

Personality Psychology

An Investigation of Plant-based Dietary Motives Among Vegetarians and Omnivores

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The three most common motives for plant-based diets in western populations are health, the environment, and animal rights. This study compares the structure, endorsement rates, and personality correlates of these motives among vegetarian and omnivorous (i.e., non-vegetarian) respondents. We found evidence for configural, metric, and scalar equivalence in the measurement of these motives across vegetarians and omnivores, suggesting that vegetarian diet motives function similarly whether or not the respondent identifies as vegetarian. Vegetarians, notably, reported being more motivated by the environment and animal rights than omnivores; health motivations were similarly high across groups. Several significant effects emerged linking vegetarian motives to personality traits, with patterns of correlations between motives and traits being highly similar across vegetarians and omnivores. Overall, these findings suggest that vegetarian eating motives are similar in terms of structure and personality correlates, but differ in endorsement rates, between vegetarian and omnivorous individuals.

Vegetarianism is a minority lifestyle in western culture that is rapidly gaining attention for its public health and sustainability benefits. Much of the research on the psychology of vegetarianism has focused on factors that distinguish vegetarians from omnivores¹ (Loughnan et al., 2014; Ruby, 2012). Less attention has been given to comparing what motivations vegetarians versus omnivores have for adopting or considering adopting a vegetarian diet (Rosenfeld & Burrow, 2017). The three main motivations to be vegetarian in western cultures are health, the environment, and animal rights (Kerschke-Risch, 2015; Rosenfeld, 2018).

Hopwood et al. (2020) recently developed and validated the Vegetarian Eating Motives Inventory (VEMI), a 15-item measure designed to assess these three motives. They found a well-fitting measurement model across four samples in two languages (English and Dutch). However, the subsamples of vegetarians in Hopwood et al.'s (2020) initial VEMI validation study samples were too small to examine the psychometric characteristics of the VEMI in vegetarians specifically, or to test whether vegetarian motives function differently among vegetarians and omnivores.

As such, it is unknown whether motives to be vegetarian are understood in the same ways and related to the same kinds of characteristics and experiences among vegetarians

as they are among omnivores. Establishing measurement invariance is one way to determine whether the underlying social cognitive processes that give rise to motivations about plant-based eating operate similarly for people who exclusively eat plant-based foods as those who do not, even if they are more compelling to vegetarians. Understanding these processes could have implications for persuasion and advocacy. If vegetarians and omnivores think the same way about the reasons to be vegetarian, then a major goal of advocacy should be to figure out how to leverage these motives to persuade omnivores to adopt plant-based diets. However, if vegetarians and omnivores organize their attitudes about plant-based eating in fundamentally different ways, an important preliminary step for advocates might be to clarify semantic differences. More practically, evidence of invariance would support the use of the VEMI to study motivations in both groups, and would permit direct comparisons of motivations across these groups.

The goal of this study was to examine the extent to which health, environmental, and animal rights motives operate similarly in vegetarian and omnivore respondents. We specifically tested whether the VEMI measurement model is equivalent, whether there are mean differences in levels of each motive, and whether correlations between vegetarian

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1 There is considerable complexity in dietary patterns (e.g., Rosenfeld & Tomiyama, 2019). We use vegetarian to mean any person who reports not eating meat of any kind (including but not limited to vegans) and omnivores to mean any person who reports eating at least some meat, even if they are not truly omnivorous.

motives and personality traits are similar among vegetarians and omnivores.

Equivalence of motives in vegetarians and omnivores

Our first goal was to determine whether health, environment, and animal rights motives operate similarly across vegetarian and omnivore participants by testing measurement invariance of the VEMI items. Invariance was tested at three levels. We hypothesized that the three-factor measurement model would be invariant across both samples across each of these levels.

We first tested configural invariance, or the degree to which the same three-factor measurement model can be used to capture variation in attitudes about vegetarian diet in both groups. Configural invariance would support the presence of these three motives as organizing factors in attitudes about vegetarian diet in both vegetarians and omnivores.

Second, we tested metric invariance, or whether the item loadings on each factor are the same across groups. Metric invariance would suggest that vegetarians understand and define these three motives in the same way as omnivores.

Finally, we tested scalar invariance, or the degree to which mean differences between the groups can be fully accounted for by mean differences in the latent motivation constructs. Evidence of scalar invariance would indicate that scores on the VEMI scales could be interpreted in the same way for both populations, and would support the direct comparison of motives across these groups in terms of means, associations with other variables, and other criteria.

