

Spring 2014

# Vegetarian meal consumption and the influence on college success and health

Sarah Marie Jochem  
*James Madison University*

Follow this and additional works at: <https://commons.lib.jmu.edu/honors201019>

---

## Recommended Citation

Jochem, Sarah Marie, "Vegetarian meal consumption and the influence on college success and health" (2014). *Senior Honors Projects, 2010-current*. 433.  
<https://commons.lib.jmu.edu/honors201019/433>

This Thesis is brought to you for free and open access by the Honors College at JMU Scholarly Commons. It has been accepted for inclusion in Senior Honors Projects, 2010-current by an authorized administrator of JMU Scholarly Commons. For more information, please contact [dc\\_admin@jmu.edu](mailto:dc_admin@jmu.edu).

Vegetarian Meal Consumption and the Influence on College Success and Health

---

A Project Presented to  
The Faculty of the Undergraduate  
College of Health and Behavioral Sciences  
James Madison University

---

In Partial Fulfillment of the Requirements  
For the Degree of Bachelor of Science

---

by Sarah Marie Jochem

May 2014

---

---

Accepted by the faculty of the Department of Health Sciences, James Madison University, in partial fulfillment of the requirements for the Degree of Bachelor of Science.

FACULTY COMMITTEE:

HONORS PROGRAM APPROVAL:

---

Project Advisor: Jeremy D. Akers, PhD, RD  
Assistant Professor, Health Sciences

---

Barry Falk, PhD  
Director, Honors Program

---

Reader: Elizabeth Edwards, PhD  
Assistant Professor, Kinesiology

---

Reader: Sarah Carson, PhD  
Assistant Professor, Kinesiology

## Table of Contents

<b>Acknowledgements</b>	<b>3</b>
<b>Abstract</b>	<b>4</b>
<b>Introduction</b>	<b>5</b>
<b>Methodology</b>	<b>8</b>
<b>Results</b>	<b>10</b>
<b>Discussion and Conclusions</b>	<b>13</b>
<b>Tables and Figures</b>	<b>16</b>
<b>Appendix</b>	<b>24</b>
<b>Bibliography</b>	<b>33</b>

## **Acknowledgements**

I would like to thank my Faculty Advisor, Dr. Jeremy Akers, PhD, RD, for all of his assistance during the research process. Thanks to the flexibility and dedication of Dr. Akers, the completion of this thesis has been a success.

Thank you to the readers, Dr. Elizabeth Edwards PhD and Dr. Sarah Carson PhD, for their contributions.

## Abstract

Studies reveal there are many health benefits to following a vegetarian diet such as lower body mass index (BMI) compared to non-vegetarians, and lowered risk for obesity, coronary heart disease, hypertension, and diabetes. The purpose of this study was to determine the relationship between consuming vegetarian meals and the academic success and health status of college students. All undergraduate and graduate students enrolled at James Madison University during the Fall 2013 semester were contacted to participate in an online questionnaire. Seven hundred and twenty eight students enrolled during the 2013-2014 school year participated in the online questionnaire. In comparison to non-vegetarians, vegetarians reported that their overall health was better ( $3.74 \pm 0.09$  out of 5 vs.  $3.54 \pm 0.03$  out of 5) and they participated in more days of cardiorespiratory physical activity per week ( $4.48 \pm 0.2$  days vs.  $3.54 \pm 0.08$  days). The most noted reasons for following a vegetarian diet were to improve overall health (74.3%) and environmental concerns (70.3%). The majority of college vegetarians exclude beef (96%), pork (96%), and poultry (92%) from their diets. Additional research involving an increased heterogeneous sample on variables such as gender, race/ethnicity, and BMI, would provide further insight into the relationship between vegetarian diets and academic success.

## Introduction

The “freshman fifteen” is a commonly used expression that refers to the weight gain that freshman experience during their first year at college. Although not all college students gain fifteen pounds within their first academic year, there have been several studies that have shown both men and women gain between 1.1 kg (2.5 lbs) and 1.8 kg (4 lbs), on average, during their first year of college<sup>1, 2, 3</sup>. Although this popular expression often evokes humor, it reflects there is a serious health problem of weight management within the United States, specifically with college students. It has become a well-known fact that the American waistline is expanding; in 2010, over one third of American adults were classified as obese<sup>4</sup>. It is daunting to learn that weight gain of college freshman is at a much higher rate than that for the average American adult<sup>1</sup>.

During their college years, many young adults experience some degree of autonomy for the first time in their lives. The new sense of freedom that a college setting endorses can result in both positive and negative behaviors, including food choices and dietary habits. Studies have revealed that about 70% of college students gain weight during their freshman year<sup>5, 6</sup>. Weight gain averages 1.6 kg (3.5 lbs) for woman and 2.5 kg (5.5 lbs) for males with weight gain continuing through to sophomore year<sup>6</sup>. The health effects of excessive weight gain include the increased incidence of cardiovascular disease, type 2 diabetes mellitus (T2DM), hypertension, stroke, dyslipidemia, osteoarthritis, and some cancers<sup>7</sup>.

Conversely, studies have revealed there are many health benefits associated with following a vegetarian diets such as lower BMI compared to non-vegetarians, lowered risk of obesity, coronary heart disease, hypertension, and diabetes<sup>8</sup>. According to The Academy of Nutrition and Dietetics Position Paper on Vegetarian Diets:

[A]ppropriately planned vegetarian diets, including total vegetarian or vegan diets, are healthful, nutritionally adequate, and may provide health benefits in the prevention and treatment of certain diseases. Well-planned vegetarian diets are appropriate for individuals during all stages of the life cycle, including pregnancy, lactation, infancy, childhood, and adolescence, and for athletes<sup>9</sup>.

Vegetarian diets may provide positive health outcomes for college students as a way to minimize the weight gain typically associated with the first year of college.

