Is Vegetarianism Related to Anxio-Depressive Symptomatology? A Cross-Sectional Survey in A Large French Sample

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Short report

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Abstract

Objective. Many studies indicate a link between vegetarianism and mental health, but the relationship remains uncertain. The aim of the present study is to examine the cross-sectional association between anxio-depressive symptomatology, happiness, and vegetarianism in a French sample while controlling for relevant confounders.

Design. Self-reported questionnaire data were obtained from a large cross-sectional sample.

Participants and setting. 9993 participants aged 18-99, 70.8% females participated in an online survey.

Results. A logistic regression analysis was performed to estimate the Odds Ratio (OR) and 95% Confidence Interval (95% CI) of anxiety, depression, happiness, and self-reported health to predict vegetarian diet, controlling for age, gender, BMI, educational level, monthly income, and city size. Vegetarians did not present an increased risk of anxiety or depression. However, they reported lower happiness than did non-vegetarians, and exhibited better self-reported health than did omnivores.

Conclusion. Vegetarian diet was not found to be related to anxiety or depressive symptoms. However, vegetarians presented lower levels of happiness. This result may be interpreted as a consequence of the social status of vegetarianism in France.

1. Introduction

Plant-based diets are currently increasingly popular in many occidental countries, motivated by three main goals: sustainability issues (1), health benefits (2), and animal welfare (3). While the replacement of meat products with vegetarian diets lowers the risk of cardiovascular issues, obesity, and diabetes, and is considered by the Academy of Nutrition and Dietetics as nutritionally adequate when appropriately planned, and even potentially beneficial for health (4), the benefits to mental health remain widely discussed. Many studies have indicated that individuals with low meat consumption or a vegetarian diet are exposed to an increased risk of depression (5, 6, 7, 8). Such results have commonly been understood as the outcome of potential nutritional deficits in vitamin B12, long-chain n-3 fatty acids, folates, and/or zinc (9, 10, 11). Other interpretations have also been considered, such as the fact that vegetarians represent a social minority, which may be related to psychological adversity (12) or concomitant psychological mechanisms affecting diet preferences and mental health (13). However, a few other studies did not confirm an increased risk of depression or anxiety among vegetarians (14, 15, 16). In a cross-sectional and longitudinal culturally diverse and representative sample, vegetarianism was found to be unrelated with mental health in the United States, Russia, and Germany, and was only slightly predictive of depression and anxiety among Chinese students (17). Finally, a few studies even found lower levels of depression among people adopting a vegetarian diet (18, 19, 20). A large multicenter randomized controlled trial of a nutrition intervention even showed that a vegan diet was inversely related to depression and anxiety (21). However, as acknowledged by the authors of that study, the control group did not receive any intervention,
and the mere presence of an intervention in the nutrition intervention group could account for the observed effects.

Given the uncertain relationship between vegetarianism and depression, and the lack of studies on this topic in the general population in France, where a recent rise in vegetarian consumption has been observed as well as a 9% decrease in meat consumption in recent years \(^{(22)}\), we aimed to determine whether vegetarianism was related to depressive symptomatology and well-being in a large community sample while taking into account relevant covariates. We also measured self-reported health (SRH), which is commonly associated with physicians’ assessments of health \(^{(23)}\) and which is related to vegetarian diet \(^{(24,25)}\).

In sum, the aim of the present research was to advance the understanding of the link between vegetarianism and mental health by using an unusually large sample enabling the inclusion of relevant covariates and by analyzing these relationships in a new national context.

2. Methods

2.1. Setting and Sample

9993 participants who had previously registered on a website promoting meat and fish substitution on one day per week (French Green Monday initiative \(^{(26)}\) completed the research survey in December 2019. Those who did not indicate their gender \((n = 1371)\) or who were not eligible to participate (due to being aged below 18 \((n = 612)\) were excluded. The final sample therefore included 8610 participants \((70.8\%\) females) aged 18–99 \((M = 60.2; SD = 22.14)\).

2.2. Measures

Covariates

As variables generally related to mental health and/or food habits, the following variables were selected as covariates: Age, gender, BMI, educational level, monthly income, and city size. The participants’ Body Mass Index (BMI) was calculated from their self-reported weight and height (weight divided by height squared; kg/m\(^2\), \(M = 23.18, SD = 3.91\)). The participants were also asked to report their educational level (from 1 = Lowest level below baccalaureate, to 7 = Doctorate or other degrees, \(M = 4.12, SD = 1.38\)), their current net monthly income (from 1 = Less than 1000 euros to 6 = More than 4500 euros, \(M = 4.11, SD = 1.38\)), and their city size (from 1 = Less than 10,000 inhabitants to 6 = More than 400,000 inhabitants, \(M = 1.24, SD = 1.17\)).

