

The Association Between Personality Traits and Dietary Choices: A Systematic Review

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ABSTRACT

Increasing evidence shows how diet may play a role in improving health including mental health. Of note, personality may influence the type of diet and consequently the prognosis of medical and psychiatric conditions. The purpose of the present systematic review is to summarize the available data regarding the influence of personality on dietary habits affecting health outcomes. A search in the main databases was conducted matching the terms “personality,” “personality traits” with “food choices,” “food preferences,” “diet,” and “dietary habits.” A total of 1856 articles were screened, and 24 articles were finally included. Exclusion criteria consisted of studies on animals or children, studies about eating disorders, types of diet not clearly associated with health outcomes, and studies for marketing reasons. Several studies showed that personality traits can influence both dietary choices and the type of diet, including the preference for healthy or unhealthy food. Unfavorable personality traits such as neuroticism and alexithymia (the inability to identify and describe emotions) were associated with unhealthy diet habits such as low consumption of fruit and vegetables, and the increased consumption of sugar and saturated fats. Personality seems to play a role in food selection and in the propensity to change diet. The interpretation of these results should be weighted by the different cultural contexts in which the studies were conducted and the extreme heterogeneity of tools used to assess personality and food preferences. Future research should clarify how personality can affect diet in specific populations such as patients with severe psychiatric disorders. *Adv Nutr* 2021;12:1149–1159.

Keywords: personality traits, food choice, diet, health, personality, food preferences

Introduction

Personality disorders are widespread psychiatric conditions that affect ~12% of the general population (1). According to Diagnostic and Statistical Manual of Mental Disorders (DSM-5), they are defined as stable impairments of different aspects of personality including identity, self-direction, and interpersonal skills (2). Because of their diffusion, they account for a significant socioeconomic burden as a consequence of the associated disability and chronicity (3). Dysfunctional personality traits, intended as specific alterations, which however, do not meet the criteria for a full-blown personality disorder, are even more prevalent. In addition to causing discomfort to affected individuals, they can worsen the prognosis of major psychiatric conditions such as mood disorders or schizophrenia, modulating adherence to therapies and socio-occupational functioning (4).

Among the modifiable factors that may improve mental health, in the last few years specific focus has been devoted to

diet. First of all, people affected by severe mental disorders, such as schizophrenia or bipolar disorder, seem to be more inclined to unhealthy dietary habits, including less consumption of vegetables and greater intake of saturated fats (5). A poor diet could contribute to the increased risk of cardiovascular events in patients with psychiatric conditions (6) and to a consequent lower life expectancy of these subjects with respect to healthy ones (7). In addition, recent studies have shown that a healthy diet may affect the prognosis of mood disorders by favoring clinical stabilization (8–10). In light of these considerations, it is clear that healthy eating styles may improve the clinical course of different psychiatric conditions (11).

Currently, despite the spread of personality disorders, most studies have focused on food choices and the diet of patients affected by schizophrenia and mood disorders. However, personality may also influence food habits, thus contributing to the well-being of subjects with specific personality traits or disorders (12–14). A certain diet can, in fact, be followed because an individual has some food preferences mediated by his own personality, or because

The authors reported no funding received for this study.

Author disclosures: The authors report no conflicts of interest.

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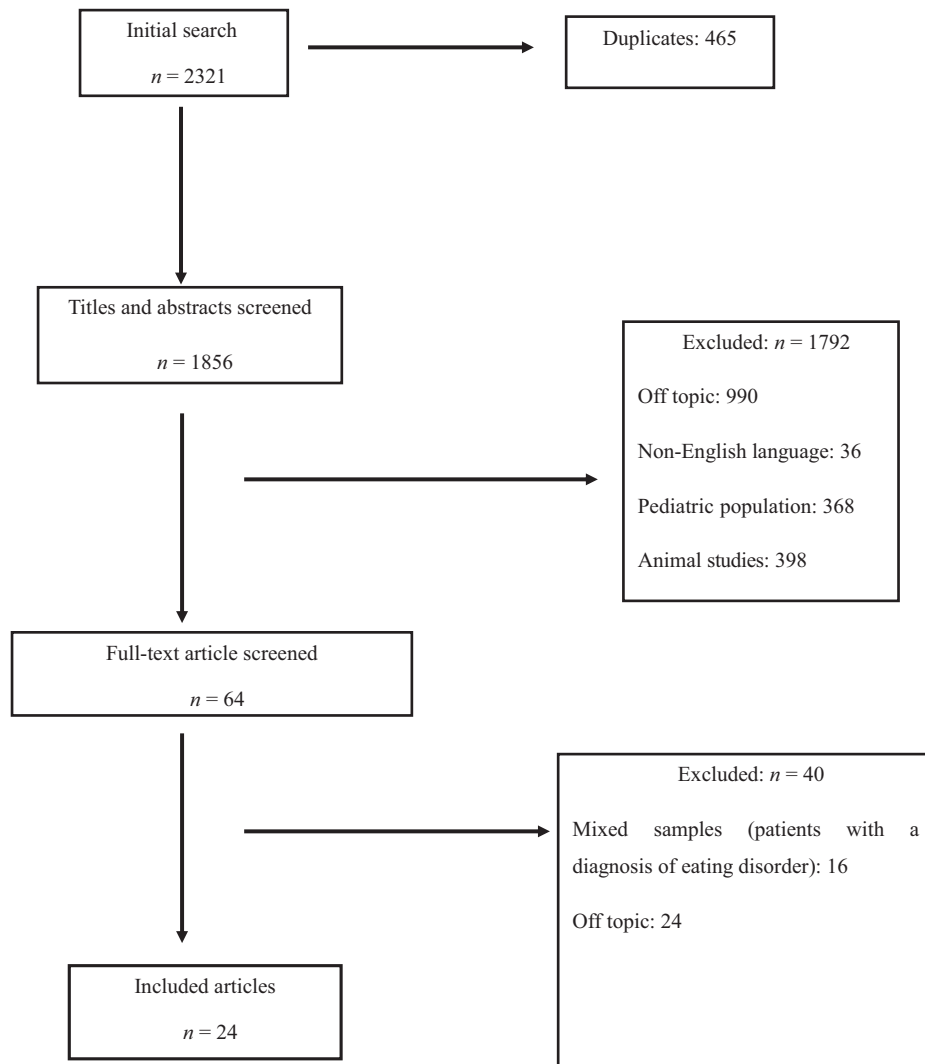


