To eat or not to eat red meat. A closer look at the relationship between restrained eating and vegetarianism in college females

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Thank you for your assistance.
Previous research has suggested that vegetarianism is a mask for restrained eating. This study compared dietary habits of subgroups of vegetarians to non-vegetarians. Those who were more restrictive of animal products, were less restrained. Only semi-vegetarians and flexitarians were motivated by weight control.
Research report

To eat or not to eat red meat. A closer look at the relationship between restrained eating and vegetarianism in college females

Introduction

Greater emphasis on healthy lifestyles, which include a well-balanced diet, has led to increased interest in vegetarian diets over the past few decades (American Dietetic Association & Dietitians of Canada, 2003). As of 2009, approximately 3.4% of the US population (i.e., between 6 and 8 million individuals) indicated that they did not consume meat, poultry, or seafood, and approximately 1% of the adult population indicated that they were vegan (The Vegetarian Resource Group, 2009). Various groups have made claims that attest to the benefits associated with the exclusion of animal products from diets for all stages of the life cycle, including during pregnancy, lactation, infancy, childhood, and adolescence (Craig & Mangels, 2009). Indeed, a well-planned vegetarian diet can meet current recommendations by providing essential nutrients and lowering levels of saturated fat, and cholesterol (American Dietetic Association & Dietitians of Canada, 2003).

It has been postulated that for some individuals, vegetarian eating patterns may be motivated by weight control (Gilbody, Kirk, & Hill, 1999). This has been supported by findings demonstrating that vegetarians have a higher rate of disordered eating than non-vegetarians (Klopp, Heiss, & Smith, 2003; Lindeman, Stark, & Latvala, 2000). Other findings suggest that dietary restraint and weight control are primary reasons identified by high school and college students for eliminating items such as meat and other animal products from their diet (Gilbody et al., 1999; Janelle & Barr, 1995; Klopp et al., 2003; Perry, McGuire, Neumark-Sztainer, & Story, 2001). Thus, some researchers have concluded that vegetarianism may provide a socially acceptable means to avoid certain foods in order to control body weight (Kadambali, Colvers, & Crisp, 1986; Klopp et al., 2003).

However, not all research has supported the relationship between dietary restraint and vegetarianism. Studies have found that samples of college-age vegetarians did not differ from their non-vegetarian counterparts on a range of measures that are associated with eating disorders such as laxative use, meal skipping, body mass index (Klopp et al., 2003), or on eating disturbance measures (Fisak, Peterson, Tantleff-Dunn, & Molnar, 2006) such as the Eating Attitudes Test (EAT; Garner, Olmsted, Bohr, & Garfinkel, 1982) and the Eating Disturbance Inventory (EDI; Garner, Olmsted, Bohr, & Garfinkel, 1982). Further, research suggests that the relationship between vegetarianism and dieting may only be present among certain groups of people. For example, some studies have found that adolescent vegetarians who have strong feminist views are more likely to be restrained eaters than their non-vegetarian counterparts (Klopp et al., 2003; Perry et al., 2001).

Keywords:
- Vegetarians
- Dieting
- Flexitarian
- Semi-vegetarians
- Food choice motivations

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It is possible that these inconsistent findings are in part a result of variation in the composition of vegetarian samples. Vegetarianism is a broad term that encompasses a range of food avoidance and selection patterns that differ primarily in the extent to which animal products are included in the diet. At one extreme are vegans who include only foods derived from plants, such as vegetables, fruits, legumes or dried beans and peas, grains, seeds, and nuts, and avoid all animal products, including dairy and eggs in their diets. Lacto-vegetarians and ovo-vegetarians are less extreme in their food choices than vegans in that they include dairy products, or eggs, respectively, in their diets. Other groups of “vegetarian-oriented” individuals include pesco-vegetarians who additionally eat fish, and semi-vegetarians, who avoid red meat, but include fish, poultry, and sometimes pork in their diets. Thus, although all vegetarian (i.e., vegan, lacto- and ovo-vegetarians) and vegetarian-oriented (pesco- and semi-vegetarian) individuals restrict red meat from their diets, the degree to which they avoid animal products varies along a continuum. While those who are concerned about health may be less restrictive, those who have strong ethical or philosophical reasons for avoiding animal products tend to adopt more restrictive forms of vegetarianism, such as veganism (Pollard, Steptoe, & Wardle, 1998; Rozin, Markwith, & Stoss, 1997).