Mean differences of vegetarian motives in vegetarians and omnivores

Our second goal was to examine mean level differences between vegetarians and omnivores in the three VEMI scales. In two samples, Hopwood et al. (2020) found modest negative correlations between identifying as vegan and health motives. This suggests that both vegetarian and non-vegetarians appreciate the health benefits of vegetarian diet (e.g., Dinu et al., 2017), and that this may actually be a stronger motivating factor for omnivores than vegans (but not necessarily vegetarians). In contrast, Hopwood et al. observed moderate positive correlations between being vegan and both environmental and animal rights motives. This is consistent with previous research suggesting that these more moral motives are more important factors for people with stricter and more sustained plant-based diets (De Backer & Hudders, 2014; Hoffman et al., 2013). Based on these results, we expected vegetarians to have higher scores on the environmental and animal rights scales, but smaller or no differences on the health scale.

Correlations between vegetarian motives and personality traits among vegetarians and omnivores

A third goal of this study was to compare the associations between health motives and external criterion variables across vegetarians and omnivores. We chose personality traits as criterion variables because there is an emerging body of research showing that vegetarian diet is related

to personality traits, including higher openness and lower conscientiousness (e.g., Pfeiler & Egloff, 2018). Moreover, there is evidence that vegetarian motives are differentially related to traits. Hopwood et al. (2020) found, across three samples, that neuroticism was somewhat more strongly related to health than environmental or animal rights motives, whereas agreeableness was consistently related to all three motives. However, such patterns in a predominately omnivore sample may not generalize to vegetarians. It is possible, for example, that neuroticism is related to animal rights motives more strongly for vegetarians than omnivores, because vegetarians tend to get distressed by the treatment of farmed and hunted animals to a greater degree than omnivores. To increase the opportunity to observe different patterns of association between vegetarian and omnivore respondents, we used a facet model of personality inclusive of 30 traits, organized around the big five factors neuroticism, extraversion, openness, agreeableness, and conscientiousness. We expected all three motives to have similar patterns of association with personality traits for vegetarians and omnivores.

Methods

We sampled 682 participants via Prolific (<https://www.prolific.co>). We initially invited 387 self-identified omnivores and 343 self-identified vegetarians to participate in the study. These invitations were sent to people who had previously registered their status as omnivorous or vegetarian with Prolific – the invitations themselves did not specifically mention dietary habits. Of these participants, 356 in the prescreened non-vegetarian sample and 326 in the prescreened vegetarian sample completed the survey. However, 91 of the individuals invited through the vegetarian sample responded affirmatively to having “generally eaten meat” (Rosenfeld & Burrow, 2017) within the survey, and 16 of the individuals invited through the non-vegetarian sample indicated that they do not generally eat meat. While part of this discrepancy might arise due to individuals self-identifying as vegetarian without exercising strict dietary adherence, part of it likely reflects participants having changed their dietary habits since the time of registering with Prolific. To ensure accuracy in classifying participants based on their current eating behaviors, we classified respondents as vegetarian only if they reported generally not eating meat and as omnivorous if they reported generally eating meat. As such, there were 431 participants in the omnivore group and 251 in the vegetarian group.

Overall, the final sample included 246 men, 422 women, and 14 people reporting other genders; the average age was 31.04 years ($SD = 11.18$, range = 18–80); 495 participants were White; 40 were Black, 82 Asian, 3 Pacific Islander, 43 multiracial, and 19 other races; 58 reported Latinx ethnicity. The vast majority of respondents (661) were North American; others came from Europe (16), Asia (3), South America (1), or Oceania (1). Scores on the 12-item Social and Economic Conservatism Scale (Everett, 2013) of 41.43 ($SD = 18.46$) indicated that the sample were more liberal on average, but that a meaningful minority of 32.4% tended to be politically conservative.

All participants completed the *Vegetarian Motives In-*

Table 1. CFA model fit across tests of measurement equivalence.

Model	χ^2	df	RMSEA	CFI
Configural Invariance	665.93	174	.09	.95
Metric Invariance	687.83	186	.09	.95
Scalar Invariance	741.12	198	.09	.95
Constrained Means	950.48	201	.11	.93

Table 2. Mean differences in vegetarian eating motives between vegetarians and omnivores.

