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Personality Traits Predict Dietary Habits in Middle-to-Older Adults

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Abstract

Personality traits are consistently associated with health behaviors, but little research has examined the role of personality on eating habits among middle-to-older adults. The current study (n = 665) examined the associations between traits and dietary habits and whether healthy eating predicted health at age 60, with the Hawaii Personality and Health Cohort. Eating healthy foods was associated with higher agreeableness, conscientiousness, emotional stability, and openness, and predicted better self-rated health and lower BMI. Eating unhealthy foods was associated with lower agreeableness, conscientiousness, emotional stability, and openness, and predicted lower self-rated health. Results were not moderated by SES.

Keywords

personality; diet; BMI; health; adulthood; socioeconomic status

Personality traits have proven consistent predictors of prominent health outcomes associated with eating practices. Personality traits are predictive of body mass index and weight (Möttus, McNeill, Jia, Craig, Starr, & Deary, 2016; Sutin & Terracciano, 2016a, 2016b; Terracciano, Sutin, McCrae, Deiana, Ferrucci, Schlessinger, & Costa, 2009), risk for diabetes (Jokela, Elovainio, Nyberg, Tabák, Hintsa, Batty, & Kivimäki, 2014; Weston, Hill & Jackson, 2015), and likelihood for eating disorders (Ghaderi & Scott, 2000). For instance, conscientious individuals, those with a proclivity towards self-control and orderliness (Roberts, Jackson, Fayard, Edmonds, & Meints, 2009), tend to experience reduced risk across the health outcomes noted above. Contrarily, researchers have linked neuroticism to greater disordered eating behaviors (e.g., Cervera, Lahortiga, Martinez-Gonzalez, Gual, Irala-Estevez, & Alonso, 2003; Eggert, Levendosky, & Klump, 2007; Heaven, Mulligan, Merrilees, Woods, & Fairooz, 2001). Other traits also appear to play a role in eating practices. For instance, items assessing levels of openness to experience often ask participants whether they are willing to try new foods (Johnson, 2014). Agreeableness and

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extraversion may be related to greater tendencies for social eating, in order to maintain and facilitate social relationships. However, whether these eating practices are viewed as “healthy” or “unhealthy” would be defined by the specific situation.

Given this array of findings, it is surprising that relatively little research has investigated the links between these personality traits and specific dietary practices. When participants are asked about specific intake across different foods, the results thus far are mixed. Two studies have found modest linkages between conscientiousness and eating a healthier diet (Goldberg & Strycker, 2002; Möttus et al., 2016), and these studies, along with a third, support positive associations with openness to experience (Brummet, Siegler, Day, & Costa, 2008). However, none support a link between dietary practices and neuroticism, and some findings suggest a positive association with agreeableness and healthy/unhealthy eating (Möttus et al., 2016).

Moreover, the correlations between personality traits and diet are likely more nuanced than can be captured by only zero-order associations. For instance, one study suggests that the positive association between openness and healthy diet may be explained partly by their shared association with education (Möttus et al., 2016). Another factor meriting investigation is socioeconomic status (SES). Previous research has demonstrated that personality traits influence health outcomes differently for individuals within higher versus lower socioeconomic strata (Chapman, Fiscella, Kawachi, & Duberstein, 2010). One possibility is that personality traits have a stronger influence on health outcomes for those individuals without financial resources to protect against health concerns. For instance, work suggests that conscientiousness may be more protective against health concerns for those without socioeconomic resources, while neuroticism conversely appears more problematic for these individuals (e.g., Elliot, Turiano, & Chapman, 2017). Similarly, high neuroticism predicts a greater risk of mortality by cardiovascular disease for women of lower SES, but neuroticism is protective for those of higher SES (Hagger-Johnson, Sabia, Nabit, Brunner, Kivimaki, Shipley, & Singh-Manoux, 2012). Therefore, paired with the influence of SES on available dietary choices, it is integral to consider SES as a factor influencing the role of personality on dietary choices.

Current Study

The current study sought to make three primary additions to the literature on personality and healthy eating practices. First, the current study sought to replicate and extend the current findings on the Big Five and dietary practices, by asking participants for their intake of specific foods and then creating broader dietary factors from these items. This methodology avoids asking participants for their own perceptions of healthy and unhealthy eating habits, which attenuates the potential for self-enhancing biases in reporting. Second, we extended the investigation to health outcomes associated with eating practices, such as body mass index (BMI) and reported diabetes status, to advance our understanding of the associations between personality and those outcomes.

Third, and most important, we provide the first examination of whether personality traits influence dietary practices differently based on SES. Moreover, we consider whether the associations between diet and health outcomes are moderated by SES. Given the obvious influence that personal wealth holds on food availability and dietary options, testing interactions between personality traits and SES provides a necessary advance to the literature. Based on past work with objective health outcomes (Elliot et al., 2017), one possibility is that traits hold stronger associations with dietary choices for individuals of lower SES, because personality may prove more influential when the individual lacks other resources for promoting healthy eating. However, given that greater wealth provides more dietary options, personality may predict dietary behavior more strongly for individuals of higher status, as traits may have a greater opportunity to impact behavior when the individual has more choices available and decisions to make. Accordingly, testing interactions between personality and SES provides a valuable step forward and an opportunity to compare these competing hypotheses.