The College Board suggests that during the admissions process, students' grades, courses taken, standardized tests scores, and more can be a beneficial component to analyzing how likely the student is to succeed in the university setting<sup>10</sup>. Other significant predictors of college grade point average (GPA) include the declaration and commitment to an academic major and satisfaction with faculty interactions<sup>11</sup>. Traditional academic focused variables, like the ones previously mentioned, may not be the only influential factors involved in the success of a college student. Non-academic factors shown to influence college performance are emotional health and social health<sup>12</sup>. A Canadian study revealed that a healthy diet was one of the greatest non-academic predictors of GPA, and overall health status could predict personal success<sup>13</sup>. For the purposes of the study, a Total Success score was determined, weighting both GPA and personal success equally to evaluate overall success. Influential predictors of the Total Success score were less time spent in passive leisure, healthy diet, waking up early, and less time spent sleeping.<sup>13</sup> This finding indicates that in addition to the traditional academic variables, a relationship may exist between a student's health behaviors and their performance in a university setting.

The current study's purpose was to examine if vegetarian meal consumption influenced academic success and indices of college health in college students. The researcher's hypothesis

stated that college students who consumed a greater proportion of vegetarian meals per week would report better health and academic success. To the researcher's knowledge, there was no previous research involving vegetarian meal consumption and overall college performance prior to conducting this project.

## **Methodology**

### ***Participants***

The Institutional Review Board (No. 14- 0185) approved the use of human research subjects for the purpose of this research project. All JMU students enrolled during the Fall 2013 semester were included in the recruitment for this study. All participants were at least 18 years of age, and participation was voluntary. There were no known risks associated with participation in the research beyond those of everyday life. During November 2013, the student population received a campus-wide recruitment email that included the study protocol, IRB approval number, confidentiality statement, and directions for the one-time anonymous Qualtrics questionnaire. All participants gave consent before beginning the research questionnaire by clicking on the button labeled “consent” on the home screen of the questionnaire before the first set of questions were revealed. Participants were able to skip over individual questions or withdraw from the study at any time without consequence. However, once their responses were submitted and anonymously recorded, participants were not able to withdraw from the study. All participants’ identities remained anonymous throughout the entire research process. At the end of the questionnaire, the participants had the option to submit their email anonymously, separately from their responses, to enter into a prize drawing for a \$25 gift card.

### ***Data Collection***

Researchers used Qualtrics Questionnaire Developer (Qualtrics, Inc., Provo, UT) to create the thirty-six question online questionnaire titled: “An Examination of JMU Student Success.” The questionnaire collected demographic, academic, lifestyle, and health related quality of life information (Appendix A). Questions asked to all students were similar; however, if participants were not vegetarian, they were asked if they would consider becoming a

vegetarian, and vegetarians were asked why they follow a vegetarian diet. All responses were self-reported. Initial data collection began on November 6, 2013 and ended during January 2014.

The study utilized the dependent variables of weight management, academic success, and mental well-being to examine any correlations between the independent variable of vegetarian meal consumption (Appendix B). Any variables that were identified as being significant at baseline were used as covariates in analyses. The initial hypothesis stated that individuals who consumed a greater percentage of vegetarian meals per week were more likely to have an overall enhanced level of college performance and success.

### ***Statistical Analysis***

Data sets were analyzed using IBM SPSS version 21.0 (Armonk, NY). Means, standard deviations, and percentages of participant demographic information and question categories were determined using frequencies and descriptive statistics. Independent samples *t*-tests were executed for comparing vegetarian to non-vegetarian outcomes. The self-reported height and weight provided the information to calculate BMI (kg/m<sup>2</sup>). Regrouping of responses into broader data sets aided the data analysis process. Duration of time for following a vegetarian diet was regrouped into broader data sets: <1 month, 1-6 months, 7-12 months, >1 year – 5 years, and >5 years. The number of vegetarian meals consumed per week was regrouped into the following data sets: 0, 1-5, 6-10, 11-15, and >15 meals per week. Significance level was set at  $P \leq 0.05$ .

### ***Confidentiality***

The questionnaire was anonymous and did not collect any identifying information. All study documents were kept in a locked filing cabinet in a locked room in the principal investigator's office. A password-protected computer kept all electronic data. All questionnaire data remained on a password-protected computer after data analysis was completed.

## Results

Of the 20,217 students who received the email containing the questionnaire invitation, 769 responded, resulting in a 3.80% response rate. Final data analysis included 728 students who responded with complete information to the questionnaire (Table 1).

### *Descriptive Information*

Of the 728 students surveyed, 16.8% were male and 83.2% female. The average age was approximately 21 years old. Vegetarians had an average BMI of  $22.56 \pm 2.41$  while non-vegetarians had a slightly higher average BMI of  $23.08 \pm 3.97$ , with both groups classified as being in the normal weight range. Non-vegetarians reported an average cumulative GPA of  $3.27 \pm 0.45$ , while vegetarians report a  $3.31 \pm 0.41$  average GPA (Table 1). The majority of the population self-identified as being white (87.1%). The remaining study subjects were Asian (5.6%), Hispanic (2.7%), Black/African American (2.3%), and other (2.2%). Most of the participants were non-vegetarians (89.29%) (Table 2).

### *Academic Success*

The average GPA of vegetarians was not significantly higher than non-vegetarians. Other aspects of academic success were determined using a five-point scale: 1= never, 2= seldom, 3= sometimes, 4=often, 5= always. Non-vegetarians compared to vegetarians reported higher rates of submitting assignments on time ( $4.80 \pm 0.47$  vs.  $4.77 \pm 0.46$ ), completing all assigned readings prior to class ( $3.41 \pm 0.922$  vs.  $3.34 \pm 0.940$ ), and participating in class discussion ( $3.48 \pm 1.01$  vs.  $3.31 \pm 0.99$ ). Differences between the two groups for all academic success variables were found to be insignificant (Table 3).

