the time and 28.1% (N=59) would do this some of the time, while 4.8% (N=10) indicated that a vending machine containing healthy items would never increase their chance of purchasing vending items. Thirty-seven respondents (17.6%) did not answer the question making the total respondents 82.4% (N=173). The breakdown of how often Health Science
students were more likely to purchase items from a vending machine if it contained healthier items is shown in Table 4.5.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of the time</td>
<td>49</td>
<td>23.3</td>
</tr>
<tr>
<td>Most of the time</td>
<td>55</td>
<td>26.2</td>
</tr>
<tr>
<td>Some of the time</td>
<td>59</td>
<td>28.1</td>
</tr>
<tr>
<td>Never</td>
<td>10</td>
<td>4.8</td>
</tr>
<tr>
<td>Total responses</td>
<td>173</td>
<td>82.4</td>
</tr>
<tr>
<td>Missing responses</td>
<td>37</td>
<td>17.6</td>
</tr>
<tr>
<td>Total</td>
<td>210</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 4.5 Breakdown of how often Health Science students were more likely to purchase items from a vending machine if it contained healthier items.

One hundred and ten respondents (52.4%) indicated which food they wished vending machines contained. Some of the foods included were granola bars with fiber, protein, and low in sugar (N=24), fresh and dried fruit (N=20), trail mix (N=5), 100 Calorie Packs (N=5), milk (N=4), sugar-free items (N=4), vegetables and dip (N=3), string cheese (N=3), yogurt (N=3), more nut choices (N=3), kettle corn and chips (N=3), pickles (N=2), individual serving cereal boxes (N=2), beer (N=1), flavor-ice (N=1), peanut brittle (N=1), pizza (N=1), hummus (N=1), and flavored powder mixes for water bottles (N=1).
One hundred and fifty-five respondents (73.8%) indicated their two favorite foods to purchase from the vending machine. Some of the foods included were and chips (N=96), candy (N=73), regular and diet soda (N=28), granola bars (N=24), cookies (N=17), chocolate (N=12), bottled water (N=8), gum (N=4), mints (N=3), coffee drinks (N=3), doughnuts (N=2), and sandwiches (N=1).

Ninety-one respondents (43.3%) indicated if there was anything else that influenced their vending selection. Some of the responses included nutritional value (N=7), thirst (N=4), brand familiarity and preference (N=4), cravings (N=3), having cash (N=3), the temperature inside and outside of the building (N=3), not having food on hand (N=3), the best value (N=3), form of payment accepted by the machine (N=2), the chances of the item getting caught in the machine (N=2), packaging appearance (N=2), sleepiness (N=1), “time of the month”(N=1), time of day (N=1), time of year (N=1), and time until the next meal (N=1).
Descriptive statistics indicated that Health Science students’ choice of vending items was influenced by cost, nutritional value, selection, taste, convenience, stress, friends, boredom, nutritional cues, and hunger.

The most influential variable was taste with a mean of 1.5 (SD=0.69), where the lower the mean the more influential the variable was. The second most influential variable was hunger with a mean of 1.8 (SD=0.69). The third most influential variable was selection with a mean of 1.9 (SD=0.76). The two least influential variables for Health Science students were joining their friends with a mean of 3.5 (SD=0.67) and boredom with a mean of 3.5 (SD=0.66). The breakdown of how Health Science students’ vending choices were influenced by cost, nutritional value, selection, taste, convenience, stress, friends, boredom, nutritional cues, and hunger is shown in Table 4.6.
Table 4.6 Breakdown of how Health Science students’ vending choices were influenced by cost, nutritional value, selection, taste, convenience, stress, friends, boredom, nutritional cues, and hunger. Possible survey responses and correlating numbers used to calculate means and standard deviations are included:

1. All of the time
2. Most of the time
3. Some of the time
4. Never

T-tests were used to determine whether males or females were more influenced by cost, nutritional value, selection, taste, convenience, stress, friends, boredom, nutritional cues, and hunger in regards to their vending choices. Females were more influenced by selection with a mean of 1.9 (SD= 0.77), nutritional value with a mean of 2.4 (SD=0.89), taste with a mean of 1.5 (SD=0.69), convenience due to location with a mean of 2.1 (SD=0.89), stress with...
a mean of 3.1 (SD=0.74), joining their friends with a mean of 3.4 (SD=0.67),
boredom with a mean of 3.4 (SD=0.65), and nutritional cues with a mean of 3.1
(SD=0.86). Males were more influenced by convenience due to time with a mean
of 2.2 (SD=0.98) and hunger with a mean of 1.6 (SD=0.67). Females and males
were equally influenced by cost with a mean of 2.3 (SD=0.86, 0.90). The
breakdown of how Health Science students’ gender influences their choice of
vending items based on cost, nutritional value, selection, taste, convenience,
stress, friends, boredom, nutritional cues, and hunger is shown in Table 4.7.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Gender</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>M</td>
<td>2.3</td>
<td>0.86</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2.3</td>
<td>0.90</td>
</tr>
<tr>
<td>Nutritional value</td>
<td>M</td>
<td>2.6</td>
<td>1.06</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2.4</td>
<td>0.89</td>
</tr>
<tr>
<td>Selection</td>
<td>M</td>
<td>1.2</td>
<td>0.84</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1.8</td>
<td>0.77</td>
</tr>
<tr>
<td>Taste</td>
<td>M</td>
<td>1.6</td>
<td>0.72</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1.5</td>
<td>0.69</td>
</tr>
<tr>
<td>Convenience due to location</td>
<td>M</td>
<td>2.1</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2.1</td>
<td>0.89</td>
</tr>
<tr>
<td>Convenience due to time</td>
<td>M</td>
<td>2.2</td>
<td>0.98</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2.2</td>
<td>0.92</td>
</tr>
<tr>
<td>Stress</td>
<td>M</td>
<td>3.5*</td>
<td>0.77</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>3.1*</td>
<td>0.74</td>
</tr>
<tr>
<td>Joining their friends</td>
<td>M</td>
<td>3.6</td>
<td>0.72</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>3.4</td>
<td>0.67</td>
</tr>
<tr>
<td>Boredom</td>
<td>M</td>
<td>3.6</td>
<td>0.72</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>3.4</td>
<td>0.65</td>
</tr>
<tr>
<td>Nutritional cues</td>
<td>M</td>
<td>3.3</td>
<td>0.94</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>3.1</td>
<td>0.86</td>
</tr>
<tr>
<td>Hunger</td>
<td>M</td>
<td>1.6</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1.9</td>
<td>0.69</td>
</tr>
</tbody>
</table>

Table 4.7 Breakdown of how Health Science students’ gender influenced their choice of vending items based on cost, nutritional value, selection, taste, convenience, stress, friends, boredom, nutritional cues, and hunger

* denotes a value of p<0.05 and indicates a statistically significant value
One-way ANOVA tests were used to determine which Health Science students were most influenced by the factors based upon gender, division, energy balance, and frequency of buying vending items.

HIMS students were most influenced by cost with a mean of 2.0 (SD=0.71), convenience due to location with a mean of 1.7 (SD=0.79), and convenience due to time with a mean of 1.9 (SD=0.90). Medical Dietetics students were most influenced by nutritional value with a mean of 1.6 (SD=0.64).

Circulation Technology students were most influenced by selection with a mean of 1.0 (SD=0.00), reading nutritional cues on vending machines with a mean of 2.0 (SD=1.73), and hunger with a mean of 1.0 (SD=0.00). Radiological Science students were most influenced by taste with a mean of 1.1 (SD=0.32). The “other” students were most influenced by stress with a mean of 2.6 (SD=0.79). Athletic Training students and Circulation Technology students were most influenced by joining their friends with a mean of 3.0 (SD 1.10, 1.00). Athletic Training and the “other” students were most influenced by boredom with a mean of 3.0 (SD=1.10, 0.82).

Post Hoc Scheffe tests were used to compare which divisions differed regarding nutritional value and nutritional cues. A value of p<0.05 indicated a
statistically significant value. Divisions that had statistically significant differences from Medical Dietetics students regarding nutritional value included Athletic Training (p=0.028), HIMS (p<0.001), Medical Technology (p=0.008), and Respiratory Therapy (p=0.015). Divisions that had statistically significant differences from Medical Dietetics students regarding nutritional cues included HIMS (p=0.008), Medical Technology (p=0.019), and Occupational Therapy (p=0.017).