FIGURE 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) diagram for review about the association between personality traits and dietary choices.

particular personality characteristics such as perfectionism could guide towards healthier dietary choices. In this sense, the available literature has addressed this topic by the association of personality traits with both food tastes and dietary habits (13). The impact of personality on diet is also supported by the fact that personality traits such as neuroticism, impulsivity, and sensitivity to reward appear as risk factors for obesity; in contrast, conscientiousness and “self-control” seem to be protective for weight gain (15).

Since diet has a prominent impact on global health, a focus on the determinants of food choices appears crucial. There is convincing evidence that increasing the consumption of vegetables and fruit reduces the risk of a number of diseases including stroke, hypertension, and coronary heart disease (16). The high consumption of sugar sweetened beverages (17) has been demonstrated to increase the risk of obesity especially in children, whereas a reduction in

saturated fat intake decreased the risk of cardiovascular diseases (18). Finally, excessive dietary salt (sodium chloride) intake was associated with an increased risk of hypertension (19).

Finally, it is important to remark that several campaigns were created to improve nutrition and that the success of these prevention programmes partly depends on prevalent personality traits of the target population (20). For example, educational interventions seem to be more effective on people with a high degree of neuroticism (21), agreeableness, and conscientiousness (22).

Investigating which personality traits are associated with certain dietary choices is crucial for understanding how these traits can impact on general health. The identification of specific personality characteristics associated with dietary habits also opens up the possibility of more targeted and effective preventive strategies. The objective of this article is therefore to review the literature regarding the association

TABLE 1 Summary of the results of the selected studies about the association of food choices or dietary habits and personality traits

Studies (country)	Quality	Sample	Measure of personality	Measure of taste preferences	Results
Shepherd and Farleigh (23) (UK)	3	36 females	Eysenck Personality Inventory (EPI)	Questionnaires on general food preferences, inclination to add table salt to foods	Higher total salt intake was related to lower preference for fruit and lower neuroticism. Extraversion was positively related to nondiscretionary salt intake, but not to total salt intake
Stone and Pangborn (24) (USA)	3	100 university students (68 females and 32 males)	Sixteen Personality Factor (16PF), Jenkins Activity Survey (JAS), Eysenck Personality Questionnaire (EPQ), Multidimensional Health Locus of Control (MHLC), and Sensation Seeking Scale (SSS)	Dietary-frequency questionnaires	The more outgoing individuals liked sweeter lemonade than the more reserved subjects, and subjects who felt they had self-control over their health liked lower levels of salt in broth, whereas those who felt that chance or others controlled their health liked higher levels. Personality traits accounted for 13% of the variance in individual preferences regarding the concentration of salt and sugar in foods
Raudenbush et al. (25) (USA)	3	1) 146 young adults (61 males and 85 females) 2) 158 young adults (79 males and 79 females) 3) 143 young adults 4) 101 undergraduate students (52 males and 49 females)	1) Activity Attitudes Survey (ACT) 2) Experience Seeking subscale of the Sensation Seeking Scale 3) Fear Survey Schedule (FSS-II) 4) ACT, sensation seeking survey, optimism/pessimism scale	1) Food Attitudes Survey (FAS) 2) FAS, Eating Attitudes Test (EAT) 3) FAS 4) FAS, neophobia, finickiness/pickiness and eating apathy scales; smell preferences ratings	1) The openness to new experiences measured by ACT is likely to influence food attitudes 2) Sensation avoidance prevents experimenting with new types of food 3) Fear or phobic tendency does not influence the predisposition to try new foods 4) No correlations between optimism or pessimism and food attitudes. FAS dislikes were not associated with smell responses. A preference for a wider range of foods increased the probability to consider a smell as pleasant. Both the food neophobia and pickiness/finickiness scales were predictive of proneness to try foods 1) STAI scores did not result in a significant correlation with FNS scores 2) The number of foods rated as unpalatable was associated with extraversion (EPQ-E scores). The number of unpalatable meat foods was inversely correlated with the degree of extraversion 1) Ideological reasons (e.g. ecological welfare) and magical beliefs concerning animal products as contaminants were more typical among vegetarians than among semivegetarians or omnivores 2) Magical beliefs concerning animal products as contaminants or regarding the functioning of the human organism were more typical among vegetarians or semivegetarians than among omnivores
Potts and Wardle (26) (UK)	3	1) 77 undergraduate engineering students (5 females and 72 males) 2) 92 mothers of 9–11-y-old children	State Trait Anxiety Inventory (STAI), Neuroticism (N) and Extroversion (E) subscales of the EPQ	Heuristic food list and Food Neophobia Scale (FNS)	
Lindeman and Stark (27) (Finland)	3	1) 171 women of age between 17–45 y 2) 187 high-school female students	Emmons' personal striving methods, questionnaire about magical thinking, Socio-cultural Attitudes Towards Appearance Questionnaire (SATAQ), EAT	Self-administrated test	

(Continued)

TABLE 1 (Continued)