Methods

Participants

Female participants (N = 240) were recruited from Introductory Psychology classes and the greater college community at The College of William & Mary. All participants either received a small monetary sum ($10) or earned credit towards their Introductory Psychology course for participation in the study. Informed consent was obtained from each participant, and all experimental procedures were approved by the Protection of Human Subjects Committee at The College of William & Mary.

Procedure

Upon entering the lab, participants were invited to a quiet room where they were presented with a booklet that contained a demographic questionnaire that was followed by battery of standardized questionnaires described below. Approximately 1 year later, a subset of participants (i.e., the first 99 female participants in the study who indicated that they at least occasionally restricted the amount of red meat in their diets) was contacted again with an online questionnaire, which inquired about their current eating habits.

Questionnaires

Personality (NEO-FFI)

All but two participants completed the sixty-item version of the NEO-FFI questionnaire (McCrae & Costa, 2004), which measures five dimensions of personality: extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience. The test was developed for use with adult (17+) men and women without overt psychopathology. In total, the NEO-FFI has 60 items, with 12 items per factor. Participants indicated their responses on a 5-point Likert-type scale, with higher scores representing higher levels of the personality dimension.

Overt Psychopathology (OPI)

The OPI is a 100-item self-report measure that assesses symptoms of psychopathology. Participants rate the frequency of symptoms on a 5-point Likert-type scale, with higher scores indicating more severe symptoms. The OPI includes subscales for anxiety, depression, social phobia, and paranoid ideation.

Procedures

Participants were asked to complete questionnaires that assessed their eating behaviors, personality, and emotional distress. The measures included the Food Choice Questionnaire (FCQ), which inquired about their current eating habits, and provided a set of questions related to vegetarian and vegetarian-oriented eating patterns. Therefore, the present study was designed to determine whether differences in eating and dieting patterns and personality characteristics exist between subgroups of vegetarian, vegetarian-oriented, and non-vegetarian university students, and what factors they consider when choosing foods by using the Food Choice Questionnaire developed by Steptoe, Pollard, and Wardle (1995). We hypothesized that vegetarian-oriented subgroups (i.e., pesco-vegetarians, semi-vegetarians) and non-vegetarians who only occasionally eat red meat (i.e., flexitarians) would consider weight control when choosing their foods, and would have higher restraint scores than those non-vegetarians who never restrict red meat (hereafter referred to as omnivores). Whereas vegetarians (i.e., vegans, lacto- and ovo-vegetarians), whose eating habits are more likely to be motivated by ethical and philosophical reasons rather than weight control (cf. Pollard et al., 1998), were hypothesized to be less neophobic, more open to new experiences, and have restraint scores that would not differ from omnivores.
The degree of avoidance of fattening foods and preoccupation with
oral control—the degree of self-control around food and the percep-
tion of pressure from others to gain weight. Participants who scored
20 or above are considered to have “abnormal eating behaviors”
and those scoring below 20 are considered to have “normal eating
behaviors.” Internal consistency reliability coefficients for these
subscale scores ranged between 0.70 and 0.88 (Doninger, Enders,
& Burnett, 2005) and has good test–retest reliability with coeffi-
cients ranging from .84 to .89 (Banasik, Wertheim, Koerner, &
Vouldouris, 2001; Capps & Moss, 1984). For the current sample.
Chronbach’s z = 0.8

Food choice questionnaire (FCQ)
This questionnaire (Steptoe et al., 1995) was completed by all
participants and consists of 36 items designed to assess the re-
ported importance of health, convenience, price, sensory appeal,
natural content, mood, familiarity, ethical concern, and weight
control. Participants indicated to what degree statements about
food choices were important to them (ranging from 1–Not at all
important to 5–Very important). Examples of statements included
in this questionnaire include “It is important to me that the food
I eat on a typical day...is low in fat” (weight control), “is not
expensive” (price), “is packaged in an environmentally friendly
way” (ethical concern), and “makes me feel good” (mood). The
FCQ was shown to have adequate internal consistency (with
Chronbach ≤ 0.70) and the factors have adequate test–retest reli-
bility (r > 0.71; Steptoe et al., 1995).