One-way ANOVA tests were used to determine if there were differences in Health Science students’ factors influencing cost, nutritional value, availability of snacks, taste, convenience, stress, social moments, boredom, portability, and friends based on their energy balance. According to the test, Health Science students trying to stay the same weight were most influenced by nutritional value with a mean of 2.1 (SD=0.86), selection with a mean of 1.8 (SD=0.72), taste with a mean of 1.5 (SD=0.62), convenience due to time with a mean of 2.01 (SD=0.95), joining their friends with a mean of 3.5 (SD=0.72), and reading nutritional cues with a mean of 2.9 (SD=0.89).

Health Science students trying to lose weight were not influenced by any of the factors. Health Science students not trying to lose weight were most
influenced by cost with a mean of 2.2 (SD=0.82), convenience due to location with a mean of 2.0 (SD=0.93), stress with a mean of 3.1 (SD=0.89), boredom with a mean of 3.4 (SD=0.70), and hunger with a mean of 1.8 (SD=0.75). Only one Health Science student was trying to gain weight so this category was removed from the analysis.

Post Hoc Scheffe tests were used to determine which energy balance groups differed regarding nutritional value and nutritional cues. Health Science students that were trying to stay the same weight had statistically significant differences from students trying to lose weight (p=0.039) and students not trying to lose weight (p=0.001). Health Science students that were not trying to lose weight had statistically significant differences from students trying to stay the same weight (p=0.001), and students trying to lose weight (p=0.015).

One-way ANOVA tests were used to determine if there were differences in Health Science students’ factors influencing cost, nutritional value, availability of snacks, taste, convenience, stress, social moments, boredom, portability, and friends based on their frequency of buying vending items. According to the test, Health Science students that bought vending items daily were most influenced by taste with a mean of 1.4 (SD= 0.63), and stress with a mean of 2.8 (SD=0.58).
Health Science students that bought vending items one time a week were most influenced by boredom with a mean of 3.0 (SD=1.00).

Health Science students that bought vending items two times a week were most influenced by convenience due to location with a mean of 1.9 (SD=0.78), and convenience due to time with a mean of 2.0 (SD=0.85). Health Science students that bought vending items once a month were not influenced by any of the factors. Health Science students that bought vending items once or twice a year were most influenced by cost with a mean of 2.0 (SD=1.23), nutritional value with a mean of 1.6 (SD=0.89), selection with a mean of 1.6 (SD=0.55), joining their friends with a mean of 3.2 (SD=0.84), reading nutritional cues with a mean of 2.4 (SD=0.83), and hunger with a mean of 1.6 (SD=0.55). There were no Health Science students who did not purchase vending items so this category was removed from the analysis.

Post Hoc Scheffe tests were used to compare how frequency of buying vending items influenced Health Science students regarding convenience due to location and boredom. According to the tests none of the pair-wise comparisons had statistically significant differences.
The survey implemented in this study was used to identify the factors that overall influenced Health Science students’ vending choices. The breakdown of how Health Science students’ choice of vending items were overall influenced by cost, nutritional value, selection, taste, convenience, stress, friends, boredom, nutritional cues, and hunger is shown in Table 4.8.
<table>
<thead>
<tr>
<th>Variable</th>
<th>All of the time</th>
<th>Most of the time</th>
<th>Some of the time</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost</td>
<td>21.9% (42)</td>
<td>39.1% (75)</td>
<td>30.7% (59)</td>
<td>8.3% (16)</td>
</tr>
<tr>
<td>Nutritional value</td>
<td>21.4% (41)</td>
<td>28.1% (54)</td>
<td>41.7% (80)</td>
<td>8.9% (17)</td>
</tr>
<tr>
<td>Selection</td>
<td>33.7% (64)</td>
<td>46.8% (89)</td>
<td>17.4% (33)</td>
<td>2.1% (4)</td>
</tr>
<tr>
<td>Taste</td>
<td>55.2% (106)</td>
<td>37.0% (71)</td>
<td>6.3% (12)</td>
<td>1.6% (3)</td>
</tr>
<tr>
<td>Convenience due to location</td>
<td>27.8% (52)</td>
<td>39.0% (73)</td>
<td>26.7% (50)</td>
<td>6.4% (12)</td>
</tr>
<tr>
<td>Convenience due to time</td>
<td>24.7% (47)</td>
<td>38.9% (74)</td>
<td>27.4% (52)</td>
<td>8.9% (17)</td>
</tr>
<tr>
<td>Stress</td>
<td>3.2% (6)</td>
<td>10.6% (20)</td>
<td>51.1% (96)</td>
<td>35.1% (66)</td>
</tr>
<tr>
<td>Joining their friends</td>
<td>1.6% (3)</td>
<td>5.3% (10)</td>
<td>37.0% (70)</td>
<td>56.1% (106)</td>
</tr>
<tr>
<td>Boredom</td>
<td>0.5% (1)</td>
<td>7.4% (14)</td>
<td>36.0% (68)</td>
<td>56.1% (106)</td>
</tr>
<tr>
<td>Nutritional cues</td>
<td>5.3% (10)</td>
<td>15.3% (29)</td>
<td>37.9% (72)</td>
<td>41.6% (79)</td>
</tr>
<tr>
<td>Hunger</td>
<td>35.1% (67)</td>
<td>50.8% (97)</td>
<td>13.6% (26)</td>
<td>0.5% (1)</td>
</tr>
</tbody>
</table>