Studies (country)	Quality	Sample	Measure of personality	Measure of taste preferences	Results
Kikuchi and Watanabe (12) (Japan)	3	470 university students (76 males and 394 females)	NEO Five-Factor Inventory (NEO-FFI)	Questionnaire about dietary habits	Neuroticism: associated with higher consumption of salty foods in females and of sweet foods in both sexes Extraversion: associated with consumption of oily foods in males Openness: inversely related to preference for salty foods and directly related to low intake of animal fat Agreeableness: associated with avoidance of salty foods in both genders Conscientiousness: associated with consumption of green/yellow vegetables in both genders Women and men classified into the highest SOC quartile had significantly higher mean intakes of vegetables than those in the lowest quartiles. Women in the highest SOC quartile also had a higher intake of fruits but lower intake of energy, total and saturated fat, sucrose, and sweets
Lindmark et al. (28) (Sweden)	3	2446 men and 2545 women (aged 25–74 y)	The 13-item Antonovsky Questionnaire for individuals "sense of coherence" (SOC)	84-item semiquantitative FFQ	Chocolate craving was associated with more irritability, rejection sensitivity, anxious worrying, self-criticism, and self-focusing (all personality traits belonging to neuroticism construct) Higher R/A Personality Scale scores were associated with higher intake of soy products, green and yellow vegetables, other vegetables, seaweed, proteins, calcium, iron, carotene, vitamin E, vitamin C, and dietary fibers. Males with higher R/A scores consumed more meat and milk. Females with higher R/A scores consumed more fish, shellfish, and eggs. Alcohol consumption was inversely associated with more prominent R/A traits
Parker and Crawford (29) (Australia)	2	2692 adults	Temperament and Personality Questionnaire	Web-based questionnaire	Low neuroticism appeared to moderate intention to consume fruit. Conscientiousness did not moderate the intention to eat fruit
Hirokawa et al. (30) (Japan)	1	28,077 adults (13,082 males and 14,995 females)	The Rationality and Anti-Emotionality (R/A) Personality Scale (blocked emotion and conscious suppression of emotion during interpersonal communication)	FFQ	Depression and hysteria resulted to be associated with preference for sweet than salty foods
De Bruijn et al. (21) (Netherlands)	2	405 adults (age range 26–87 y)	The personality dimensions conscientiousness and neuroticism assessed by 6 items based on a shortened version of a Dutch translation of Goldberg's adjective list	Face-to-face interviews using a validated questionnaire to assess fruit consumption	
Aguayo et al. (31) (Grand Duchy of Luxembourg)	2	190 adults with severe obesity	Minnesota Multiphasic Personality Inventory-2 (MMPI-2)	Self-reported taste preferences	

(Continued)

TABLE 1 (Continued)

Studies (country)	Quality	Sample	Measure of personality	Measure of taste preferences	Results
Möttus et al. (22) (Estonia)	3	1691 adults, aged 18–89 y	NEO-FFI	Questionnaire about dietary habits	Higher scores on the health aware diet factor were associated with lower neuroticism, and higher extraversion, openness, and conscientiousness. Higher scores on the traditional diet factor were related to lower levels of openness
Haws and Redden (32) (USA)	2	245 adults	The 13-item short form of Tangney's general self-control scale	All participants indicated the total number of pieces they would eat of the available snack assortment	In case of a wide choice of foods, subjects with low self-control expressed the desire to eat more than subjects with high self-control. Subjects with low self-control would be more prone to diversify their diet
Möttus et al. (33) (UK-Scotland)	2	1091 senior adults (mean age 69.6 y)	NEO-FFI	FFQ (Identification of Mediterranean diet, health aware diet [high consumption of meat and fruit], traditional Scottish diet, diet with high intake of sugars)	Neuroticism: mild inverse correlation with Mediterranean diet; mild direct correlation with traditional Scottish diet Extraversion: moderate direct correlation with Mediterranean diet Openness: strong direct correlation with Mediterranean diet, moderate inverse correlation with traditional Scottish diet, mild inverse correlation with intake of sugars Agreeableness: strong direct correlation with health aware diet Conscientiousness: mild direct correlation with health aware diet
Tiainen et al. (34) (Finland)	3	1681 adults	NEO-FFI	Semiquantitative FFQ	In men, openness was associated with higher vegetable and lower confectionery and chocolate intakes. In women, neuroticism was associated with lower fish and vegetable and higher soft drink intakes; extraversion with higher meat and vegetable intakes; openness with higher vegetable and fruit intakes; agreeableness with lower soft drink intake; conscientiousness with higher fruit intake. Resilience in women seems to be associated with higher intakes of vegetables, fruits, fish, and dietary fiber
Jackson and Beaver (35) (USA)	2	1357 male adults	A scale of psychopathic personality traits, realized and validated by authors	Face-to-face interviews	A significant association between meal deprivation in adolescence and development of psychopathic features
Keller and Siegrist (13) (Switzerland)	2	951 adults	NEO-FFI	FFQ	Neuroticism: mild direct association with intake of sweet and savories Extraversion: mild direct association with consumption of sweetened drinks and strong direct association with consumption of vegetables and salad Openness: strong direct association with consumption of fruit and salad/vegetables; mild inverse association with intake of sweetened drinks

(Continued)

TABLE 1 (Continued)