General eating habits (GEH)
All participants were asked to choose one of the following seven
categories that best characterized their eating behavior: 1. vegan;
2. lacto-vegetarian; 3. ovo-vegetarian; 4. pesco-vegetarian; 5.
semi-vegetarian; 6. flexitarian; and 7. omnivore. Each of the cate-
gories were defined (e.g., a flexitarian is someone who occasionally
eats red meat, eats all white meat, seafood, eggs, dairy products,
fruits, vegetables, and grains) to help participants accurately de-
define their eating habits. Those who identified themselves as being
vegetarian or vegetarian-oriented, by choosing categories 1–5 indi-
cated how long they had restricted animal products from their
diets. All participants also reported their weight and height, and
for a subset of participants (n = 95) we additionally measured their
weight at the end of the study.

Follow-up online questionnaire
One year after they were initially tested, we contacted all of the
vegetarian and vegetarian-oriented participants (n = 79) and flexi-
tarians (n = 20) who participated during the first 24 months of the
study with an online questionnaire. They were asked to complete
the GEH, in which they were asked to indicate which of seven cat-
egories (as described above) best described their eating habits.
They were also asked to indicate whether over the previous year
they had a university meal plan, and if so, how they thought eating
at the university cafeterias affected their eating patterns, if at all.

Statistical analyses
As a manipulation check we determined the frequency with
which the vegetarian, vegetarian-oriented, and non-vegetarian
participants reported eating fish, poultry, pork, and red meat in
the FFQ. For 14 individuals (approximately 6% of the sample), re-
ports of food consumption were not consistent with their classifi-
cation on the GEH questionnaire. Of these, seven classified
themselves as pesco-vegetarian, but reported eating chicken
(n = 6) and beef (n = 1), two classified themselves as lacto-ovo-veg-
etarian, but reported eating fish, and the remaining five classified
themselves as semi-vegetarians, but reported eating red meat
occasionally (n = 3), or reported that they ate fish but no meat
A series of one-way analyses of variance were conducted to determine whether subgroups differed on demographic, personality, and eating habit (e.g., restraint, disinhibition, and food neophobia) measures. For the FCO scores, a multivariate analysis of variance was conducted to test whether scores on the FCO varied as a function of vegetarian subgroup. All significant univariate and multivariate effects were further probed with post hoc tests using Bonferroni adjusted alpha levels to determine whether the subgroups differed from the omnivore subgroup, which in this study was considered a control group.

For the follow-up analyses we divided vegetarian, vegetarian-oriented, and flexitarian participants into three categories: those who maintained their eating habits; those who became more restrictive; and those who became less restrictive since they were last tested, by comparing their initial reported classification on the GEH to their reported classification one year later. We then conducted a series of analyses to determine whether there were differences between the subgroups in the maintenance of their eating patterns, and whether those who became less restrictive over the course of the year differed from the others in their initial food motivations.

### Results

#### Participant characteristics

As shown in Table 1, of the 240 participants, approximately half indicated that they did not consume red meat. Because of the small sample sizes of the vegetarian subgroups (i.e., 14 vegans, 6 lacto-vegetarians, and 35 lacto/ovo-vegetarians) and lack of between-group differences, these subgroups were combined for all further analyses. Overall, the sample consisted of 79% Caucasian, 12% Asian, 6% African American, and 3% mixed (more than one race) and of these, 5.2 percent were Hispanic or Latino. There were no differences in the racial and ethnic composition of any of the subgroups, nor did they differ on any of the other demographic variables measured (Table 1).