Table 4.8 Breakdown of how Health Science students were overall influenced by cost, nutritional value, selection, taste, convenience, stress, friends, boredom, nutritional cues, and hunger. Percentages are listed with the number of students in parentheses. **Bolded** values represent the largest value for that factor.
CHAPTER 5
DISCUSSION, IDEAS FOR FUTURE RESEARCH, CONCLUSION

Discussion and Ideas for Future Research

The results of this study suggest that Health Science students’ vending choices were influenced by many factors including cost, nutritional value, selection, taste, convenience, stress, friends, boredom, nutritional cues, and hunger. Furthermore, there were differences in the factors based upon gender, division, energy balance, and frequency of buying vending items. By identifying these factors effective interventions can be put in place to encourage healthy snacking.

The results of this study indicated that the most influential factor affecting Health Science students’ vending purchases was taste. This is consistent with the literature which indicates that most college students select vending snacks that taste great and are familiar to them, such as candy bars and chips (10). This is important because if great-tasting nutrient-dense snacks are more readily-available in vending machines, then it is likely that they will be selected by the students over less nutrient-dense snacks.
The second most influential factor affecting vending purchases was hunger. It is likely that the hungry students were looking for the most filling snack giving them the best value for their money. Students need to become educated on foods that are nutrient-dense yet filling, such as whole grains and low-fat proteins that will provide them with long-lasting energy.

The third most influential factor affecting vending purchases was the selection of snacks. According to Montone et al., an assumption within the college community is that students prefer chips, candy, and soda, to fruit, trail mix, and bottled water as snack food (14). This is contradictory to the research of this study which indicates that students would prefer to have healthier vending selections available such as fruit, yogurt, and low-sugar or sugar-free items. These finding indicate that if there is a greater selection of healthy vending snacks available, then the students will most likely select them as a snack.

The fourth and fifth most influential factors affecting vending purchases were convenience due to location and time. With students rushing from class to class, they are limited in where and when they can buy food. This is an important finding because with strategically placed vending machines containing various
healthy snacks, students may be more likely to select them instead of going hungry or selecting junk food.

The sixth most influential factor affecting vending purchases was cost. Students are notoriously strapped for cash, and a vending snack can be easier on the wallet than a meal. This is of concern, because it is likely that these students are not consuming adequate nutrition from these snacks and are predisposing themselves to a future of nutritional deficiencies.

The seventh most influential factor affecting vending purchases was the nutritional value of the snack. Interestingly, although Health Science students strongly indicated they like to purchase vending items such as soda, chips, and candy, they expressed interest in vending machines including healthier items such as fruit, vegetables, and other lower calorie, higher fiber snacks. This finding is significant, because while it may appear risky to include fresh fruit and vegetables in a vending machine due to their perishability, students indicated that they wished these items were available for purchase.

The eighth most influential factor affecting vending purchases was reading nutritional cues on vending machines. Unfortunately, the results of this study indicated that this practice was not common among the majority of Health
Science college students. *Snackwise* is a vending program at The Ohio State University that educates students about vending snacks by measuring and comparing their nutrient density so students can make healthier snack choices. It should become a priority to educate students about this useful resource and encourage them to use the information when selecting a vending snack.

The ninth most influential factor affecting vending purchases was stress. This finding is in contrast to the literature which indicates that the more stressed a person is, the less nutrient-dense the food selection will be. In times of stress, comfort food (which is typically high in calories, fat, sugar, and salt), is usually the number one selection. This is why it is especially important for students to understand the benefit of healthy snacking during stressful times such as final exams.