	Vegetarian		Omnivore		t	d
	Mean	SD	Mean	SD		
Health	5.55	1.21	5.39	1.34	1.52	.13
Environment	6.13	1.06	4.73	1.58	12.50*	1.12
Animal Rights	6.26	1.13	4.87	1.58	12.24*	1.07

* $p < .01$

ventory (Hopwood et al., 2020), a 15-item questionnaire with items measuring health (e.g., I want to be healthy), environmental (e.g., eating meat is bad for the planet), and animal rights (e.g., I don't want animals to suffer) motives on a 1 (not important) to 7 (very important) response scale (all coefficient alphas > .90). Participants also completed the 60-item version of the *International Personality Item Pool* (Maples-Keller et al., 2019), which assesses the 30 trait facets of the five factor model domains neuroticism, extraversion, openness, agreeableness, and conscientiousness (see list of specific facets below). Items are responded to on a 1 (strongly disagree) to 5 (strongly agree) scale (Mdn. Coefficient alpha = .79). This research was declared exempt by the local IRB. Data and other materials for this study are available at https://osf.io/wa58p/?view_only=799cce0464f043d2b907df2f210a946b. This study was not preregistered and thus all hypotheses are exploratory.

Results

We examined measurement invariance in a confirmatory factor analysis framework with maximum likelihood estimation, implemented in lavaan 0.6-6 in R to test the first hypothesis. We first evaluated the fit of the VEMI measurement model reported in Hopwood et al. (2020), with parameter estimates freed to vary across samples.

This model fit the data fairly well in both samples (Table 1; Hu & Bentler, 1999), establishing configural invariance across the samples. The next step was to determine whether the measurement paths could be constrained across groups (i.e., metric invariance). Constraining these paths to be equal across the groups did not worsen model fit as indicated by equivalent RMSEA and CFI values (Cheung & Rensvold, 2002), providing evidence for metric invariance. Finally, we tested scalar invariance, or the equivalence of latent variable intercepts. This model continued to fit the data well. Overall, these results support the hypothesis that the VEMI measurement model holds across vegetarian and

omnivore respondents in terms of configural, metric, and scalar invariance.

Our second hypothesis was that the groups would differ on the environment and animal rights scales but not the health scale. Indeed, constraining the means to equality significantly worsened fit. Model parameters (https://osf.io/wa58p/?view_only=799cce0464f043d2b907df2f210a946b) indicated that, consistent with our hypotheses, vegetarians are more motivated by the environment and animal rights than omnivores. Measured score mean differences on these variables were both large ($d > 1$; Table 2), whereas group differences on the health scale were small and not statistically significant.

We next examined correlations between each of the motives and personality trait facets in both samples (Table 4). Although this was not a focus of the study and we do not have hypotheses about these effects, the results from Hopwood et al. (2020) serve as a useful guide for the pattern of results to expect. Given the sample sizes in this study, correlations above $|.10|$ were generally statistically significant at the .01 level. Given the large number of correlations and our general interest in the overall pattern rather than individual effects, we interpreted correlations as meaningful if they were $>|.15|$.

Using this metric, traits reflecting low neuroticism (self-consciousness, vulnerability), high extraversion (all facets) and high conscientiousness (self-efficacy, orderliness, achievement-striving, and self-discipline) were generally related to stronger health motives. The strongest correlates of environmental and animal rights motives, in contrast, tended to fall in the openness and agreeableness domains. Artistic interests, intellect, altruism, and sympathy were relatively strong correlates of both of these motives. Adventurousness and liberalism were somewhat stronger correlates of environmental motives, whereas openness to emotions and cooperativeness were somewhat stronger correlates of animal rights motives.

Table 3. Correlations between vegetarian motives and personality trait facets among vegetarians and omnivores.