None of the vegetarians, pesco-, or semi-vegetarians ate red meat, while those who identified themselves as non-vegetarians (i.e., flexitarians and omnivores) consumed approximately 2–3 servings of red meat per week. Within this group of non-vegetarians, compared to omnivores, flexitarians less frequently ate red meat (1.5 ± 0.2 vs. 2.6 ± 0.2 times/week, t(126) = 2.9, p < 0.01) and pork (0.6 ± 0.2 vs. 1.1 ± 0.1 times/week, t(126) = 2.2, p < 0.02). With the exception of vegetarians, who abstained from eating fish, the remaining subgroups ate fish approximately 2–5 times/week (i.e., semi-vegetarians: 2.7 ± 0.6 vs. omnivores: 4.5 ± 0.4 times/week; F(2, 154) = 2.7, p = 0.07).

#### Comparisons of vegetarian, pesco-vegetarian, and flexitarian subgroups to omnivores

As shown in the Table 1, there were main effects of subgroup for openness (F(4, 234) = 8.3, p < 0.01; η² = 0.12), variety seeking (F(4, 232) = 4.6; p < 0.01, η² = 0.07), and food neophobia (F(4, 232) = 3.4; p < 0.01, η² = 0.06). Post hoc analyses revealed that vegetarians and pesco-vegetarians did not differ in their level of restraint (p > 0.4), semi-vegetarians (p < 0.001) and flexitarians (p < 0.013) were more restrained than omnivores. Moreover, as

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Table 1: Characteristics of female vegetarians and Non-vegetarians (% or mean ± SEM).