Methods

Participants

Participants comprise a subset of the Hawaii Personality and Health Cohort (Hampson, Dubanoski, Hamada, Marsella, Matsukawa, Suarez, & Goldberg, 2001; Hampson, Goldberg, Vogt, & Dubanoski, 2007). This cohort was originally assessed between 1959 and 1967 as children when they were rated on personality characteristics by their teachers. In 1998, efforts to find these children, now middle-to-older adults, were begun. When members of the original cohort were located (i.e., rolling recruitment), they were invited to join the study. Since joining, participants have completed one or more of eight questionnaires and, from 2003 onward, have been invited to attend a half-day medical and psychological examination. Measures in the current study were drawn from Q1 (food frequency questionnaire; 1999), Q5 (adult personality; assessed in 2008) and Q7 (self-rated health and self-reported diabetes status; assessed in 2015), and the clinic visit (body mass index; assessed when participant was age 50).

Of the 2,418 in the original child cohort, 1,387 (73%) have been recruited and have completed at least one questionnaire. To be included in the subsample for this study, participants had to have completed the adult personality questionnaire and the food frequency questionnaire. This resulted in a subsample of 665 participants (48% female; Mean age: 44.09 years at diet assessment). This sample size gives us 90% power to detect correlations at least as large as $r = 0.13$.

Measures

Personality.—Participants completed the 120-item NEO from the International Personality Item Pool (Johnson, 2014), in which participants are asked to rate how well a phrased item describes them on a scale from 1 (*Not at all*) to 5 (*Very much*). Each of the Big Five traits is estimated as a composite of 24 of these phrased items, and the reliability of these measures was very good: extraversion (α = .88 [.005]), agreeableness (α = .81 [.007]), conscientiousness (α = .87 [.005]), neuroticism (α = .88 [.005]), and openness (α = .77 [.008]).

Self-Rated Health.—Participants rated their own general health, compared to others of their same age and sex, on a scale from 1 (*Poor*) to 5 (*Excellent*; *M* = 3.37, *SD* = 0.99). ***Body Mass Index*** (kg/m^2; *M* = 28.58, *SD* = 6.39) was measured by research staff when participants were about age 50. Finally, participants self-reported whether a physician had ever diagnosed them with ***Type II Diabetes*** (19% of participants had been diagnosed). Of the 665 participants who completed both personality and food consumption questionnaires, 592 (89%) had data for at least one of these health measures.

Socioeconomic status (SES) was calculated as a composite of two measures. The first, the maximum income earned by the participant over their lifespan, was measured on a scale from 1 (*Less than $10K per year*) to 5 (*More than $80K per year*, *M* = 3.69; *SD* = 1.04). The second, the highest educational degree or grade achieved, was measured on a scale from 1 (*eighth grade or less*) to 9 (*postgrad or professional degree*; *M* = 7.00, *SD* = 1.73). These variables correlated at $r = 0.36$, which was large enough to justify creating a composite using a one-factor principal components analysis. Of the 665 participants who completed both personality and food consumption questionnaires, 414 (62%) had data for at least one of these SES measures. These participants also had data for at least one health measure.

Food Consumption was assessed using the Hawaii Quantitative Food Frequency Questionnaire (Stram et al., 2000). For this questionnaire, participants are given a list of 24 different foods or food categories and asked to rate how often they consume these foods on a scale from 1 (*Not at all*) to 7 (*Two or more times a day*). Specific food categories are listed in Supplementary Table 1, along with the frequency of endorsement for each response option for each item. The inventory was designed to capture both foods common across the world, as well as those unique to the Hawaiian sample.

Data reduction procedures are common when analyzing food consumption (Mõttus et al., 2013; Goldberg & Strycker, 2002), and so we used factor analysis to represent these items. To determine the number of factors to extract, we examined plots of fit statistics (specifically, complexity, root mean square, and empirical BIC) for inflection points at which fit dramatically reduces with greater complexity. We also looked for when the RMSEA fit statistic dropped below .10, a common cutoff. From these plots and cutoffs, we then extracted the one-factor, two-factor and three-factor solutions and examined the loadings. Our goal was to identify the solution that best balanced parsimony with representativeness of all items. To this end, we looked to see that factors had at least some large loadings (i.e., greater than .60) and that nearly every item loaded substantially onto at least one factor (i.e., with a loading of at least .20)[1]. The solution that met these criteria with the greatest complexity was the two-factor solution, which accounted for 23% of the total variance (RMSEA = .066 [.061, .068]). The first factor was defined by positive loadings of meats (e.g., hamburgers, sausage, spam, steak) fried foods (e.g., French fries, potato chips, doughnuts), and carbohydrate-rich foods (e.g., macaroni, potato salad, pizza, spaghetti, rice, chow mein). The second factor was defined by positive loadings of vegetables, high-fiber

[1]The only item that did not load substantially on either factor was poi. Future research may need larger, or targeted samples to better understand the role of personality on culturally important, though potentially less widely consumed foods, such as poi. For frequency of responses to all items, see Supplemental Table 1.

cereals, whole grains, skim milk, chicken, fish and tofu. This solution can be seen in Supplementary Table 2. At the risk of overgeneralizing, we labeled these factors as “unhealthy foods” and “healthy foods,” respectively. Factor scores were estimated using regression-based weights.