## ***Lifestyle***

Vegetarians prepared  $8.70 \pm 7.38$  meals at home per week, compared to non-vegetarians who prepared  $7.40 \pm 6.41$  meals. Vegetarians bought fewer meals on campus per week ( $6.54 \pm 5.22$ ) in contrast to non-vegetarians ( $6.61 \pm 5.43$ ). Vegetarians on average ate at more fast food restaurants than non-vegetarians do per week ( $1.53 \pm 1.86$  days vs.  $1.51 \pm 1.85$ ) (Table 4).

## ***Dietary Habits of Non-Vegetarians***

Shellfish was the number one food excluded from the diet of non-vegetarians (24.04%) and fish is the second most popular food type that is avoided (18.49%). Of the non-vegetarians surveyed, 73% eat vegetarian meals during the week, 51.46% reported an average consumption of 1-5 vegetarian meals per week, 11.25% consumed 6-10 meals, 5.08% consumed 11-15 meals, and 1.23% consumed greater than 15 vegetarian meals per week. Over 37% of the non-vegetarians considered becoming a vegetarian in the future (Table 5).

## ***Dietary Habits of Vegetarians***

Vegetarians surveyed report the exclusion of beef (95.95%), pork (95.95%), poultry (91.98%), fish (60.81%), shellfish (62.16%), eggs (16.22%), dairy products (18.92%), and gelatin (6.76%) from their diet. The top reasons for following a vegetarian diet were improvement of overall health (74.32%), environmental concerns (70.27%), weight loss (66.22%), and food safety concerns (47.30%). The least common reason was to save money (8.11%). Over 33% of vegetarians have been following this type of diet for more than five years, and another 33% have been vegetarian for at least a year (Table 6).

## ***Health Related Quality of Life***

General health status was determined using a five-point scale: 1= poor, 2 = fair, 3=good, 4=very good, 5= excellent. Among vegetarians health status was revealed to be significantly

higher than non-vegetarians ( $3.74 \pm 0.75$  vs.  $3.54 \pm 0.86$ ) ( $t(715) = 2.163, p < 0.05$ ). Although not significantly different, vegetarians compared to non-vegetarians tended to exercise for longer periods ( $38.47 \pm 26.55$  minutes vs.  $38.31 \pm 36.78$  minutes), engaged in physical activity more often ( $5.11 \pm 1.85$  days vs.  $4.70 \pm 1.90$  days), were less stressed ( $6.76 \pm 1.84$  out of 10 vs.  $6.81 \pm 1.78$  out of 10), and feel fatigued less often ( $4.47 \pm 2.30$  days vs.  $4.52 \pm 2.16$  days). Vegetarians were significantly more likely to participate in cardiorespiratory physical activity per week than non-vegetarians ( $4.48 \pm 1.94$  days vs.  $3.91 \pm 1.92$  days) ( $t(715) = 2.390, p < 0.05$ ). Compared to vegetarians, non-vegetarians tended to strength train more days per week ( $2.55 \pm 1.60$  days vs.  $2.34 \pm 1.39$  days), felt helpless less often ( $2.43 \pm 1.71$  days vs.  $2.48 \pm 1.60$  days), and felt as though they got enough sleep ( $4.79 \pm 1.98$  days vs.  $5.10 \pm 2.00$  days). These differences were not found to be significant (Table 7).

## Discussion and Conclusions

Results of the study indicate there may be a positive relationship between vegetarian meal consumption and overall college success, including academic, mental, and physical wellbeing. An independent samples *t*-test identified that vegetarians have a significantly higher general health status compared to non-vegetarians ( $p < 0.05$ ). Data analysis showed that vegetarians do not have a significantly higher average GPA and do not experience fatigue less often than non-vegetarians. Improvement of overall health was the number one reported reason why vegetarians chose to follow a vegetarian diet.

An independent samples *t*-test identified that vegetarians participate in significantly more days of cardiorespiratory physical activity per week compared to non-vegetarians, while non-vegetarians tend to strength train more often, although not significantly more. This finding shows that there is a variance in the type of physical activity preferred by the two sample groups. In addition, vegetarians tended to exercise for longer periods, engaged in physical activity more often, and feel fatigued less often than non-vegetarians experience. Non-vegetarians tended to receive sufficient sleep more often than non-vegetarians. George et. al. found that less time sleeping was actually revealed to be a positive predictor of the total success of college students<sup>13</sup>. These health-related variables can help explain why the general health status of vegetarians in the present sample is significantly greater compared to non-vegetarians.

Although average cumulative GPA between vegetarians and non-vegetarians is comparable, non-vegetarians reported a higher rate of class participation, submitting assignments on time, and completing all assigned readings prior to class. It is typical for college courses to use tests and quizzes as the main source of assessment when determining final class grades, while class participation and assignments tend to make up only a fraction of the final grade.

Since vegetarians reported higher rates of confidence with class material prior to tests and quizzes, this may explain why this group had a similar average GPA as non-vegetarians despite having lower rates of performance in other variables related to academic success.

Study results display that 73% of non-vegetarians consume vegetarian meals during the week. Majority of non-vegetarians report an average of 1-5 vegetarian meals consumed per week. This indicates that integrating vegetarian meals into the diet is a practice that is widely accepted by the non-vegetarian JMU student population. McEvoy et. al. reported that following a plant-based diet with small intakes of meat and dairy products may lead to significant health improvements<sup>14</sup>. In the present sample, top foods excluded from the diets of non-vegetarians were fish and shellfish. The prevalence of food allergies in the United States is about 4% in adults<sup>15</sup>; therefore, this finding should be considered when analyzing how frequently foods are excluded from the diets of non-vegetarians, some avoidances may be allergy-based. About 37% of the non-vegetarians surveyed had considered becoming a vegetarian in the future. A gradual increase in the number of vegetarian meals consumed per week may be a beneficial approach to eventually following a vegetarian diet.