Studies (country)	Quality	Sample	Measure of personality	Measure of taste preferences	Results
Kessler et al. (36) (Germany)	1	9249 adults	Questions about reason for the choice of nutritional approach, Big Five Inventory-Socio-Economic Panel (BFI-S), Portraits Value Questionnaire (PVQ), Empathizing Scale (short form)	Questionnaire about consumption of luxury foods/drinks, illegal drugs, and eating habits	<p>Agreeableness: strong inverse association with meat consumption; moderate inverse association with intake of sweetened drinks</p> <p>Conscientiousness: mild direct association with consumption of salad and vegetables</p> <p>Motives of diet style: vegans rated food taste, love of animals, and global/humanitarian reasons as more important, and the influence of their social environment as less important than vegetarians did</p> <p>BFI-S: vegans scored lower on neuroticism and higher on openness than vegetarians</p> <p>PVQ: vegans scored lower than vegetarians on desire of power, achievement, safety, conformity, and tradition and higher on desire of self-determination and universalism</p> <p>Empathizing Scale (short form): vegans showed higher empathy than vegetarians</p>
Robino et al. (14) (Italy)	2	649 adults	Temperament and Character Inventory (TCI), 20-Item Toronto Alexithymia Scale (TAS-20)	Food-liking questionnaire (realized by authors)	<p>Alexithymia: inversely associated with preference for vegetables, condiments, cheeses; directly associated with preference for alcohol, meat/fat, and sweets</p> <p>Self-transcendence: directly associated with preference for vegetables</p> <p>Reward dependence: directly associated with preference for condiments</p> <p>Persistence: inversely associated with predisposition to alcohol consumption</p> <p>Self-directedness: inversely associated with preference for sweets</p>
Sagioglou and Greitemeyer (37) (USA; data were analyzed in Austria)	2	953 adults (2 samples of ~500 subjects)	Short Form of the Buss-Perry aggression questionnaire (BPAQ-SF), 12-items Dark Triad measure, 10-item personality inventory (TIPI), Comprehensive Assessment of Sadistic Tendencies (CAST)	Self-administered test about taste preferences	<p>Bitter taste preferences are positively associated with malevolent personality traits, with the most robust relation to everyday sadism and psychopathy. No association with sweet or salty taste preferences</p>
Conner et al. (38) (New Zealand)	2	1073 young adults, aged 17–25 y	NEO-FFI	Self-reported daily diary for 21 or 13 d	<p>Openness, extraversion, and conscientiousness were found to be related to a higher consumption of fruits and vegetables. Neuroticism and agreeableness were unrelated to fruit and vegetable consumption</p> <p>Vegetarians and semivegetarians were more open to new experiences, but more neurotic than omnivores</p>
Forestell and Nezzlek (39) (USA)	2	6422 undergraduate students	Five-factor model (FFM) of personality	Self-reported food habits: vegetarians ($n = 276$), semivegetarians ($n = 1191$), omnivores ($n = 4955$)	<p>Vegetarians and semivegetarians were more open to new experiences, but more neurotic than omnivores</p>

(Continued)

TABLE 1 (Continued)

Studies (country)	Quality	Sample	Measure of personality	Measure of taste preferences	Results
Harmon et al. (40) (USA)	3	143 university students	Questionnaire created by authors on previous personality survey and assessing neuroticism and openness to experience	Self-reported preferences	Higher scores on openness to experience and lower scores on neuroticism predicted preference for indirect potable reuse (IDR) water which had a higher concentration of Ca and HCO ₃ ⁻ with respect to tap or bottled water
Perälä et al. (41) (Finland)	3	1668 men and women, aged 56–70 y	Tridimensional Personality Questionnaire	128-item FFQ	Harm avoidance was related to lower consumption of vegetables, fruits, fish, and several vitamins. Reward dependence was associated with higher consumption of vegetables and intake of vitamin E and lower intake of alcohol. Novelty seeking was significantly related to higher intake of fish, fat and alcohol and lower consumption of cereals, milk products, and carbohydrates

ACT, Activity Attitudes Survey; BFI-5, Big 5 Inventory; Socio-Economic Panel; BPAQ-SF, Short Form of the Buss-Perry aggression questionnaire; CAST, Comprehensive Assessment of Sadistic Tendencies; EAT, Eating Attitudes Test; EPI, Eysenck Personality Inventory; EPQ, Eysenck Personality Questionnaire; EPQ-E, Eysenck Personality Questionnaire – Extraversion; EPQ-N, Eysenck Personality Questionnaire – Neuroticism; FAS, Food Attitudes Survey; FFM, Five-Factor Model; FNS, Food Neophobia Scale; FSS-II, Fear Survey Schedule; JAS, Jenkins Activity Survey; MHL, Multidimensional Health Locus of Control; MMPI-2, Minnesota Multiphasic Personality Inventory-2; NEO-FFI, NEO Five-Factor Inventory; PVQ, Portrait Value Questionnaire; R/A, Rationality and Antiemotionality; SATAQ, Sociocultural Attitudes Towards Appearance Questionnaire; SOC, Sense of coherence; SSS, Sensation Seeking Scale; STAI, State Trait Anxiety Inventory; TAS-20, 20-Item Toronto Alexithymia Scale; TCI, Temperament and Character Inventory; TIPI, 10-item personality inventory; 16PF, 16 Personality Factor.

between personality traits and food choices/dietary styles associated with health outcomes.

Methods

A search of the main databases (PubMed, Embase, PsycInfo, Isi Web of Knowledge, Medscape, The Cochrane Library) was conducted with a last check on 30 April, 2019.

The terms “personality” and “personality traits” were singularly matched with “food choices,” “food preferences,” “diet,” and “dietary habits.”

A manual selection of articles was then performed in order to consider only those concerning the topic of the present article. No restriction criteria were established for study design. Exclusion criteria consisted of: 1) animal studies; 2) studies about eating disorders; 3) studies with pediatric populations; 4) type of diets not clearly associated with health outcomes (e.g. consumption of spicy foods); and 5) studies investigating food preferences for marketing reasons. Furthermore, we excluded articles in a language other than English.

The research was conducted by identifying, in the main databases, which articles corresponded to the chosen inclusion and exclusion criteria. The selection was conducted by 1 of the authors and double-checked by another researcher. As indicated in [Figure 1](#), the initial research identified 2321 studies, of which 465 were duplicates. The remaining 1856 articles were screened using titles and abstracts for selection. In this way, we identified 64 articles, which were read entirely to select those that fitted the topic; 24 articles were then included.