<table>
<thead>
<tr>
<th>Vegetarian</th>
<th>Pesco-vegetarian</th>
<th>Semi-vegetarian</th>
<th>Flexitarian</th>
<th>Omnivore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample size</td>
<td>55</td>
<td>28</td>
<td>29</td>
<td>37</td>
</tr>
<tr>
<td>Age (years)</td>
<td>19.42 ± 1.5</td>
<td>19.75 ± 0.41</td>
<td>19.62 ± 0.91</td>
<td>18.51 ± 1.6</td>
</tr>
<tr>
<td>BMI</td>
<td>21.44 ± 0.30</td>
<td>22.29 ± 0.51</td>
<td>24.90 ± 0.55</td>
<td>22.70 ± 0.61</td>
</tr>
<tr>
<td>Family income (% &gt;$75,000)</td>
<td>60.38%</td>
<td>62.50%</td>
<td>74.07%</td>
<td>79.41%</td>
</tr>
<tr>
<td>Smokes cigarettes (% yes)</td>
<td>5.45%</td>
<td>7.14%</td>
<td>6.90%</td>
<td>5.41%</td>
</tr>
<tr>
<td>Drinks alcohol (% yes)</td>
<td>61.81%</td>
<td>71.43%</td>
<td>65.52%</td>
<td>54.05%</td>
</tr>
<tr>
<td>Length of time as a vegetarian (years)</td>
<td>6.53 ± 0.70</td>
<td>4.01 ± 0.68</td>
<td>7.12 ± 0.91</td>
<td>N/A</td>
</tr>
<tr>
<td>Personality inventory (NEO-FFI)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neuroticism</td>
<td>35.25 ± 1.30</td>
<td>32.89 ± 1.59</td>
<td>32.66 ± 1.83</td>
<td>34.97 ± 1.41</td>
</tr>
<tr>
<td>Extroversion</td>
<td>40.84 ± 1.22</td>
<td>43.36 ± 1.35</td>
<td>45.45 ± 1.49</td>
<td>44.62 ± 1.18</td>
</tr>
<tr>
<td>Openness</td>
<td>46.18 ± 0.74</td>
<td>47.50 ± 0.93</td>
<td>40.90 ± 1.18</td>
<td>42.11 ± 1.23</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>45.96 ± 0.86</td>
<td>47.89 ± 1.18</td>
<td>45.69 ± 1.22</td>
<td>45.92 ± 0.97</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>43.50 ± 1.08</td>
<td>45.04 ± 1.28</td>
<td>47.50 ± 1.18</td>
<td>45.57 ± 1.23</td>
</tr>
<tr>
<td>Variety seeking</td>
<td>30.00 ± 0.61</td>
<td>30.74 ± 0.95</td>
<td>26.68 ± 1.06</td>
<td>28.95 ± 1.08</td>
</tr>
<tr>
<td>Food neophobia</td>
<td>27.04 ± 1.45</td>
<td>25.33 ± 1.88</td>
<td>33.31 ± 1.62</td>
<td>30.25 ± 2.01</td>
</tr>
<tr>
<td>General neophobia</td>
<td>23.69 ± 1.28</td>
<td>23.81 ± 1.83</td>
<td>24.38 ± 1.66</td>
<td>24.58 ± 1.54</td>
</tr>
<tr>
<td>Food choice</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Convenience</td>
<td>13.56 ± 0.44</td>
<td>13.54 ± 0.65</td>
<td>13.12 ± 0.57</td>
<td>14.14 ± 0.64</td>
</tr>
<tr>
<td>Natural content</td>
<td>8.07 ± 0.31</td>
<td>8.50 ± 0.40</td>
<td>8.29 ± 0.37</td>
<td>6.97 ± 0.35</td>
</tr>
<tr>
<td>Health</td>
<td>17.87 ± 0.47</td>
<td>18.25 ± 0.58</td>
<td>19.07 ± 0.68</td>
<td>17.81 ± 0.64</td>
</tr>
<tr>
<td>Weight control</td>
<td>7.13 ± 0.32</td>
<td>8.50 ± 0.41</td>
<td>9.21 ± 0.44</td>
<td>8.76 ± 0.41</td>
</tr>
<tr>
<td>Sensory appeal</td>
<td>10.57 ± 0.46</td>
<td>10.57 ± 0.62</td>
<td>10.79 ± 0.47</td>
<td>10.65 ± 0.40</td>
</tr>
<tr>
<td>Price</td>
<td>9.04 ± 0.33</td>
<td>9.20 ± 0.40</td>
<td>8.62 ± 0.41</td>
<td>8.66 ± 0.25</td>
</tr>
<tr>
<td>Familiarity</td>
<td>5.20 ± 0.32</td>
<td>5.00 ± 0.30</td>
<td>6.04 ± 0.40</td>
<td>6.59 ± 0.42</td>
</tr>
<tr>
<td>Mood</td>
<td>14.11 ± 0.51</td>
<td>13.04 ± 0.74</td>
<td>14.32 ± 0.63</td>
<td>14.70 ± 0.68</td>
</tr>
<tr>
<td>Ethical concern</td>
<td>5.56 ± 0.26</td>
<td>5.86 ± 0.41</td>
<td>5.04 ± 0.33</td>
<td>4.16 ± 0.22</td>
</tr>
<tr>
<td>Eating Attitudes Test (EAT)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dieting</td>
<td>9.37 ± 0.08</td>
<td>11.79 ± 1.95</td>
<td>12.84 ± 1.47</td>
<td>11.84 ± 1.48</td>
</tr>
<tr>
<td>Bulimia</td>
<td>3.94 ± 0.42</td>
<td>3.68 ± 0.80</td>
<td>3.97 ± 0.65</td>
<td>3.78 ± 0.47</td>
</tr>
<tr>
<td>Oral control</td>
<td>3.39 ± 0.45</td>
<td>4.50 ± 0.98</td>
<td>4.38 ± 0.54</td>
<td>3.89 ± 0.43</td>
</tr>
<tr>
<td>Total score</td>
<td>16.70 ± 1.53</td>
<td>19.96 ± 3.44</td>
<td>21.19 ± 2.34</td>
<td>19.51 ± 2.05</td>
</tr>
</tbody>
</table>

*Significantly different from omnivores, p < 0.05 (with Bonferroni correction).
vegetarian and vegetarian-oriented individuals became more restrictive of animal products, their restraint scores decreased (\(r(112) = -0.25, p < 0.01\)). No significant group differences were observed in levels of disinhibition, hunger, or for any of the subscales of the EAT (\(p > 0.25\)).