Since vegetarians are more likely to participate in at-home meal preparation and buy fewer meals on campus per week, they may have a heightened sense of what exactly goes into the food they eat. Although the nutrition information is available online for food items sold on campus, not all individuals may be aware of the nutritional content of the food items that are available on campus. The majority of JMU vegetarians exclude beef, pork, poultry, fish, and shellfish from their diets. This restriction in diet does not necessarily reflect the need for vegetarians to prepare their meals solely at home; vegetarians actually go out to eat at restaurants more often than non-vegetarians. This indicates that there are desirable vegetarian menu items

available at many local restaurants. Forestell et. al. found that vegetarians and pesco-vegetarians (those who include fish and other seafood items in their diet) experience the same level of restraint as non-vegetarians when it comes to eating<sup>16</sup>. Two-thirds of the vegetarians surveyed have been following a vegetarian diet for over a year, demonstrating that following a vegetarian diet as a college student is realistic.

Limitations of the study include the limited sample size, homogeneous group, and the possibility of self-selection bias made by the study subjects. Seven hundred sixty nine students currently enrolled at James Madison University during the 2013-2014 school year responded to the questionnaire, a small fraction of the total student body. As a result, the study sample may not accurately reflect the total college student population at James Madison University or the student population throughout the United States. Since a significant amount of the study participants were undergraduate Caucasian females with an average GPA above a 3.0, this may have inhibited the capability to identify differences between the variables of primary interest (Appendix B). For further research, increasing the study's sample size to include more JMU students and expanding data collection to include other universities as well would help to increase the diversity of the population studied.

### ***Conclusion***

Vegetarian meal consumption is related to college success and health. Specifically, general health status and amount of cardiorespiratory physical activity performed per week was significantly higher in vegetarian students compared to non-vegetarian students. However, more research is necessary to identify all of the benefits that vegetarian meals can provide an individual, in addition to the physical health benefits.

### **List of Tables**

- Table 1. Self-Reported Descriptive Information of JMU Students
- Table 2. Self-Reported Demographic Information of JMU Students
- Table 3. Academic Success of JMU Students
- Table 4. Lifestyle of JMU Students
- Table 5. Dietary Habits of Non-Vegetarian JMU Students
- Table 6. Dietary Habits of Vegetarian JMU Students
- Table 7. Health Related Quality of Life of JMU Students

<b>Table 1. Self-Reported Descriptive Information of JMU Students</b>			
	<b>Mean ± SD</b>		
	<i>All</i>	<i>Vegetarian</i>	<i>Non-Vegetarian</i>
<b>Age (years)</b>	20.71±3.41	20.64±2.77	20.72±3.48
<b>Height (cm)</b>	167.83±8.92	167.44±7.70	167.83±9.03
<b>Weight (kg)</b>	65.11±13.31	63.35±8.76	65.25±13.70
<b>BMI (kg/m<sup>2</sup>)</b>	23.04±3.84	22.56±2.41	23.08±3.97
<b>Credit Hours Enrolled</b>	14.43±2.90	14.57±2.52	14.41±2.95
<b>Cumulative GPA</b>	3.27±0.45	3.31±0.41	3.27±0.45

\* All=728 students, Vegetarians= 74 students, Non-vegetarians= 650 students, No response= 4 students

<b>Table 2. Self-Reported Demographic Information of JMU Students</b>			
	<i>All</i> <i>N (%)</i>	<i>Vegetarian*</i> <i>N (%)</i>	<i>Non-Vegetarian*</i> <i>N (%)</i>
	728 (100%)	74 (10.16%)	650 (89.29%)
<b>Gender</b>			
Male	122 (16.8%)	5 (6.8%)	115 (17.7%)
Female	606 (83.2%)**	69 (93.2%)	535 (82.3%)
<b>Race/Ethnicity</b>			
Asian	41 (5.6%)	4 (5.4%)	37 (5.7%)
Black or African American	17 (2.3%)	1 (1.4%)	16 (2.5%)
Hispanic	20 (2.7%)	0 (0%)	20 (3.1%)
White	634 (87.1%)**	69 (89.2%)	564 (86.8%)
Other	16 (2.2%)	2 (4.1%)	12 (2.0%)
<b>Academic Year</b>			
Freshman	145 (19.9%)	10 (13.5%)	134 (20.6%)
Sophomore	125 (17.2%)	18 (24.3%)	107 (16.5%)
Junior	165 (22.7%)	20 (27%)	144 (22.2%)
Senior	232 (31.9%)	20 (27%)	210 (32.2%)
Graduate	61 (8.4%)	6 (8.1%)	55 (8.5%)
* 4 choose not to answer all questions			
** Significant “All” group difference $p < 0.001$			

<b>Table 3. Academic Success of JMU Students</b>		
	<b>Mean* <math>\pm</math> SD</b>	
	<i>Vegetarian</i>	<i>Non-Vegetarian</i>
<b>Submit all class assignments on time</b>	4.77 $\pm$ 0.46	4.80 $\pm$ 0.47
<b>Complete all assigned readings prior to class</b>	3.34 $\pm$ 0.940	3.41 $\pm$ 0.922
<b>Confident with class material before taking a quiz or exam</b>	3.84 $\pm$ 0.57	3.80 $\pm$ 0.66
<b>Participate in class discussion</b>	3.31 $\pm$ 0.99	3.48 $\pm$ 1.01
*Mean calculated based on the following scale: 1= never, 2= seldom, 3= sometimes, 4=often, 5= always		

<b>Table 4. Lifestyle of JMU Students</b>		
	<b>Mean ± SD</b>	
	Vegetarian	Non-Vegetarian
<b>Meals Prepared at Home (per week)</b>	8.70±7.38	7.40±6.41
<b>Meals Bought on campus (per week)</b>	6.54±5.22	6.61±5.43
<b>Meals Eaten at Fast Food or Sit Down Restaurant (per week)</b>	1.53±1.86	1.51±1.85