[Table 1](#) provides an evaluation on the quality of the studies according to the Qualitative Assessment Tool for Quantitative Studies (Effective Public Health Practice Project) (42), and it summarizes the results of the included articles.

Results

All the 24 included articles are cross-sectional studies, conducted between 1986 and 2018. The articles investigated the role of personality in influencing the consumption of salt, the probability of having a restricted diet, consumption of sugar, fruit and vegetable intake, consumption of animal fats, and preference for water with a different mineral content.

Personality and food preferences

Several personality traits, such as neuroticism, extraversion, openness, and agreeableness, were identified as factors influencing dietary preferences. Among these, most studies focused on neuroticism and extraversion. A summary of the results for these 2 personality traits are reported in [Tables 2](#) and [3](#). [Tables 4](#) and [5](#) report the personality traits associated, respectively, with the preference for salty foods and sweet foods.

Neuroticism seems to be related to a tendency to prefer sweet foods, such as sweets (13), soft drinks (34), or chocolate (29). In parallel, a lower trend towards fruit consumption (21) and a preference for a Scottish diet rather than a Mediterranean one (33) was reported for this personality

TABLE 2 Summary of the results of the dietary preferences related to neuroticism

NEUROTICISM	Reduced total salt intake	Shepherd and Farleigh (23)
	Increased salty food intake	Kikuchi and Watanabe (12)
	Increased chocolate craving	Parker and Crawford (29)
	Increased fruit consumption	De Bruijn et al. (21)
	Higher scores on the health aware diet factor	Möttus et al. (22)
	Preference for a Scottish diet than a Mediterranean diet	Möttus et al. (33)
	Increased soft drink intake	Tiainen et al. (34)
	Increased sweet and salty food intake, reduced fish, and vegetable intake	Keller and Siegrist (13)
	Tendency to be a vegetarian rather than be an omnivore	Forestell and Nezelek (39)

trait. Subjects with prominent neuroticism seem to prefer salty flavors, whereas fish and vegetables do not seem to be equally appreciated by these individuals. With regard to the consumption of salty foods, the results appear controversial: whereas Shepherd and Farleigh demonstrated a tendency for a reduced total salt intake in subjects with higher neuroticism scores (23), research by Kikuchi and Watanabe highlighted a preference for salty foods in women with the aforementioned personality trait (12).

As mentioned above, it seems that the preference for sweet foods is associated with higher neuroticism (13, 29), higher extraversion (13, 24), and lower openness and agreeableness (13). Two studies reported the tendency to consume sugar and sweets by subjects with prominent alexithymia and hysteria (14, 31). Lindmark and colleagues highlighted a relation between a lower sense of coherence and sweet consumption (28).

Extraversion seems to be related to the selection of healthy foods as a consequence of the awareness of a healthy diet (22). Consistently, several studies confirmed that extraversion is associated with an increased consumption of vegetables and fruit (13, 34, 38), as well as the tendency to prefer a Mediterranean diet (33). As showed in Table 3, the preference for sweet beverages seems to be a stable characteristic of people with extrovert traits (13, 24). Salt intake does not seem to be related to this personality trait (23), whereas a study by Kikuchi and Watanabe reported the tendency to prefer oily food in extrovert subjects (12). Finally, subjects with prevalent extrovert traits seem to be less satisfied by food, as they rated a higher number of foods as unpalatable compared with controls (26).

With regard to salt intake, contrasting results were reported in relation to neuroticism (12, 23). The preference

for salty foods was found to be associated both with lower openness and agreeableness (12), and with the tendency to feel that one's health is conditioned by chance or by others (24).

Dietary attitudes were reported to be influenced by openness to new experiences such as trying new foods, whereas optimism and pessimism were not proven to be criteria capable of predicting dietary choices (25). In parallel, subjects with low self-control were found to be more prone to diversify their diet (32). A personality characterized by novelty seeking seems to be more inclined to a higher intake of fish, fat, and alcohol, whereas reward dependence and harm avoidance was reported to be more related to healthy food choices such as the tendency to prefer vegetables and vitamins (41). In addition, higher scores on the Rationality and antiemotionality Personality Scale were found to be associated with healthier dietary choices (e.g. a higher intake of soy products, vegetables, vitamins, and dietary fibers) (30). This study also revealed gender differences: women showed a preference for fish products, whereas men showed a preference for meat (30). A study by Harmon and colleagues reported a predictable preference for indirect potable reuse water in subjects with higher openness to experience and lower neuroticism (40).

Finally, psychopathic and malevolent personality traits were related to meal deprivation during adolescence (35), as well as the tendency to prefer a bitter taste rather than salty or sweet ones (37).

Personality and type of diet

The following studies focused more on the association between personality traits and types of diet grouped in general categories such as vegetarian or vegan.

TABLE 3 Summary of the results of the dietary preferences related to extraversion

EXTRAVERSION	Nondiscretionary salt intake	Shepherd and Farleigh (23)
	Increased sweet beverage intake	Stone and Pangborn (24)
	Increased number of foods rated as unpalatable	Potts and Wardle (26)
	Increased oily food consumption	Kikuchi and Watanabe (12)
	Higher scores on the health aware diet factor	Möttus et al. (22)
	Preference for a Mediterranean diet	Möttus et al. (33)
	Increased meat and vegetable intake	Tiainen et al. (34)
	Increased intake of sweetened drinks, vegetables, and salad	Keller and Siegrist (13)
	Increased fruit and vegetable intake	Conner et al. (38)