	Vegetarian			Omnivore		
	Health	Environment	Animal	Health	Environment	Animal
Neuroticism						
Anxiety	-.23	-.06	-.02	-.04	.10	.15
Anger	-.07	-.08	-.01	.01	-.02	-.01
Depression	-.28	-.05	.05	-.12	.11	.11
Self-consciousness	-.19	-.10	-.06	-.15	.00	.04
Immoderation	-.07	-.03	.04	-.07	.00	.00
Vulnerability	-.18	-.06	.01	-.18	-.01	.05
Extraversion						
Friendliness	.25	.16	.10	.19	.07	.11
Gregariousness	.19	.20	.15	.17	.11	.13
Assertiveness	.25	.14	.06	.20	.11	.05
Activity	.16	.08	-.05	.14	.12	.05
Excitement	.25	.20	.14	.16	.17	.17
Cheerfulness	.36	.18	.04	.25	.12	.05
Openness						
Imagination	.05	.18	.15	.11	.13	.14
Arts	.01	.26	.25	.02	.27	.26
Emotionality	-.08	.12	.29	-.04	.18	.27
Adventure	.14	.21	.10	.02	.20	.09
intellect	.08	.20	.17	.02	.21	.16
liberalism	-.11	.25	.13	-.10	.38	.24
Agreeableness						
Trust	.15	.16	.07	.10	.07	.08
Morality	.04	.05	.14	-.01	.08	.12
Altruism	.14	.18	.27	.11	.20	.33
Cooperation	.07	.06	.17	.00	.16	.19
Modesty	-.14	-.07	.14	-.17	.00	.11
Sympathy	-.04	.18	.25	.06	.33	.41
Conscientiousness						
Self-efficacy	.20	.06	.04	.18	.00	.02
Orderliness	.23	.05	-.07	.21	.08	.09
Dutifulness	.12	.00	.10	.00	.06	.06
Achievement	.31	.17	.02	.23	.07	.05
Self-discipline	.21	.13	-.02	.23	-.02	.04
Cautiousness	.10	-.05	-.05	-.03	-.03	-.03

Note. Correlations > |.15| in bold.

More pertinent to the specific aims of this study are the similarities in these profiles of association. We Fisher-transformed each of the columns in Table 3 and then correlated them with one another in order to ascertain how similar the personality trait profile of each of the motives were across samples. In essence, this technique allows us to estimate the overall similarity of effect sizes across vegetarians and omnivores, and across the three vegetarian motives.

The three strongest correlations were between the same

motives across vegetarian and omnivore samples. The profile correlation across samples was strongest for the health motive (.91), somewhat smaller for animal rights motives (.83), and smallest—albeit still fairly large—for environmental motives (.71). Moreover, no individual facet-level correlation differed > .16 across these samples. The effect sizes that differed the most (> .10) were anxiety, depression, liberalism, sympathy, and self-discipline. This pattern points to a more general effect in which environmental mo-

Table 4. Personality trait profile correlations for vegetarian eating motives across samples.

Omnivore	Vegetarian		
	Health	Environment	Animal Rights
Health	.90	.56	-.07
Environment	-.03	.71	.67
Animal Rights	-.18	.51	.83

tives are somewhat more similar to health motives among vegetarians than among omnivores, which is also reflected in the .56 correlations between those motives in vegetarians, in contrast to the -.03 correlation in omnivores. The only other substantial cross-motive profile correlations were between environmental and animal rights motives in both samples. This is not surprising, given that these scales also tend to be correlated with similar patterns of criterion variables, in general (Hopwood et al., 2020). Overall, these results show that both the internal and external validities of vegetarian motives are very similar across vegetarians and omnivores.

Discussion

There are three main results of this study. First, vegetarians and omnivores both organize the motives for being vegetarian around health, the environment, and animal rights and conceptualize those motives in similar ways. Second, individuals from both groups tend to be motivated to adopt a vegetarian diet for health reasons, but vegetarians tend to be more motivated by environmental and animal rights motives. Third, the kinds of people most likely to be sympathetic to each of the three motives are similar for both vegetarians and omnivores.

Common Structure and Meaning of Vegetarian Motives in Vegetarians and Omnivores

These results have important implications for research on the psychological factors underlying vegetarian and related diets. Namely, whereas most previous research has aimed to distinguish vegetarians from non-vegetarians, findings from this study suggest that much of the interesting variation actually exists *within* these groups. This implies value in studying these motivations across people with different food choice patterns. Moreover, this variation has a similar structure and meaning in vegetarians as it does in omnivores. As such, understanding general variation in vegetarian eating motives, in both vegetarian and non-vegetarian populations, could lead to novel insights about the psychology of dietary preferences (Rosenfeld & Burrow, 2017).

Health Motives

A general finding from this line of research is that health motives behave rather differently than environmental and animal rights motives, which are somewhat similar to each other (i.e., they correlate strongly with one another, and have a similar pattern of personality correlates). Most peo-

ple want to be healthy and acknowledge the value of vegetarian diets for achieving that goal (Povey et al., 2001), and this was not an appreciably stronger motivator among vegetarians than omnivores in this study. This null difference is perhaps related to the finding that actual vegetarians are more likely to cite ethical motivations over health ones, particularly if they have sustained the diet/lifestyle long-term (Haverstock & Forgyas, 2012; Hoffman et al., 2013; Rosenfeld, 2018). Thus, the important question related to health motives has less to do with how vegetarians and non-vegetarians differ, but rather the degree to which health factors motivate people to embrace a vegetarian lifestyle. Questions remain open as to why many people who acknowledge the health benefits of vegetarian diets continue to eat meat, and why people who become vegetarian for health reasons tend not to stick to the diet, though research has made strides toward addressing these matters (e.g., Pizzanza et al., 2015; Rosenfeld, 2019; Rothgerber, 2012, 2020).