<b>Table 5. Dietary Habits of Non-Vegetarian JMU Students (n=649)</b>	
	<b>N (%)</b>
<b>Exclude from Diet</b>	
Beef	79 (12.17%)
Pork	95 (14.64%)
Poultry	21 (3.24%)
Fish	120 (18.49%)
Shellfish	156 (24.04%)
Eggs	36 (5.55%)
Dairy Products	43 (6.63%)
Animal Products	20 (3.08%)
Eat all of the above	375 (57.78%)
<b>Eat vegetarian meals</b>	
Yes	474 (73.0%)
No	175 (27.0%)
<b>Number of Vegetarian Meals Consumed Per Week</b>	
0	201 (30.97%)
1-5	334 (51.46%)
6-10	73 (11.25%)
11-15	33 (5.08%)
>15	8 (1.23%)
<b>Consider Becoming a Vegetarian</b>	
Yes	245 (37.75%)
No	404 (62.25%)

<b>Table 6. Dietary Habits of Vegetarian JMU Students (n=74)</b>	
	<b>N (%)</b>
<b>Exclude from Diet</b>	
Beef	71 (95.95%)
Pork	71 (95.95%)
Poultry	68 (91.98%)
Fish	45 (60.81%)
Shellfish	46 (62.16%)
Eggs	12 (16.22%)
Dairy Products	14 (18.92%)
Gelatin	5 (6.76%)
<b>Reason for Following a Vegetarian Diet</b>	
Improve overall health	55 (74.32%)
Animal welfare	49 (66.22%)
Weight loss	17 (22.97%)
Weight maintenance	11 (14.86%)
Save money	6 (8.11%)
Environmental concerns	52 (70.27%)
Food Safety concerns	35 (47.30%)
Does not like the taste or texture	12 (16.22%)
<b>Length of Following a Vegetarian Diet</b>	
<1 month	3 (6.25%)
1-6 months	7 (14.58%)
7-12 months	6 (12.50%)
>1 year – 5 years	16 (33.33%)
>5 years	16 (33.33%)

<b>Table 7. Health Related Quality of Life of JMU Students</b>		
	<b>Mean ± SD</b>	
	<b>Vegetarian</b>	<b>Non-Vegetarian</b>
<b>General Health (scale of 1 to 5; 5 being the best)</b>	3.74±0.75*	3.54±0.86
<b>Average Time Spent Exercising (minutes per day)</b>	38.47±26.55	38.31±36.78
<b>Engage in Physical Activity (days per week)</b>	5.11±1.85	4.70±1.90
<b>Strength Train (days per week)</b>	2.34±1.39	2.55±1.60
<b>Cardiorespiratory Physical Activity (days per week)</b>	4.48±1.94*	3.91±1.92
<b>Stress Level (scale of 1 to 10, 10 being the most stressed)</b>	6.76±1.84	6.81±1.78
<b>Feel Helpless (days per week)</b>	2.48±1.60	2.43±1.71
<b>Experience Fatigue (days per week)</b>	4.47±2.30	4.52±2.16
<b>Received Sufficient Sleep (days per week)</b>	5.10±2.00	4.79±1.98
* Significant vegetarian group difference $p < 0.05$		

## Appendix A

### “An Examination of JMU Student Success” Questionnaire Questions:

#### *Demographic Information*

1. Please select your current academic year at James Madison University:
    - Freshman
    - Sophomore
    - Junior
    - Senior
    - Graduate
  
  2. What is your current age? (*drop down box*)
    - 18-100
  
  3. What is your gender?
    - Male
    - Female
  
  4. What is your height?
    - Feet
    - Inches
  
  5. What is your weight?
    - Pounds
  
  6. Which one of these groups would you say best represents your race/ethnicity? (*drop down box*)
    - American Indian or Alaska Native
    - Asian
    - Black or African American
    - Hispanic
    - Native Hawaiian or Other Pacific Islander
    - White
    - Other
  
  7. What is your current “Primary” major? (*fill in the blank*)
  
  8. How many class credits are you currently enrolled in?
    - Credit Hours
  
  9. What is your current cumulative GPA?
    - Cumulative GPA
- #### *Academic Success*
10. Do you submit all class assignments on time? (including homework, papers, and projects)

*(drop down box)*

- Never
- Seldom
- Sometimes
- Often
- Always

11. Do you complete all assigned readings prior to class? *(drop down box)*

- Never
- Seldom
- Sometimes
- Often
- Always

12. On average, do you feel confident with class material before taking a quiz or exam? *(drop down box)*

- Never
- Seldom
- Sometimes
- Often
- Always

13. Do you typically participate in class discussion? *(drop down box)*

- Never
- Seldom
- Sometimes
- Often
- Always

***Lifestyle***

14. Do you live on campus or off campus?

- On campus
- Off campus

15. On average, how many meals a week do you prepare at home?

[x] Meals per week

16. On average, how many meals a week do you buy on campus?

[x] Meals per week

17. On average, how many meals a week do you eat out at fast food restaurants and/or sit-down restaurants (examples: McDonald's, Chipotle, Red Lobster, etc)?

[x] Meals per week

18. Do you consider yourself a vegetarian? (If yes, go to vegetarian status, if no go to non-vegetarian status)

Yes  
No

***Vegetarian Status***

19. As a vegetarian, what foods do you exclude from your diet? (*select all that apply*)

Beef  
Pork  
Poultry  
Fish  
Shellfish  
Eggs  
Dairy products  
Other

20. What other food items (if any) do you exclude from your diet? (*fill in the blank*)

21. Why did you choose to follow a vegetarian diet? (*select all that apply*)

Improve overall health  
Animal welfare  
Weight loss  
Weight maintenance  
Save money  
Environmental concerns  
Food safety concerns  
Other

22. If you selected “other” for the previous question, please elaborate. (*fill in the blank*)

23. How long have you followed a vegetarian diet? (please specify the number of days, weeks, months, or years) (*fill in the blank*)

***Non-Vegetarian Status***

24. As a non-vegetarian, what foods (if any) do you exclude from your diet? (*select all that apply*)

Beef  
Pork  
Poultry  
Fish  
Shellfish  
Eggs  
Dairy products  
Animal products  
Other  
I eat all of the foods listed above