TABLE 4 Personality traits associated with the preference for salty foods

PREFERENCE FOR SALTY FOODS	Lower neuroticism Subjects who felt that chance or others had a control on their health Higher neuroticism, lower openness, and agreeableness	Shepherd and Farleigh (23) Stone and Pangborn (24) Kikuchi and Watanabe (12)
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In a study by Lindeman and Stark, magical beliefs about animal products as contaminants (e.g. animal bones or blood pollute food), about the functioning of the human organism (e.g. that an illness should be treated with a medicine that has similar properties as the illness), as well as ideological reasons (e.g. ecological welfare or benevolence of the world) were found to be more frequent in vegetarians or semivegetarians than omnivores (27). The influence of personality traits in choosing a vegan or vegetarian diet was examined in a German study by an online anonymous survey that was completed by >10,000 subjects (36). With regard to the reasons for diet preference, vegans rated food taste, love of animals, price, and global/humanitarian reasons as more important reasons, and the influence of their social environment as less important than vegetarians did. Vegans were found to be less neurotic, and more open to experiences and emphatic than vegetarians; in addition, vegans scored lower than vegetarians on desire of power, achievement, safety, conformity, and tradition and higher on desire of self-determinism and universalism. A recent study compared personality traits between vegetarians, semivegetarians, and omnivores and the authors reported more openness to new experiences, but also more neuroticism in vegetarians and semivegetarians compared with omnivores (39).

Data about diet and personality traits were also extrapolated by 1091 participants to the Scottish Mental Survey 1947 (33). A Mediterranean diet strongly correlated with openness ($r = 0.21$) and mildly correlated with low neuroticism ($r = -0.7$); a health aware diet (large consumption of fruit and meat products) strongly correlated with agreeableness ($r = 0.11$); the choice to follow a traditional Scottish diet showed a moderate inverse correlation with openness ($r = -0.09$) and mild direct correlation with neuroticism ($r = 0.08$); the intake of sweet foods showed a mild inverse correlation with openness ($r = -0.08$). Openness would therefore be more associated with healthy diet styles. Finally, an Estonian study (22) confirmed the relation between personality traits such as lower neuroticism, and higher extraversion, openness, and conscientiousness ($r = 0.11-0.17$ in self-ratings; $r = 0.08-0.11$ in informant-ratings), assessed by the NEO Five-Factor Inventory (NEO-FFI), and healthy

diet. On the other hand, lower levels of openness ($r = -0.14$ and -0.13 , self- and informant-ratings, respectively) seemed to be related to the preference for a traditional diet.

Discussion

The reported data confirm that personality traits may play a role in the selection of food and may influence the effectiveness of campaigns promoting healthy diet habits. Of note, some studies specifically focused on the weight of personality in affecting food preferences (23, 24), or on the predisposition of individuals to try new foods and consequently to change diet (26, 25).

The reported results show that unhealthy eating habits are associated with more dysfunctional personality traits. The increased consumption of sugar or sweet foods is more frequent in subjects with alexithymia (14) or neurotic aspects, as reported by 2 different articles (12, 29, 31). The same personality traits (alexithymia and neuroticism) would predispose to the increased consumption of SFAs (14, 33). Alexithymic aspects would also predispose to an increased consumption of alcohol (14, 30). In contrast, favorable personality traits such as low neuroticism (21, 33), low alexithymia (14), openness (7, 34, 33), agreeableness (33), extraversion (13, 38, 34), sense of coherence (SOC) (28), and conscientiousness (34, 38) seem to be related to the increased consumption of fruit and vegetables. It is interesting to point out that neuroticism is more prominent in subjects with schizophrenia than in healthy subjects (43), and that subjects suffering from severe psychiatric conditions such as schizophrenia or bipolar disorder frequently have a poor diet (44). Similarly, alexithymia has been associated with a number of poor outcomes including increased suicidal risk in subjects affected by psychiatric disorders (45). With regard to salt intake (Table 4), the results are more controversial with 1 study associating less consumption of salt with neuroticism (12) and another with agreeableness (23).

Recent data indicate that a vegetarian diet may reduce the risk of heart disease and cancer with respect to an omnivore diet (46), whereas some concerns have been reported regarding the risk of a lack of micronutrients such as vitamin B-12 in vegans (46). With regard to the

TABLE 5 Personality traits associated with the preference for sweet foods

PREFERENCE FOR SWEET FOODS	Higher extraversion Lower sense of coherence Higher neuroticism Higher levels of depressive and hysterical traits Higher neuroticism and extraversion, lower openness, and agreeableness Lower self-directedness and alexithymia	Stone and Pangborn (24) Lindmark et al. (28) Parker and Crawford (29) Aguayo et al. (31) Keller and Siegrist (13) Robino et al. (14)
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personality traits predisposing to the choice of a vegan versus a vegetarian or omnivore diet, the available data are contrasting. On one hand, vegans seem to be characterized by more openness with respect to vegetarians and omnivores (36), on the other hand, vegetarians and vegans have more magical beliefs regarding animal products as contaminants or human functioning than omnivores (27); in addition, vegetarians appear to be more neurotic than omnivores (39).

Finally, the global interpretation of the reported results may be difficult in the light of 2 main factors: 1) the cited articles present an extreme heterogeneity of the tools used to assess personality traits and food preferences/diet and 2) the studies were conducted in countries that have very dissimilar traditional cuisine (e.g. Japan, Italy, and the USA), and cultural aspects may have contributed to the final results.

Taken as a whole, the results of the present review indicate that personality traits may influence the propensity to change diet, although no specific characteristics were associated with this aspect; unfavorable personality features such as neuroticism and alexithymia could contribute to poor diet and future research could clarify how personality traits may affect diet in specific populations such as patients with severe psychiatric disorders.

Moreover, the use of antipsychotic drugs in severe personality disorders or in the case of comorbidity of personality disorders with major psychiatric conditions is another factor to be taken into account in this regard. An unhealthy diet and the risk of metabolic syndrome due to treatment with some antipsychotics are both factors associated with a reduced life expectancy in patients with mental disorders (47, 48).