Main variables
Participants were asked about their self-rated health (SRH, from 1 = In bad health to 5 = In excellent health, M = 4.07, SD = 0.73). We relied on the Gad-2 scale\(^{(27)}\) to evaluate anxiety (M = 2.30, SD = 1.01, Cronbach's alpha = .81, example item: “In the last two weeks, how often have you been bothered by the following problems: feeling nervous, anxious, or on the edge”), and the PGQ-2 scale\(^{(28)}\) was used to estimate depression (M = 1.73, SD = 0.82, Cronbach's alpha = .71, example item “In the last two weeks, how often have you been bothered by the following problems: Feeling down, depressed of hopeless”). Response options for both measures ranged from 1 = Not at all, to 5 = every day. Finally, we measured the participants’ self-rated happiness (1 = Not at all happy, to 5 = Very happy, M = 3.93, SD = 0.71). Regarding their dietary habits, the participants were asked which foods they never (or almost never) consumed. Those who declared avoiding both meat and sh (N = 1024) were classified in the vegetarian group, coded 2, which was contrasted to the category of those who ate meat, fish, or both (N = 7586), coded 1.

### 2.3. Statistical methods

Missing data were imputed using a straightforward linear interpolation method. A logistic regression analysis was performed to estimate the Odds Ratio (OR) and 95% Confidence Interval (95% CI) of every variable in order to predict belonging to the vegetarian group in contrast with the non-vegetarian group. Age, gender, BMI, educational level, monthly income, and city size were entered into block 1 of a multivariate analysis. In block 2, depression, happiness and self-reported health were added to the model. The significance level used to select the variables that remained in the model was p < 0.05.

### 2.4. Ethical aspects

The study was carried out in compliance with the principles of the Helsinki declaration. Each participant formally agreed to participate, and was informed of their right to be removed at any time from the research database if they wished.

### 3. Results

Univariate analysis are shown in table 1. The results of the logistic regression analysis showed that on average vegetarians had lower BMIs (OR = 0.93, 95% CI: 0.91–0.95, p =.000), higher self-rated health (OR = 1.24, 95% CI: 1.12–1.37, p =.000), and lower monthly incomes (OR = 0.83, 95% CI: 0.78–0.87, p =.000). Regarding our main research goal, vegetarians and non-vegetarians were not significantly different on anxiety (OR = 0.93, 95% CI: 0.85–1.01, p =.09) or depression (OR = 1.10, 95% CI: 0.99–1.22, p =.07). However, vegetarians’ self-rated happiness was lower (OR = 0.88, 95% CI: 0.79–0.98, p =.025). The overall determination coefficient of the model was .045 (Nagelkerke R2). (Table 2).

### 4. Discussion

The main objective of this study was to investigate for the first time in France the associations between vegetarianism, anxiety, depression, and well-being. Our results showed that individuals with a vegetarian diet did not present an increased risk of anxiety or depression. This result is consistent with those of
some prior studies in other countries \((29, 30, 31, 32)\). However, it was also observed in the present study that happiness was slightly lower among vegetarians. This result may be interpreted in light of the status of vegetarianism in France, where this social minority is less accepted than in many other countries \((33)\). As with any kind of discrimination, this status potentially decreases individuals' happiness \((34)\). Moreover, for many vegetarians, concern about the ethics of raising and slaughtering animals may be a central motivation \((35)\) which could also affect their response to a question on their own happiness because of the empathic inclusion of animals. Our study also showed that vegetarians had better self-reported health than non-vegetarians, and that they displayed lower BMIs, which is consistent with previous studies \((36, 37, 38)\). However, some limitations affecting this study need to be discussed. First, we contrasted participants who declared that they were avoiding meat and fish with participants who were not doing so. It is possible that participants belonging to the vegetarian category were not fully abstaining from meat and fish, as many earlier studies have suggested \((39, 40)\). Second, the compared categories did not take into account the specificities of intermediary diets. For example, individuals who avoid meat but not fish (pescetarians), or those who also exclude dairy products and eggs, represent profiles that may deserve to be studied separately. Measuring various levels of commitment towards a vegetarian diet is another recommended strategy that further studies may choose to follow. A third limitation inherent to cross-sectional studies is their inability to draw causal mechanisms linking the measured variables. A fourth limitation here was the absence of detailed dietary intake, which may enable researchers to more precisely assess participants' food habits and to estimate occasional deviations from vegetarianism by participants in the vegetarian group. Finally, the sample was not representative of the countries' general population and was reached through a specific national campaign, which represents a fifth limitation to the generalization of the results. In conclusion, a vegetarian diet appears unrelated to anxiety or depression in France, but vegetarians appeared to experience slightly more psychological adversity as they showed lower happiness than non-vegetarians.