Multiple comparisons of the subgroups on their food choice motivations revealed main effects of natural content (\(F(4, 233) = 9.1, p < 0.01, \eta^2 = .13\)), familiarity (\(F(4, 233) = 4.4, p < 0.01, \eta^2 = .07\)), ethical concern (\(F(4, 233) = 10.9, p < 0.01, \eta^2 = .16\)), and weight control (\(F(4, 233) = 5.7, p < 0.01, \eta^2 = .09\)). Post hoc analyses indicated that omnivores considered natural content to be less important in determining their food choices than the vegetarians and vegetarian-oriented subgroups (all \(p < 0.01\)). Omnivores also rated familiarity as more important than vegetarians (\(F(143) = 3.1, p < 0.01\)) and pesco-vegetarians (\(F(116) = 3.0, p < 0.01\)) whereas they rated ethical concern less important than vegetarians (\(F(143) = 3.1, p < 0.01\)) and pesco-vegetarians (\(F(116) = 1.1, p < 0.01\)). Consistent with the restrained eating findings reported above, semi-vegetarians (\(t(116) = 3.2, p < 0.01\)) and flexitarians (\(t(125) = 2.5, p < 0.01\)) rated weight control as significantly more important than omnivores. Vegetarians and pesco-vegetarians did not differ from omnivores in their ratings of weight control (\(p > 0.25\)).

**Maintenance of eating patterns**

Seventy-three of the 99 female participants who were contacted one year after initial testing responded to our online questionnaire. Of these, 57 had been vegetarian or vegetarian-oriented during initial testing. All of these individuals reported that they had continued with some form of vegetarian or vegetarian-oriented eating pattern, and 14% reported that they had become more restrictive of animal products since the initial test. At the time of the online questionnaire, 28 reported that they were vegetarian (i.e., either vegan, lacto- or lacto-ovo-vegetarian), 17 were pesco-vegetarians, 12 were semi-vegetarians, and 16 were flexitarians. Compared to those who had originally classified themselves as vegetarian or vegetarian-oriented, significantly more of the flexitarians (37%) indicated that they had become more restrictive of animal products by adopting some form of vegetarianism (\(\chi^2(2) = 4.4, p < 0.04\)).

**Fifty-four of the respondents indicated that they had been on a university meal plan over the previous year**

Of these, approximately 39% indicated that their vegetarian eating habits had been affected by the limited selection and quality of the food in the dining halls, while 50% indicated that their eating habits had not been affected. The remaining 11% indicated that they had consumed more vegetarian options over the previous year because the dining hall provided more variety than at home. However, changes in vegetarian eating habits did not differ as a function of these perceptions.

Participants who became more restrictive of animal products over the previous year were more likely to indicate during the initial session that their food choices were influenced by weight control (\(\chi^2(4) = 9.3, p = 0.05\)). Although there were no differences in their original restraint scores, those who became more restrictive had marginally lower hunger scores compared to those who became less restrictive of animal products (\(M = 4.2 \pm 0.25\) vs. \(M = 6.5, t(24) = 1.80, p = 0.08\)). The degree to which other influences, such as moral, health, environmental, palatability, religion, or parents affected their food choices over the previous year did not differ between those who had become more or less restrictive, or who maintained their eating habits (all \(p > 0.05\)).

**Discussion**

The purpose of this study was to examine and compare the dietary habits and lifestyle behaviors of college-age vegetarian, vegetarian-oriented, and non-vegetarian females, whose eating habits were defined by the extent to which they restricted animal products from their diets. Analyses indicated that semi-vegetarians were more cognitively restrained than omnivores. These findings, which are consistent with Curtis and Comer (2006), suggest that vegetarians who are more restrictive than omnivores in their diets are less restrained than semi-vegetarians. In addition to semi-vegetarians, we also found that a subset of non-vegetarians; flexitarians, who reported that they occasionally restricted their intake of red meat, were more restrained than omnivores. Consistent with their restraint scores, semi-vegetarians and flexitarians reported that they were more concerned about weight control and less concerned about animal welfare than the other subgroups of female vegetarians. Thus, female semi-vegetarians and flexitarians, differ from vegetarians and omnivores respectively, not only in their eating patterns, but also in their dietary motivations.