Conclusion

Dysfunctional personality traits such as neuroticism and alexithymia are associated with unhealthy dietary habits. This aspect has 2 implications for nutritionists. First, dysfunctional personality traits are more common in people affected by mental disorders and this observation partly explains the poor diet of subjects affected by severe psychiatric disorders such as schizophrenia. Nutritionists should pay particular attention to the management of these patients given their tendency for unhealthy eating habits and their low propensity to change the diet. It is therefore increasingly evident of the need for close collaboration between different health figures to improve the outcome of people suffering from psychiatric disorders. Second, some personality traits may influence the efficacy of campaigns aimed to promote healthy diets and personality aspects should be taken into account in the development of prevention programmes.

Acknowledgments

The authors' responsibilities were as follows—CME and MB: collaborated in designing, writing, and the final content; AC: helped in the revision process; and all authors: read and approved the final manuscript.

References

1. Volkert J, Gablonski TC, Rabung S. Prevalence of personality disorders in the general adult population in Western countries: systematic review and meta-analysis. *Br J Psychiatry* 2018;213(6):709–15.
2. American Psychiatric Association, 2013. Diagnostic and statistical manual of mental disorders: DSM-5. Washington (DC): American Psychiatric Press [Internet]. Available from: <https://doi.org/10.1176/appi.books.9780890425596.744053>.
3. Moran P, Romaniuk H, Coffey C, Chanen A, Degenhardt L, Borschmann R, Patton GC. The influence of personality disorder on the future mental health and social adjustment of young adults: a population-based, longitudinal cohort study. *The Lancet Psychiatry* 2016;3(7):636–45.
4. Beckwith H, Moran PF, Reilly J. Personality disorder prevalence in psychiatric outpatients: a systematic literature review. *Personality and Mental Health* 2014;8(2):91–101.
5. Hassan S, Ross J, Marston L, Osborn D, Walters K. Factors prospectively associated with physical activity and dietary related outcomes in people with severe mental illness: a systematic review of longitudinal studies. *Psychiatry Res* 2019;273:181–91.
6. Osborn DPJ, Wright CA, Levy G, King MB, Deo R, Nazareth I. Relative risk of diabetes, dyslipidaemia, hypertension and the metabolic syndrome in people with severe mental illnesses: systematic review and metaanalysis. *BMC Psychiatry* 2008;8:84.
7. Correll CU, Detraux J, De Lepeleire JDE, De Hert M. Effects of antipsychotics, antidepressants and mood stabilizers on risk for physical diseases in people with schizophrenia, depression and bipolar disorder. *World Psychiatry* 2015;14(2):119–36.
8. Buoli M, Serati M, Altamura A. Biological aspects and candidate biomarkers for rapid-cycling in bipolar disorder: a systematic review. *Psychiatry Res* 2017;258:565–75.
9. Arab A, Mehrabani S, Moradi S, Amani R. The association between diet and mood: a systematic review of current literature. *Psychiatry Res* 2019;271:428–37.
10. Lassale C, Batty GD, Baghdadli A, Jacka F, Sánchez-Villegas A, Kivimäki M, Akbaraly T. Healthy dietary indices and risk of depressive outcomes: a systematic review and meta-analysis of observational studies. *Mol Psychiatry* 2019;24(7):965–86.
11. Mörtl S, Wagner-Skacel J, Lahousen T, Lackner S, Holasek SJ, Bengesser SA, Painold A, Holl AK, Reininghaus E. The role of nutrition and the gut-brain axis in psychiatry: a review of the literature. *Neuropsychobiology* 2018;Sep 17:1–9.
12. Kikuchi Y, Watanabe S. Personality and dietary habits. *J Epidemiol* 2000;10(3):191–8.
13. Keller C, Siegrist M. Does personality influence eating styles and food choices? Direct and indirect effects. *Appetite* 2015;84:128–38.
14. Robino A, Mezzavilla M, Pirastu N, La Bianca M, Gasparini P, Carlino D, Tepper BJ. Understanding the role of personality and alexithymia in food preferences and PROP taste perception. *Physiol Behav* 2016;157:72–8.
15. Gerlach G, Herpertz S, Loeber S. Personality traits and obesity: a systematic review. *Obes Rev* 2015;16(1):32–63.
16. Boeing H, Bechthold A, Bub A, Ellinger S, Haller D, Kroke A, Leschik-Bonnet E, Müller MJ, Oberritter H, Schulze M, Stehle P, Watzl B. Critical review: vegetables and fruit in the prevention of chronic diseases. *Eur J Nutr* 2012;51(6):637–63.
17. Hu FB. Resolved: there is sufficient scientific evidence that decreasing sugar-sweetened beverage consumption will reduce the prevalence of obesity and obesity-related diseases. *Obes Rev* 2013;14:606–19.
18. Hooper L, Martin N, Abdelhamid A, Davey Smith G. Reduction in saturated fat intake for cardiovascular disease. *Cochrane Database Syst Rev* 2015;6:CD011737.
19. Rust P, Ekmekcioglu C. Impact of salt intake on the pathogenesis and treatment of hypertension. *Adv Exp Med Biol* 2017;956:61–84.
20. Kaur A, Scarborough P, Rayner M. A systematic review, and meta-analyses, of the impact of health-related claims on dietary choices. *Int J Behav Nutr Phys Act* 2017;14(1):93.