The tenth most influential factor affecting vending purchases was a tie with students joining their friends and boredom. One reason Health Science students were not influenced by their peers vending selections could be because selecting vending items is usually performed without help or advice from others. Surprisingly, boredom was one of the least influential factors of this study. This
is contrary to the literature which states that boredom was the most frequently cited reason for snacking (9).

The results of this study indicated that the gender of Health Science students was a factor that influenced vending purchases. Female Health Science students were most influenced by selection, nutritional value, taste, convenience due to location, stress, joining their friends, boredom, and nutritional cues. Male Health Science students were most influenced by convenience due to time, and hunger. Females and males were equally influenced by cost.

It is logical that different factors influence genders differently and this study was no exception. Females were more concerned with long-term factors that are related to their health, such as nutritional value and nutritional cues, while males were more concerned with short-term factors such as how they can satiate their hunger the most effectively and in the shortest amount of time. These results indicate that there should be a push to educate males on the long-term benefits of healthy snacking as a way of increasing their selection of nutrient-dense vending snacks.

For comparison between divisions, it was no surprise that Medical Dietetics students were most influenced by the nutritional value of the vending
snack when compared to all other divisions. These findings indicate that while Medical Dietetics students are schooled in the benefit of consuming nutrient-dense foods and realize the importance of including them in their diet, other divisions need to become educated on the benefits of healthy snacking. One way to do that would be to provide handouts or short information sessions on how to read and understand the nutritional cues on vending machines. This would be a strategy to make students more aware of their consumption of nutrient-dense snacks from vending machines, and provide long-lasting health benefits for the future.

The literature agrees with this finding and states that students tend to choose healthier snack foods when advertising messages emphasize the nutritional properties of foods. Messages that emphasize the benefits of a healthful food should be effective in promoting healthful eating because they provide the consumer with clear and specific benefits of choosing the healthful food (12).

Energy balance was another factor that influenced the vending selections of Health Science students. Interestingly, the results indicted that those Health Science students that were trying to stay the same weight were more influenced
by looking at the nutritional values and cues than those students trying to lose weight. This data is contradictory to a study of factors influencing snack choices of students in Newcastle, Australia, where many respondents said they would change to healthier snacks only if they had health problems or if they gained weight (24). A possible area of future research would be to identify what factors motivate those students trying to lose weight, as they are the ones who are at the greatest risk for overweight and obesity.

The results of this study indicated that the frequency of buying vending items was a factor that influenced Health Science students’ vending selections. Those that bought vending items daily were most influenced by taste and stress; this is in agreement with the literature which states that more frequent vending machine users were less likely to choose or plan to choose a low-fat vending snack (28). Health Science students that bought vending items once a week cited boredom as the most influential factor.

Health science students that bought vending items two times a week were most influenced by convenience due to time and location, possibly purchasing a vending snack as a meal replacement on days when there were no breaks in between classes. Surprisingly, Health Science students that bought vending items
once a month were not greatly influenced by any of the factors. This could be an area of future research to determine what factors influenced their vending selections. Health Science students that bought vending items once or twice a year were most influenced by cost, nutritional value, selection, joining their friends, reading nutritional cues, and hunger, making them the most influenced students of the study.

Overall, the Health Science students’ vending choices were most influenced by taste “all of the time”, which indicates that vending machines need to include more great-tasting healthy items. The students were most influenced by cost, selection, convenience due to time and location, and hunger “most of the time”, which indicates that a large variety of high-fiber, high-protein snacks that are well-priced and conveniently located would be highly popular among college students.

The students were most influenced by nutritional value and stress “some of the time”, which indicates that during final exam week and other high-stress occasions would be an especially good time to promote nutrient-dense vending snacks to students. This study found that students were “never” influenced by joining their friends, boredom, and reading nutritional cues on vending machines.
It is possible that the data in this study was skewed because only Health Science students were polled. Health Science students are a population that are known to be concerned about the health of themselves and others, so it is likely that their responses would be different from the general college population. One way to answer this question would be to poll the general college population at random as a way of obtaining unbiased results.