Although female vegetarians and pesco-vegetarians were not more restrained than omnivores in their food intake, they were more open in their personalities, more variety seeking, and less food neophobic. This was not the case for any of the other subgroups. These results are not surprising; food neophobia is known to be negatively associated with openness, the consumption of fruits and vegetables, and the likelihood of having a healthy diet.
(Schickenberg et al., 2008). For women, openness and food neophobia appear to be influenced by an overlapping set of genetic factors (Knaapila et al., 2011). Whether these women are also genetically predisposed to become vegan or lacto-ovo-vegetarians is a topic for further investigation.

Given that college marks the beginning of an important transition from adolescence to emerging adulthood for many individuals (Arnett, 2000) this may be a particularly important context in which to study eating patterns of subgroups of vegetarian and vegetarian-oriented individuals. As children move into adolescence they seek to establish a unique identity, and often struggle with pressures to conform to a cultural ideal of physical beauty (Story, 1984). For some, vegetarianism may serve as an eating pattern that allows them to control their weight while concealing disordered eating behaviors from their parents during adolescence (Robinson-O’Brien, Perry, Wall, Story, & Neumark-Sztainer, 2009). However, as they move away from home, they experience a change in social context, increased freedom, and independence in their food choices. As a result, the motivations for maintaining a vegetarian eating style may change for vegetarian subgroups once they reach young adulthood (Fisak et al., 2006, Perry et al., 2002). For this reason, it is important not to generalize previous findings that suggest that adolescent vegetarians may be prone to eating disorders to college-age students. In the current study, most of the students became vegetarians before they entered college, either as children or adolescents, however it is unclear as to whether their motivations for maintaining a vegetarian lifestyle changed after they entered college.

Although it was beyond the scope of this study to track the progression of participants’ eating patterns over the long term, we contacted a proportion of vegetarian, vegetarian-oriented and flexitarian females one year after their initial test to determine the stability of their eating habits. Of the 74% of female participants who responded to our online questionnaire, most of the vegetarian and vegetarian-oriented individuals had either maintained or become somewhat less restrictive of their consumption of animal products; none however had become flexitarians or regular omnivores. Of course it is possible that these results are skewed by response bias. For example, a high proportion of those who did not respond may have become omnivores. Approximately a third of flexitarians became more restrictive of their intake of animal products, adopting a vegetarian lifestyle. It is possible that weight-related concerns motivated the flexitarians to become more restrictive of animal products, given that a higher proportion of the individuals who became more restrictive had originally indicated that their eating habits were motivated to a large extent by weight-related concerns. Further research that investigates the progression of eating patterns within this subgroup will help identify those who are at high-risk for developing unhealthy weight control strategies.

A limitation of the current study was that the sample did not include male vegetarians. Because males typically have lower restraint scores than females and a smaller proportion of vegetarians are male relative to non-vegetarians, it is important to analyze males and females separately when comparing restraint scores of vegetarians and non-vegetarians to reduce bias. More research is needed in order to better understand how subgroups of male vegetarians differ in their eating and lifestyle characteristics. Further research should also strive to recruit larger samples of vegetarian subgroups in order to investigate potential differences between their food choice motivations.

It appears that semi-vegetarians and flexitarians specifically, may be more likely to experiment with restriction of animal products as a form of weight control than vegetarians and pesco-vegetarians. Previous research has shown that in general vegetarians are generally more health conscious, leaner (Sabaté, Lindsted, Harris, & Sanchez, 1991), and less likely to develop diabetes (e.g., Snowdon & Phillips, 1985) than non-vegetarians. For those who adopt vegetarian diets later in life, overall nutrition improves (Turner-McGrievy, Barnard, & Scialli, 2007). Thus, it appears that those who follow well-planned vegetarian diets, which are relatively low in saturated fat, generally don’t need to lose weight. As a result, responsible vegetarian diets may actually help protect against eating disorders (Barnard & Levin, 2009). The degree to which semi-vegetarians and flexitarians in the current study followed a balanced healthy diet is unknown. It is possible that these individuals may not be as health conscious, as vegetarians and pesco-vegetarians who avoid poultry and red meat (Larsson, Klock, Aström, Haugejorden, & Johansson, 2002).