25. Do you ever eat vegetarian meals?

Ye  
No

26. If so, how many vegetarian meals do you eat on average per week?  
[x] Meals per week

27. Would you ever consider becoming a vegetarian?  
Yes  
No

***Health Related Quality of Life***

28. Would you say that in general your health was: (*drop down box*)  
Excellent  
Very good  
Good  
Fair  
Poor

29. What is the average amount of time you spend exercising on a given day?  
[x] Minutes

30. On average, how many days a week do you engage in physical activity? (*drop down box*)  
0 Days  
1 Day  
2 Days  
3 Days  
4 Days  
5 Days  
6 Days  
7 Days

31. On average, how many days a week do you typically strength/resistance train? (*drop down box*)  
0 Days  
1 Day  
2 Days  
3 Days  
4 Days  
5 Days  
6 Days  
7 Days

32. On average, how many days a week do you typically engage in cardiorespiratory physical activity?(*drop down box*)  
0 Days  
1 Day

- 2 Days
- 3 Days
- 4 Days
- 5 Days
- 6 Days
- 7 Days

***Health Related Quality of Life***

33. On a scale of 1 to 10, what would you rate your typical stress level during the academic year? (1 being the least stressed, 10 being the most stressed). (*fill in the blank*)

34. How many days per week do you feel helpless? (*drop down box*)

- 0 Days
- 1 Day
- 2 Days
- 3 Days
- 4 Days
- 5 Days
- 6 Days
- 7 Days

35. How many days per week do you experience fatigue? (*drop down box*)

- 0 Days
- 1 Day
- 2 Days
- 3 Days
- 4 Days
- 5 Days
- 6 Days
- 7 Days

36. How many days per week do you feel that you did not get enough sleep at night? (*drop down box*)

- 0 Days
- 1 Day
- 2 Days
- 3 Days
- 4 Days
- 5 Days
- 6 Days
- 7 Days

## **Appendix B**

### **Dependent Variables**

#### ***Weight Management***

- BMI
- Meals prepared at home
- Meals bought on campus
- Meals eaten at a fast food or sit-down restaurant
- General health
- Average time spent exercising
- Engage in physical activity
- Strength train
- Cardiorespiratory physical activity

#### ***Academic Success***

- Credit Hours Enrolled
- Cumulative GPA
- Submit all class assignments on time
- Complete all assigned readings prior to class
- Confident with class material before taking a quiz or exam
- Participate in class discussion

#### ***Mental Well-Being***

- Stress level
- Feel helpless
- Experience Fatigue
- Received sufficient sleep

## Appendix C1

### Abstract of Vegetarian Meal Consumption & the Influence on College Success and Health Presented at the 85th Annual Virginia Dietetic Association Conference

**Title:** VEGETARIAN MEAL CONSUMPTION AND THE INFLUENCE ON COLLEGE SUCCESS AND HEALTH

**Authors:** SM Jochem, JD Akers, PhD, RD, Department of Health Sciences, James Madison University, Harrisonburg, VA

**Learning Outcome:** Readers will identify the relationship between eating a vegetarian diet and academic success, body mass index (BMI), and overall health related quality of life.

**Abstract:** Studies reveal there are many health benefits to following a vegetarian diet such as lower body mass index (BMI) compared to non-vegetarians, and lowered risk of obesity, coronary heart disease, hypertension, and diabetes. The purpose of the current study was to determine the relationship between consuming vegetarian meals and the academic success and health status of college students. All undergraduate and graduate students at James Madison University that were enrolled during the Fall 2013 semester were contacted to participate in an online questionnaire. Seven hundred and twenty eight students who were enrolled during the 2013-2014 school year participated in the online questionnaire. Multiple Regression models concluded that the number of vegetarian meals consumed [ $\beta=0.16$ ,  $t=4.082$ ,  $p<0.001$ ,  $sr^2=0.03$ ], [ $\beta=0.159$ ,  $t=4.082$ ,  $p=0.011$ ,  $sr^2=0.01$ ] were the best predictors of GPA and BMI, respectively when controlling for all other health predictors. Full model: GPA  $R^2=0.37$ , BMI  $R^2=0.011$ . In comparison to non-vegetarians, vegetarians reported that, significantly, their overall health was better ( $3.74\pm 0.09$  out of 5 vs.  $3.54\pm 0.03$  out of 5) and they participated in more days of cardiorespiratory physical activity ( $4.48\pm 0.2$  days vs.  $3.54\pm 0.08$  days) ( $p<0.05$ ). The most noted reasons for following a vegetarian diet were to improve overall health (74.3%) and environmental concerns (70.3%). The majority of college vegetarians exclude beef (96%), pork (96%), and poultry (92%) from their diets. Additional research involving an increased heterogeneous sample on variables such as gender, race/ethnicity, and BMI, would provide further insight into the relationship between

## **Appendix C2**

**Poster of Vegetarian Meal Consumption and the Impact on College Success and Health  
Presented at the 85th Annual Virginia Dietetic Association Conference**

# VEGETARIAN MEAL CONSUMPTION AND THE INFLUENCE ON COLLEGE SUCCESS AND HEALTH

SM Jochem<sup>1</sup>, ES Edwards, PhD<sup>2</sup>, SA Carson, PhD<sup>2</sup>, JD Akers, PhD, RD<sup>1</sup>

Department of Health Sciences<sup>1</sup>, Department of Kinesiology<sup>2</sup>, James Madison University, Harrisonburg VA