College students are an impressionable group, who at times might feel invincible against the threat of future diet-related diseases such as obesity, cancer, diabetes, and heart disease. For this reason, health professionals must use their knowledge of these influencing factors as a way of motivating the students to improve their health now, so students can stay healthy when diet-related diseases become more of a threat.
CONCLUSION

This study was done to determine the factors that influenced Health Science college students’ choice of vending items. The specific objectives were to determine if the factors (cost, nutritional value, selection, taste, convenience, stress, friends, boredom, nutritional cues, and hunger) influenced Health Science college students’ choice of vending items, and to determine if there were differences in the factors based upon gender, division, energy balance, and frequency of buying vending items. The answers to these questions are summarized below.

Research Question Summaries

1. Did cost influence Health Science college students’ choice of vending items?

   Out of eleven factors, cost was the sixth most influential factor. Overall, Health Science students reported that cost influenced their vending purchases “most of the time”. In this study some students admitted to snacking on vending items instead of eating meals as a way of saving money, which could predispose them to various nutritional deficiencies.
2. Did **nutritional value** influence Health Science college students’ choice of vending items?

Nutritional value was the seventh most influential factor of this study. Overall, Health Science students reported that the nutritional value influenced their vending purchases “some of the time”. While a majority of students in this study tended to purchase energy-dense-nutrient-poor items such as candy and chips, many expressed an interest in consuming more nutrient-dense snacks instead.

3. Did **selection** influence Health Science college students’ choice of vending items?

Selection was the third most influential factor in this study. Overall, Health Science students reported that the selection influenced their vending purchases “most of the time”. As described in this study, students indicated that they would like to have a larger selection of healthy items available for purchase including items such as dairy products, fruits, vegetables, low-fat and low-sugar items.
4. Did taste influence Health Science college students’ choice of vending items?

Taste was the most influential factor in this study. Overall, Health Science students reported that taste was the only factor that influenced their vending purchases “all of the time”.

5. Did convenience due to time and location influence Health Science college students’ choice of vending items?

Convenience due to time and location was the fifth most influential factor in this study. Overall, Health Science students reported that convenience due to time and location influenced their vending purchases “most of the time”. Students indicated that when short on time, they will purchase a snack from a vending machine. If these machines include a greater selection of healthy items, students will be more likely to select them over an energy-dense-nutrient-poor snack.
6. Did stress influence Health Science students’ choice of vending items?

   Stress was the ninth most influential factor in this study. Overall, Health Science students reported that stress influenced their vending purchases “some of the time”.

7. Did joining their friends influence Health Science students’ choice of vending items?

   Joining their friends was the tenth most influential factor in this study. Overall, Health Science students reported that joining their friends “never” influenced their vending purchases. It is likely from this study that the Health Science students’ chose their vending snack independently of other students.

8. Did boredom influence Health Science students’ choice of vending items?

   Boredom was also the tenth most influential factor in this study. Overall, Health Science students reported that boredom “never” influenced their vending purchases, which is in contrast to the literature, which states that students frequently snack as a result of boredom.
9. Did **nutritional cues** influence Health Science students’ choice of vending items?

Reading nutrition cues was the eighth most influential factor in this study. Overall, Health Science students reported that reading nutritional cues “never” influenced their vending purchases. *Snackwise* is a program designed to educate consumers on selecting the most nutrient-dense snacks available for purchase. Students should become aware of this program and utilize the information provided by the program in making more informed snacking decisions.

10. Did **hunger** influence Health Science students’ choice of vending items?

Hunger was the second most influential factor in this study. Overall, Health Science students reported that hunger influenced their vending purchases “most of the time”.
11. Were there differences in the factors (cost, nutritional value, selection, taste, convenience, stress, friends, boredom, nutritional cues, and hunger) that influenced Health Science students’ based upon gender?

Female Health Science students vending purchases were most influenced by selection, nutritional value, taste, convenience due to location, stress, joining their friends, boredom, and nutritional cues. Male Health Science students were most influenced by convenience due to time, and hunger.

12. Were there differences in the factors that influenced Health Science students’ vending purchases based upon division?

HIMS students were most influenced by cost, and convenience due to time and location. Medical Dietetics students were most influenced by nutritional value. Circulation Technology students were most influenced by selection, nutritional cues, and hunger. Radiological Science students were most influenced by taste. The “other” students were most influenced by stress. Athletic Training and Circulation Technology students were most influenced by joining their friends. Athletic Training and the “other” students were most influenced by boredom.
13. Were there differences in the factors that influenced Health Science students’ vending purchases based upon energy balance?