**Abbreviations**

BMI : Body Mass Index

GAD scale: Generalized Anxiety Disorder Scale

OR : Odds Ratio

PGQ scale: Patient Health Questionnaire Scale.

SRH : Self-Rated Health

**Declarations**

Ethics approval and consent to participate
The present study has been exempted from requiring ethics approval by the USR 3394, University Grenoble Alpes. All procedures performed were in accordance with the ethical standards for questionnaire studies at University Grenoble Alpes and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Consent for publication

Participants involved in the study gave their consent for publication

Availability of Data and Materials

Data are fully available on request to Laurent.Begue@univ-grenoble-alpes.fr

Competing interests

The authors do declare no competing interests

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Author’s contributions

Conceptualization (LB, RS), Data analysis (LB), first draft (LB), final draft (RS, LB)

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References

1. Godfray C, et al. Meat consumption, health, and the environment. Science. 2018;361:eaam5324.
2. Wang X, et al. Red and processed meat consumption and mortality: Dose-response meta-analysis of prospective cohort studies. Public Health Nutrition. 2016;19:893–905.
3. Rosenfeld DL. The psychology of vegetarianism: Recent advances and future directions. Appetite. 2018;131:125–38.
4. Craig W, Mangels AR. Position of the American Dietetic Association: Vegetarian Diets. Journal of the Academy of Nutrition Dietetics. 2009;109:1266–82.
5. Jacka FN, Pasco JA, Williams LJ, Mann N, Hodge A, Brazionis L, Berk M. Red meat consumption and mood and anxiety disorders. Psychother Psychosom. 2012;81:196–8.

6. Larsson CL, Klock KS, Nordrehaug AA, et al. Lifestyle-related characteristics of young low-meat consumers and omnivores in Sweden and Norway. J Adolesc Health. 2002;31:190–8.

7. Michalak J, Zhang XC, Jacobi F. Vegetarian diet and mental disorders: results from a representative community survey. International Journal of Behavioral Nutrition Physical Activities. 2012;9:67.

8. Paslakis G, Richardson C, Nöhre, et al. Prevalence and psychopathology of vegetarians and vegans. Results from a representative survey in Germany. Sci Rep. 2020;10:6840.

9. Hibbeln JR, Northstone K, Evans J, et al. Vegetarian diets and depressive symptoms among men. J Affect Disord. 2018;225:13–7.

10. Michalak J, Zhang XC, Jacobi F. Vegetarian diet and mental disorders: results from a representative community survey. International Journal of Behavioral Nutrition Physical Activities. 2012;9:67.

11. Li X, Cao HJ, Xie S, et al. Adhering to a vegetarian diet may create a greater risk of depressive symptoms in the elderly male Chinese population. J Affect Disord. 2019;243:182–7.

12. Forestell CA, Nezlek JB. Vegetarianism, depression, and the five factors model of personality. Ecol Food Nutr. 2018;57:246–59.

13. Michalak J, Zhang XC, Jacobi F. Vegetarian diet and mental disorders: results from a representative community survey. International Journal of Behavioral Nutrition Physical Activities. 2012;9:67.

14. Beezhold BL, Johnston CS, Daigle DR. Vegetarian diets are associated with healthy mood states. A cross-sectional study in Seventh Day Adventist adults. Nutr J. 2010;9(26):1–7.

15. Timko CA, Hormes JM, Chubski J. Will the real vegetarian please stand up? An investigation of dietary restraint and eating disorder symptoms in vegetarians versus non-vegetarians. Appetite. 2012;58(3):982–90.

16. Pfeiler T, Egloff B. Do vegetarians feel bad? Examining the association between eating vegetarian and subjective well-being in two representative samples. Food Qual Prefer. 2020;86:104418.

17. Lavallee K, Zhang XC, Michalak J, et al. Vegetarian diet and mental health: Cross-sectional and longitudinal analyses in culturally diverse samples. J Affect Disord. 2019;248:147–54.