## ABSTRACT

Studies reveal that there are many health benefits to following a vegetarian diet such as lower BMI compared to non-vegetarians, lowered risk of obesity, coronary heart disease, hypertension, and diabetes. The purpose of the current study was to determine the relationship between consuming vegetarian meals and the academic success and health status of college students. All undergraduate and graduate students at James Madison University were contacted to participate in an online questionnaire. Seven hundred and twenty-eight students who were enrolled during the 2013-2014 school year participated in the online questionnaire. Multiple Regression models concluded that the number of vegetarian meals consumed ( $\beta=0.11$ ,  $t=4.082$ ,  $p<0.001$ ,  $r^2=0.03$ ), ( $\beta=0.159$ ,  $t=4.082$ ,  $p<0.001$ ,  $r^2=0.03$ ) were the best predictors of GPA and BMI, respectively when controlling for all other health predictors. Full model: GPA  $R^2=0.37$ , BMI  $R^2=0.011$ . In comparison to non-vegetarians, vegetarians report that, significantly, their overall health is better (3,742.09 out of 5 vs. 3,542.09 out of 5) and they participate in more days of cardiorespiratory physical activity (4.48 $\pm$ 0.2 days vs. 3.54 $\pm$ 0.08 days) ( $p<0.05$ ). The most noted reasons for following a vegetarian diet were to improve overall health (74.3%) and environmental concerns (30.3%). The majority of college vegetarians exclude beef (96%), pork (96%), and poultry (92%) from their diets. Additional research involving an increased homogeneous sample, including gender, race/ethnicity, and BMI, would provide further insight into the relationship between vegetarian diets and academic success.

## INTRODUCTION

It has become a well-known fact that the American waistline is expanding. In 2010, over a third of American adults were considered obese (Ogden, 2010). It is daunting to learn that weight gain of college freshmen is at a much higher rate than that for the average American adult (Holm-Denoma, 2006). About 70% of college students gain weight during their freshman year (Goepfer, 2012). Weight gain averages 1.6 kg for women and 2.5 kg for males, with weight gain continuing through to sophomore year (Lloyd-Richardson, 2009). The health effects of excessive weight gain include the increased incidence of cardiovascular disease, type 2 diabetes mellitus (DM), hypertension, stroke, dyslipidemia, osteoarthritis, and some cancers (Barton, 1985).

Studies show that vegetarian diets are associated with several health benefits such as lower BMI compared to non-vegetarians, lowered risk of obesity, coronary heart disease, hypertension, and diabetes (Berkey, 2006). According to The Academy of Nutrition and Dietetics Position Paper on Vegetarian Diets, "appropriately planned vegetarian diets, including total vegetarian or vegan diets, are healthful, nutritionally adequate, and may provide health benefits in the prevention and treatment of certain diseases" (Craig, 2009). Vegetarian diets can result in a number of health benefits, but is vegetarian meal consumption related to college success, including academic, mental, and physical wellbeing? To the researcher's knowledge, there is no previous research that considers vegetarian meal consumption and overall performance in college.

## PURPOSE

The purpose of the current study was to determine the relationship between consuming vegetarian meals and the academic success and health status of college students.

## METHODS

- ◆ Online Qualtrics questionnaire sent to 20,217 JMU students who were enrolled during the Fall 2013, consisting of 36 questions related to students' demographic information, academic success, lifestyle, vegetarian status, non-vegetarian status, and health-related quality of life
- ◆ Statistical analyses performed using IBM SPSS version 21.0
- ◆ Descriptives and Frequencies analyses were performed for demographic and descriptive data
- ◆ Independent Samples T-tests were executed for comparing vegetarians to non-vegetarian participants
- ◆ Multiple Regression analysis, using nested models, were conducted to determine the relationship between the number of vegetarian meals consumed per week and certain outcomes of academics and health
- ◆ Data expressed as Mean  $\pm$  SD and percentages

## RESULTS

Fig 1. Multiple Regression Model Examining The Relationship Between Vegetarian Meals Consumed Per Week and Cumulative GPA

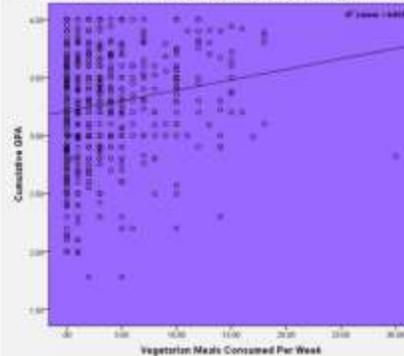


Fig 2. Multiple Regression Model Examining The Relationship Between Vegetarian Meals Consumed Per Week and BMI

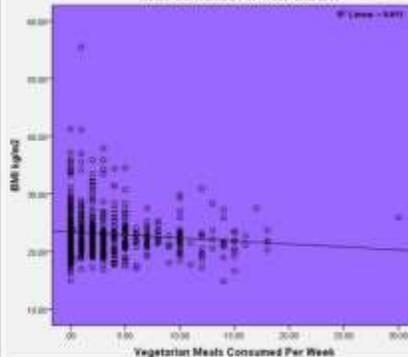


Table 1. Self-Reported Descriptive Information of JMU Students

	Mean $\pm$ SD		
	All (728)	Vegetarian (74)	Non-Vegetarian (650)
Age (years)	20.71 $\pm$ 3.41	20.64 $\pm$ 2.77	20.72 $\pm$ 3.48
Height (cm)	167.81 $\pm$ 8.93	167.44 $\pm$ 7.70	167.83 $\pm$ 9.03
Weight (kg)	65.11 $\pm$ 13.31	63.35 $\pm$ 8.76	65.25 $\pm$ 13.70
BMI (kg/m <sup>2</sup> )	23.04 $\pm$ 3.84	22.56 $\pm$ 2.81	23.08 $\pm$ 3.97
Credit Hours Enrolled	14.43 $\pm$ 2.90	14.57 $\pm$ 2.52	14.41 $\pm$ 2.95
Cumulative GPA	3.27 $\pm$ 0.45	3.31 $\pm$ 0.41	3.27 $\pm$ 0.45

Table 2. Self-Reported Demographic Information of JMU Students

	All N (%)	Vegetarian N (%)	Non-Vegetarian* N (%)
		74 (10.16%)	650 (89.29%)
Gender			
Male	122 (16.8%)	5 (6.8%)	135 (17.7%)
Female	606 (83.2%)**	69 (93.2%)	535 (82.3%)
Race/Ethnicity			
Asian	41 (5.6%)	4 (5.4%)	37 (5.7%)
Black/African American	17 (2.3%)	1 (1.4%)	16 (2.5%)
Hispanic	20 (2.7%)	0 (0%)	20 (3.1%)
White	634 (87.1%)**	69 (93.2%)	564 (86.8%)
Other	16 (2.2%)	2 (2.7%)	12 (2.0%)
Academic Year			
Freshman	145 (19.9%)	10 (13.5%)	134 (20.6%)
Sophomore	125 (17.2%)	18 (24.3%)	107 (16.5%)
Junior	165 (22.7%)	20 (27.0%)	144 (22.2%)
Senior	212 (29.1%)	20 (27.0%)	192 (29.5%)
Graduate	81 (11.1%)	6 (8.1%)	75 (11.5%)

\* All females and no Asians identified.