21. De Bruijn G-J, Brug J, Van Lenthe FJ. Neuroticism, conscientiousness and fruit consumption: exploring mediator and moderator effects in the theory of planned behaviour. *Psychol Health* 2009;24(9):1051–69.
22. Mõttus R, Realo A, Allik J, Deary IJ, Esko T, Metspalu A. Personality traits and eating habits in a large sample of Estonians. *Health Psychol* 2012;31(6):806–14.
23. Shepherd R, Farleigh CA. Preferences, attitudes and personality as determinants of salt intake. *Hum Nutr Appl Nutr* 1986;40(3):195–208.
24. Stone LJ, Pangborn RM. Preferences and intake measures of salt and sugar, and their relation to personality traits. *Appetite* 1990;15(1):63–79.
25. Raudenbush B, van der Klaauw NJ, Frank RA. The contribution of psychological and sensory factors to food preference patterns as measured by the Food Attitudes Survey (FAS). *Appetite* 1995;25(1):1–15.
26. Potts HW, Wardle J. The list heuristic for studying personality correlates of food choice behaviour: a review and results from two samples. *Appetite* 1998;30(1):79–92.
27. Lindeman M, Stark K. Pleasure, pursuit of health or negotiation of identity? Personality correlates of food choice motives among young and middle-aged women. *Appetite* 1999;33(1):141–61.
28. Lindmark U, Stegmayr B, Nilsson B, Lindahl B, Johansson I. Food selection associated with sense of coherence in adults. *Nutr J* 2005;4:9.
29. Parker G, Crawford J. Chocolate craving when depressed: a personality marker. *Br J Psychiatry* 2007;191:351–2.
30. Hirokawa K, Nagata C, Takatsuka N, Shimizu N, Shimizu H. Rationality/anti-emotionality personality and dietary habits in a community population in Japan. *J Epidemiol* 2008;18(4):183–90.
31. Aguayo GA, Vaillant MT, Arendt C, Bachim S, Pull CB. Taste preference and psychopathology. *Bull Soc Sci Med Grand Duche Luxemb* 2012;2:7–14.
32. Haws KL, Redden JP. In control of variety. high self-control reduces the effect of variety on food consumption. *Appetite* 2013;69:196–203.
33. Mõttus R, McNeill G, Jia X, Craig LC, Starr JM, Deary IJ. The associations between personality, diet and body mass index in older people. *Health Psychol* 2013;32(4):353–60.
34. Tiainen AM, Männistö S, Lahti M, Blomstedt PA, Lahti J, Perälä MM, Rääkkönen K, Kajantie E, Eriksson JG. Personality and dietary intake – findings in the Helsinki birth cohort study. *PLoS One* 2013;8(7):e68284.
35. Jackson DB, Beaver KM. The influence of nutritional factors on verbal deficits and psychopathic personality traits: evidence of the moderating role of the MAOA genotype. *IJERPH* 2015;12(12):15739–55.
36. Kessler CS, Holler S, Joy S, Dhruva A, Michalsen A, Dobos G, Cramer H. Personality profiles, values and empathy: differences between lacto-ovo-vegetarians and vegans. *Forsch Komplementmed* 2016;23(2):95–102.
37. Sagioglou C, Greitemeyer T. Individual differences in bitter taste preferences are associated with antisocial personality traits. *Appetite* 2016;96:299–308.
38. Conner TS, Thompson LM, Knight RL, Flett JA, Richardson AC, Brookie KL. The role of personality traits in young adult fruit and vegetable consumption. *Front Psychol* 2017;8:119.
39. Forestell CA, Nezelek JB. Vegetarianism, depression, and the five factor model of personality. *Ecology of Food and Nutrition* 2018;57(3):246–59.
40. Harmon D, Gauvain M, Reisz Z, Arthur I, Story SD. Preference for tap, bottled, and recycled water: relations to PTC taste sensitivity and personality. *Appetite* 2018;121:119–28.
41. Perälä MM, Tiainen AM, Lahti J, Männistö S, Lahti M, Heinonen K, Kaartinen NE, Pesonen AK, Kajantie E, Rääkkönen K, Eriksson JG. Food and nutrient intakes by temperament traits: findings in the Helsinki Birth Cohort Study. *Eur J Clin Nutr* 2018;72(8):1136–41.
42. Armijo-Olivo S, Stiles CR, Hagen NA, Biondo PD, Cummings GG. Assessment of study quality for systematic reviews: a comparison of the Cochrane Collaboration Risk of Bias Tool and the Effective Public Health Practice Project Quality Assessment Tool: methodological research. *J Eval Clin Pract* 2012;18(1):12–8.
43. Ohi K, Shimada T, Nitta Y, Kihara H, Okubo H, Uehara T, Kawasaki Y. The Five-Factor Model personality traits in schizophrenia: a meta-analysis. *Psychiatry Res* 2016;240:34–41.
44. Dipasquale S, Pariante CM, Dazzan P, Aguglia E, McGuire P, Mondelli V. The dietary pattern of patients with schizophrenia: a systematic review. *J Psychiatr Res* 2013;47(2):197–207.
45. De Berardis D, Fornaro M, Orsolini L, Valchera A, Carano A, Vellante F, Perna G, Serafini G, Gonda X, Pompili M, Martinotti G, Di Giannantonio M. Alexithymia and suicide risk in psychiatric disorders: a mini-review. *Front Psychiatry* 2017;8:14.
46. Dinu M, Abbate R, Gensini GF, Casini A, Sofi F. Vegetarian, vegan diets and multiple health outcomes: a systematic review with meta-analysis of observational studies. *Crit Rev Food Sci Nutr* 2017;57(17):3640–49.
47. Walker ER, McGee RE, Druss BG. Mortality in mental disorders and global disease burden implications: a systematic review and meta-analysis. *JAMA Psychiatry* 2015;72(4):334–41.
48. Siafis S, Tzachanis D, Samara M, Papazisis G. Antipsychotic drugs: from receptor-binding profiles to metabolic side effects. *CN* 2018;16(8):1210–23.