18. Beezhold BL, Johnston CS, Daigle DR. Vegetarian diets are associated with healthy mood states. A cross-sectional study in Seventh Day Adventist adults. Nutr J. 2010;9(26):1–7.

19. Beezhold BL, Johnston CS. Restriction of meat, fish, and poultry in omnivores improves mood: a pilot randomized controlled trial. Nutr J. 2012;14:11–9.

20. Jin Y, Kandula N, Alka M, et al. (2019). Vegetarian diet is inversely associated with prevalence of depression in middle-aged South Asians in the United States. Ethnicity & Health, in press.

21. Agarwal U, Mishra S, Xu J, et al. A Multicenter Randomized Controlled Trial of a Nutrition Intervention Program in a Multiethnic Adult Population in the Corporate Setting Reduces Depression and Anxiety and Improves Quality of Life: The GEICO Study. American Journal of Health Promotion. 2015;29(4):245–54.
22. FranceAgriMer. (2015). *Impact de la crise économique sur la consommation de viande et évolution des comportements alimentaires*. Vol. 21. Les synthèses de FranceAgriMer.

23. Bombak AE. Self-rated health and public health: a critical perspective. Frontiers in Public Health. 2013;1:15.

24. Burkert NT, Muckenhuber J, Großschädl F, et al. Nutrition and Health – The Association between Eating Behavior and Various Health Parameters: A Matched Sample Study. PLoS ONE. 2014;9(2):e88278.

25. Cade J, Burley V, Greenwood D. The UK Women's Cohort Study: comparison of vegetarians, fish-eaters and meat-eaters. Public Health Nutrition. 2004;7(7):871–8.

26. Bègue L, Treich N. Immediate and 15-Weeks Correlates of Individual Commitment to a “Green Monday” National Campaign Fostering Weekly Substitution of Meat and Fish by Other Nutrients. Nutrients. 2019;11:7, 1694.

27. Kroenke K, Spitzer RL, Williams JB. The Patient Health Questionnaire-2: Validity of a Two-Item Depression Screener. Med Care. 2003;41:1284–92.

28. Kroenke K, Spitzer RL, Williams JB, et al. Anxiety disorders in primary care: prevalence, impairment, comorbidity, and detection. Ann Intern Med. 2007;146:317–25.

29. Beezhold BL, Johnston CS, Daigle DR. Vegetarian diets are associated with healthy mood states. A cross-sectional study in Seventh Day Adventist adults. Nutr J. 2010;9(26):1–7.

30. Beezhold BL, Johnston CS. Restriction of meat, fish, and poultry in omnivores improves mood: a pilot randomized controlled trial. Nutr J. 2012;14:11–9.

31. Timko CA, Hormes JM, Chubski J. Will the real vegetarian please stand up? An investigation of dietary restraint and eating disorder symptoms in vegetarians versus non-vegetarians. Appetite. 2012;58(3):982–90.

32. Lavallee K, Zhang XC, Michalak J, et al. Vegetarian diet and mental health: Cross-sectional and longitudinal analyses in culturally diverse samples. J Affect Disord. 2019;248:147–54.

33. Ruby MB, Alvarenga MS, Rozin P, et al. Attitudes toward beef and vegetarians in Argentina, Brazil, France, and the USA. Appetite. 2016;96:546–54.

34. Schmitt MT, Branscombe NR, Postmes T, & al. The Consequences of Perceived Discrimination for Psychological Well-Being: A Meta-Analytic Review. Psychol Bull. 2014;140:921–48.

35. Rosenfeld DL. The psychology of vegetarianism: Recent advances and future directions. Appetite. 2018;131:125–38.

36. Burkert NT, Muckenhuber J, Großschädl F, et al. Nutrition and Health – The Association between Eating Behavior and Various Health Parameters: A Matched Sample Study. PLoS ONE. 2014;9(2):e88278.

37. Hibbeln JR, Northstone K, Evans J, et al. Vegetarian diets and depressive symptoms among men. J Affect Disord. 2018;225:13–7.
38. Paslakis G, Richardson C, Nöhre M, et al. Prevalence and psychopathology of vegetarians and vegans. Results from a representative survey in Germany. Sci Rep. 2020;10:6840.

39. Ruby MB. Vegetarianism. A Blossoming field of study. Appetite. 2012;58:141–50.

40. Vinnari M, Montonen J, Harkanen T, et al. Identifying Vegetarians and their food consumption according to self-identification and operationalized definition in Finland. Public Health Nutrition. 2008;12:481–8.

Tables

Due to technical limitations, table 1,2 is only available as a download in the Supplemental Files section.