\*\* Significant  $\chi^2$  within group differences ( $p<0.05$ )

Table 3. Health Related Quality of Life of JMU Students

	Mean $\pm$ SD	
	Vegetarian	Non-Vegetarian
General Health (scale: 1 to 5, Subent)	3.74 $\pm$ 0.75*	3.54 $\pm$ 0.86
Stress Level (scale: 1 to 10, 10=most stressed)	6.76 $\pm$ 1.64	6.81 $\pm$ 1.78
Sufficient Sleep (days per week)	5.10 $\pm$ 2.00	4.79 $\pm$ 1.88
Engage in Physical Activity (days per week)	5.11 $\pm$ 1.85	4.70 $\pm$ 1.90
Average Time Spent Exercising (minutes per day)	38.47 $\pm$ 26.55	38.31 $\pm$ 36.78
Cardiorespiratory Physical Activity (days/week)	4.48 $\pm$ 1.94*	3.91 $\pm$ 1.92
Strength Train (days per week)	2.34 $\pm$ 1.39	2.55 $\pm$ 1.50

\* Significant between group differences ( $p<0.05$ )

## DISCUSSION AND CONCLUSIONS

- ◆ The number of vegetarian meals consumed per week is the best predictor of GPA when controlling for all other predictors in the nested model (Fig 1).
- ◆ The number of vegetarian meals consumed per week is the best predictor of BMI when controlling for all other predictors in the nested model (Fig 2).
- ◆ In the present sample, vegetarians had a significantly higher general health status and participate in significantly more days of cardiorespiratory physical activity per week compared to non-vegetarians.
- ◆ There was a trend towards vegetarians having higher cumulative GPAs and taking more credit hours.
- ◆ Eating more vegetarian meals per week may increase a student's overall success at college, including academic achievements and management of a healthy weight status.
- ◆ The results of this study may be limited due to the homogeneous study population, limited sample size, and the possibility of self-selection bias.
- ◆ More research is necessary to identify other variables that are influenced by the number of vegetarian meals eaten per week.

## Bibliography

1. Holm-Denoma, J, Joiner Jr. T, Vohs K, Heatherton T. The “freshman fifteen” (the “freshman five” actually): predictors and possible explanations. *Hth Psych.* January 2008; 27:S3.
2. Zagorsky J, Smith P. The freshman 15: a critical time for obesity intervention or media myth?. *Social Science Quarterly.* December 2011; 92(5):1389-1407.
3. Mihalopoulos N, Auinger P, Klein J. The freshman 15: is it real?. *J Am Coll Hth.* March 2008; 56(5): 531-534.
4. Ogden C, Carroll M, Kit B, Flegal K. Prevalence of obesity in the United States, 2009-2010. *NCHS Data Brief.* 2012; 82: 1-8. Accessed from <http://www.cdc.gov/nchs/data/databriefs/db82.pdf>
5. Gropper S, Simmons K, Connell J, Ulrich P. Weight and body composition changes during the first three years of college. *J Obes.* 2012; 2012:634048.
6. Lloyd-Richardson E, Bailey S, Fava J, Wing R. A prospective study of weight gain during the college freshman and sophomore years. *Prev Med.* 2009; 48(3): 256-61.
7. Burton B, Foster W, Hirsch J, Van Itallie T, Health implications of obesity: and NIH Consensus Development Conference. *Int J Obes.* 1985; 9(3): 155-70.
8. Berkow S, Barnard N. Vegetarian diets and weight status. *Nutr Reviews.* April 2006;64(4):175-188.
9. Craig W, Mangels A. Position of the American Dietetic Association: vegetarian diets. *J Am Dietetic Association.* July 2009; 109(7); 1266-1282.
10. Guidelines on the Use of College Board Test Scores and Related Data. College Board Web site. <http://professionals.collegeboard.com/profdownload/guidelines-on-uses-of-college-board-test-scores-and-data.pdf>. Published 2011. Accessed March 30, 2014.

11. Graunke S, Sherry A. An exploration of the factors that affect the academic success of college sophomores. *College Student Journal*. Jun 2005;39(2):367.
12. Pritchard M, Wilson G. Using emotional and social factors to predict student success. *J College Student Development*. Jan 2003; 44(1); 18-28.
13. George D, Dixon S, Stansal E, Gelb S, Pheri T. Time diary and questionnaire assessment of factors associated with academic and personal success among university undergraduates. *J Am Coll Health*. May 2008;56(6):706-715.
14. McEvoy CT, Temple N, Woodside JV. Vegetarian diets, low-meat diets and health: A review. *Public Health Nutr*. 2012;15(12):2287-2294. doi: 10.1017/S1368980012000936.
15. National Institute of Allergy and Infectious Diseases, National Institutes of Health. Report of the NIH Expert Panel on Food Allergy Research. 2006. Retrieved from [www3.niaid.nih.gov/topics/foodAllergy/research/ReportFoodAllergy.htm](http://www3.niaid.nih.gov/topics/foodAllergy/research/ReportFoodAllergy.htm).
16. Forestell CA, Spaeth AM, Kane SA. To eat or not to eat red meat. A closer look at the relationship between restrained eating and vegetarianism in college females. *Appetite*. 2012;58(1):319-325. doi: 10.1016/j.appet.2011.10.015.