Although some flexitarians and semi-vegetarians may eventually progress to a more restrictive vegetarian eating style that is less focused on weight control, it is possible that others may be at risk for developing unhealthy weight control strategies or eating disorders. With this in mind, development of programs that teach vegetarian adolescents and young adults how to maintain healthy and well-balanced diets may be an effective approach for producing healthful changes to vegetarian dietary patterns over the long-term.

**Uncited references**

Bedford and Barr (2005), Garner and Garfinkel (1979).

**References**


Blatner, D. J. (2008). The flexitarian diet: The mostly vegetarian way to lose weight, be healthier, prevent disease, and add years to your life. United States of America: McGraw-Hill.


620 Validity of a food frequency questionnaire for the determination of individual
621 food intake.
622
623 Another means of weight control?
626
628 vegetarian and nonvegetarian women. Journal of the American Dietetic
628
630 anorexia nervosa. International Journal of Eating Disorders, 5(3), 539–544. doi:
631 10.1002/1098-108X(199806)5:3<539::AID-EAT2260050310>3.0.CO;2-O.
632
634 vegetarian and nonvegetarian women. International Journal of Eating
635 Disorders, 5, 713–718. doi:10.1002/1098-108X(199806)5:3<539::AID-EAT2260050310>3.0.CO;2-O.
636
637 Klopp, S. A., Heiss, C. J., & Smith, H. S. (2003). Self-reported vegetarianism may be a
638 marker for college women at risk for disordered eating. Appetite, 40(3), 539–544. doi:
639 10.1016/S0195-6663(02)00392-8.
640
642 Lifestyle-related characteristics of young low-meat consumers and omnivores
644
646
648 Does a vegetarian eating style mask concerns about weight? Appetite, 32(1),
650
652 Inventory. Personality and Individual Differences, 36(3), 587–596. doi:10.1016/
653 0191-8869(93)00118-1.
654
656 Validity of a food frequency questionnaire for the determination of individual
658 <http://www.jacn.org/>.
659
661 of vegetarian adolescents in a multiethnic urban population. Journal of
662 Adolescent Health, 29(6), 406–416. doi:10.1016/S1054-139X(01)00258-0.
663
665
667 Using the Food Choice Questionnaire to explain variation in dietary intake. Journal
667
668 Robinson-O’Brien, R., Perry, C. L., Wall, M. M., Story, M., & Neumark-Sztainer, D.
669 (2009). Adolescent and young adult vegetarianism: Better dietary intake and
670 weight outcomes but increased risk of disordered eating behaviors. Journal of
672
674 vegetarian: The transformation of preferences into values and the
675 recruitment of disgust. Psychological Science, 8(2), 67–73. doi:10.1111/j.1467-
677
679 ovo vegetarian children and adolescents. European Journal of Clinical Nutrition,
680 45, 51–58.
681 Schick, J. L., & Forestell, C. A. (2010). Food Neophobia in Young Adults: Genetic
682 Architecture and Relation to Personality, Pleasure, and Use Frequency of Foods, and Body Mass Index—A
683 Twin Study. Behavior Genetics, 41(4), 512–521. doi:10.1007/s10519-010-9403-
684 8.
685
687 Lifestyle-related characteristics of young low-meat consumers and omnivores
688
691
693 Does a vegetarian eating style mask concerns about weight? Appetite, 32(1),
695
697 Inventory. Personality and Individual Differences, 36(3), 587–596. doi:10.1016/
698 0191-8869(93)00118-1.
699
701 Validity of a food frequency questionnaire for the determination of individual
703 <http://www.jacn.org/>.
704
706 of vegetarian adolescents in a multiethnic urban population. Journal of
707 Adolescent Health, 29(6), 406–416. doi:10.1016/S1054-139X(01)00258-0.
708