Health Science students trying to stay the same weight were most influenced by nutritional value, selection, taste, convenience due to time, joining their friends, and nutritional cues. Health Science students trying to lose weight were not influenced by any of the factors. Health Science students not trying to lose weight were most influenced by cost, convenience due to location, stress, boredom, and hunger.

14. Were there differences in the factors that influenced Health Science students’ vending purchases based upon frequency of buying?

Health Science students that bought vending items daily were most influenced by taste and stress. Health Science students that bought vending items once a week were most influenced by boredom. Health Science students that bought vending items twice a week were most influenced by convenience due to time and location. Health Science students that bought vending items once a month were not influenced by any of the factors. Health Science students that
bought vending items once or twice a year were most influenced by cost, nutritional value, selection, joining their friends, nutritional cues, and hunger.

**Limitations of the Study**

This study was limited by those variables reliant on participant self-reporting such as energy balance and frequency of buying vending items. In addition, the Health Science students analyzed in this study represent only a small percentage, thus not representing all students.

**Summary**

It can be concluded from this study that Health Science college students’ vending choices were influenced by many factors including cost, nutritional value, selection, taste, convenience, stress, friends, boredom, nutritional cues, and hunger. Furthermore, there were differences in the factors based upon gender, division, energy balance, and frequency of buying vending items.

Through effective education and promotion of healthy vending snacks using these influencing factors as a guide, college students can be steered towards
healthier snacking selections that positively influence their nutritional intake. This will lower the incidence of college overweight and obesity and in turn, prevent or deter diet-related diseases in their future.
Works Cited


APPENDIX A

Dear SAMP student:

Congratulations on being a student in the School of Allied Medical Professions. We understand that your time is valuable and appreciate your participation to complete this survey!

The survey is about vending machine choices. Vending is a huge business and it is of interest what students select to buy. This study is a component of a graduate student’s thesis. It will take **approximately 5-10 minutes to complete.** Your responses will NOT be linked to your name. Your survey responses will remain completely confidential and participation is voluntary.

If you have any questions or concerns, please contact: Kay.Wolf@osumc.edu

The survey link is:
https://www.surveymonkey.com/s.aspx?sm=An7vK1KhS3uWJvJ1kZgl4g_3d_3d

Thank you for helping me graduate.

Sincerely,

Sandra Gutman, Graduate Student, The Ohio State University
Kay N. Wolf, PhD RD LD Associate Professor
Gail Kaye, PhD RD LD Lecturer
Jill Clutter, PhD CHES Assistant Professor
Survey Questions

Are you 18 years or older?
Yes
No

When you purchase items from a vending machine, which of the following influence your purchasing decision?

1. Cost
   All of the time
   Most of the time
   Some of the time
   Never

2. Nutritional Value
   All of the time
   Most of the time
   Some of the time
   Never

3. Selection
   All of the time
   Most of the time
   Some of the time
   Never
4. **Taste**
   All of the time
   Most of the time
   Some of the time
   Never

5. **Convenience due to location**
   All of the time
   Most of the time
   Some of the time
   Never

6. **Convenience due to time**
   All of the time
   Most of the time
   Some of the time
   Never

7. **Stress**
   All of the time
   Most of the time
   Some of the time
   Never

8. **Joining your friends**
   All of the time
   Most of the time
   Some of the time
   Never
9. **Boredom**
   All of the time  
   Most of the time  
   Some of the time  
   Never

10. **Reading nutritional cues on vending machines**
    All of the time  
    Most of the time  
    Some of the time  
    Never

11. **Hunger**
    All of the time  
    Most of the time  
    Some of the time  
    Never

12. Is there anything else that influences your vending selection?

13. My two favorite foods to purchase from the vending machine are:

14. I wish vending machines had the following food item:

15. I am more likely to select items from a vending machine if it contains healthy choices:
    All of the time  
    Most of the time  
    Some of the time  
    Never
16. How often do you purchase items from a snack vending machine?
Daily
Once a week
Twice a week
Once a month
Once or twice a year
Don’t purchase items from vending

17. Are you trying to do any of the following about your weight?
Stay the same weight
Lose weight
Gain weight
I am not trying to do anything about my weight

18. What is your gender?
Male
Female

19. What is your major?