We note, however, that another possibility is that respondents did not pay close attention to the instructions when completing the measure. In the VEMI, the instructions ask the respondent to rate each item based on the extent to which it would motivate them to adopt a vegetarian diet, and specific items do not reference diet. A respondent who ignored the instructions could endorse an item that asks whether they want to be healthy without necessarily endorsing the idea that a vegetarian diet would help them achieve that. This could explain the lack of differences between the groups. We note, however, that there is other evidence supporting the assumption that both vegetarians and non-vegetarians generally believe that plant-based diets are healthy (Corrin & Papadopoulos, 2017). Nevertheless, it would be useful for future research to test the impacts of putting the stem in each item, as opposed to the general instructions, to rule out this explanation.

Environmental and Animal Rights Motives

In contrast to health motives, environmental and animal rights motives are reliably stronger among vegetarians. Thus, efforts to promote plant-based diets may benefit from identifying ways to increase the importance of these motives among omnivores, and testing whether doing so leads to greater adoption of plant-based diets. Environmental and animal rights motives are also largely similar to one another, to the degree that previous research has found it challenging to distinguish them psychometrically (Lindeman & Väänänen, 2000). A novel strength of the VEMI is its ability to distinguish environmental from animal rights motives both in terms of item content/measurement structure and external correlates. Based on the results from the

current study and Hopwood et al. (2020), the main difference between these variables is that environmental motives reflect an aspect of a more general tendency to be intellectually concerned about social issues and liberal causes, whereas the animal rights motive is a more affectively-rooted disposition involving sympathy for others' suffering. Animal rights motive also appears to be more strongly tied to sensory-affective evaluations of meat, such as how disgusted people feel toward meat, whereas environmental motives may resemble health motives in being less tied to sensory-affective processes (Rosenfeld, 2019).

Personality Correlates of Vegetarian Motives

Beyond these trends, it is interesting to note that some personality findings varied relative to the first VEMI study by Hopwood et al. (2020). In the current study, the general pattern was that low neuroticism, extraversion, and conscientiousness were related to stronger health motives, whereas high agreeableness and openness were related to stronger environmental and health motives. This could be because different personality measures were used in the two studies. An advantage of the current study was the use of a personality measure with facets, which allowed us to describe more specific differences. More research is clearly needed with different measures and in different populations to determine how vegetarian motives are related to personality traits.

Limitations and Future Directions

More generally, this work was limited by the sampling of WEIRD participants and the use of two specific self-report measures. Future work should explore whether vegetarian motives behave similarly in different Western sub-groups and beyond Western populations in multimethod data. It would also be interesting to examine the impact of other kinds of factors, such as gender, age, political orientation, cultural factors, or religious beliefs on vegetarian motives, and to test whether the influence of these factors is moderated by vegetarian status. Ultimately, research should aim

to understand how vegetarian motives affect the transition across dietary patterns and identities.

Conclusion

In summary, the results from this study suggest that health, environmental, and animal rights are shared motives to adopt a plant-based diet across both vegetarians and omnivores, despite the different dietary behaviors in which these two groups engage. Results further indicate that the VEMI is a valid tool for studying these motives in both groups, that individual differences in dietary preferences are related to personality traits, and that health motives behave somewhat differently than environmental or animal rights motives in terms of endorsement rates and personality correlates. Overall, this research highlights the value of better understanding the psychological factors underlying plant-based eating behavior and the viability of the VEMI for achieving this goal.

Contributions

C. Hopwood and W. Bleidorn conceived this study. C. Hopwood and S. Chen analyzed the data. All co-authors contributed to manuscript preparation.

Competing Interests Statement

The authors declare no competing interests. W. Bleidorn is an Associate Editor at Collabra: Psychology. She was not involved in the peer review process of this article.

Data Accessibility Statement

All the stimuli, presentation materials, participant data, and analysis scripts can be found at https://osf.io/wa58p/?view_only=799cce0464f043d2b907df2f210a946b

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