Results

Descriptive statistics of the study variables along with their sex differences and their correlation with age and education at the time of the food consumption assessment are presented in Table 1. Correlations of personality traits with food consumption variables and health variables (i.e., self-rated health, BMI and Type II Diabetes) are presented in Table 2.

Women reported higher intake of healthy foods and lower intake of unhealthy foods than men (See Table 1). Women also scored higher on all personality traits, reported higher self-rated health, and had lower BMI scores. Age was associated with eating more healthy foods and fewer unhealthy foods. Age was not associated with personality traits or health variables. These findings suggest that any evidenced relationships between personality traits or health variables and the food consumption variables may be due to gender differences. Therefore, when computing correlations between these variables we present both the zero-order correlations and the partial correlations controlling for gender, to determine whether this relationship is accounted for by gender differences. We also control for age, despite its lack of significant associations with personality and health, to allow for easier comparison against other studies.

Higher levels of agreeableness, conscientiousness, and openness and lower levels of neuroticism were all related to consuming more healthy foods and fewer unhealthy foods, even after controlling for age and gender. Greater consumption of healthy foods was also associated with better self-reported health, lower BMI scores and lower likelihood of Type II diabetes, even after controlling for age and gender. Greater consumption of unhealthy foods was associated with lower self-reported health and higher BMI before controlling for age and gender, but only self-reported health after controlling for these variables.

We then examined whether the relationships between the food consumption variables and personality and health were moderated by levels of SES. To do so, we used multiple regression predicting scores on the food consumption variables by SES, each of the personality and health variables, and their interaction terms with SES, and we controlled for age and gender. We also calculated the partial correlation between food consumption and the personality or health variable at high and low levels of SES by standardizing all variables and centering at SES at 1 and −1, respectively. We then extracted the standardized coefficient estimate for the personality or health variable. This coefficient estimate represents the partial correlation between that variable and the food consumption outcome controlling for age and gender and at that particular SES level. In other words, by centering at different levels of SES, we estimate the relationship of personality and health at those SES levels. Results are shown in Table 3.

To summarize, SES only significantly moderated the relationship between neuroticism and consumption of unhealthy foods such that at low levels of SES, neuroticism was unrelated to eating unhealthy foods, but at high levels of SES, neuroticism was positively associated with eating unhealthy foods. We caution against over-interpreting this result, however, as we ran 16 separate regression models for these analyses, resulting in a family-wise Type I error rate of 56%. We also performed analyses with just the income variable and again with just the education variable, rather than their composite, to determine whether the results were sensitive to changes in the SES operationalization. These results can be found in Supplemental Tables 3 and 4. When using maximum lifetime income, the coefficient of the interaction of neuroticism and SES was nearly identical ($b = 0.14$ vs $b = 0.17$), but no longer significant; when using education, the effect was nearly null ($b = 0.01$). Overall, we would conclude that the relationship between personality traits and food consumption is unrelated to levels of SES.

At the request of reviewers, we also explored the interactions of gender with personality and health variables to predict dieting. None of these interactions were significant; all results are reported in Supplemental Table 5.

Discussion

The current study found that personality traits are associated with greater healthy food intake and lower unhealthy food intake, specifically higher levels of agreeableness, conscientiousness, and openness and lower levels of neuroticism. In only one case did SES change the relationship between traits and eating, and in that case, the association between neuroticism and consumption of unhealthy foods was stronger at higher levels of SES. However, this result should be interpreted as random error, as the large number of interactions tested would likely yield a significance result by chance and tests of sensitivity to the operationalization of SES failed.

The lack of moderation of personality by SES on eating is an important insight. First, it suggests that, if SES truly moderates the relationship between personality and health (e.g., Hagger-Johnson et al., 2012), this is not necessarily because those with fewer monetary or status resources find the effects of personality are more constrained. Having a lower status may constrain the ability to engage in other health behaviors, for instance exercise and physical fitness, and thus further relationships should continue to examine the personality-SES transaction on health behaviors. Interest in whether personality traits are strong predictors of behavior is related to efforts to tailor health interventions (Hagger-Johnson & Whiteman, 2008). Given these results, it would by hypothesized that individuals low in agreeableness, conscientiousness, openness and high in neuroticism would receive greater benefits from diet interventions. Importantly, the need for such an intervention would not be expected to vary with socioeconomic status.

In addition, healthy and unhealthy eating were related to indices of health. Interestingly, these associations were stronger for subjective health than for the more objective measures: BMI and diabetes status. Past research has noted the differences between personality associations with clinician-assessed BMI (as collected here) and self-reported BMI (Sutin &

Terracciano, 2016a). In conjunction with the current study, those findings suggest different mechanisms affecting objective and subjective health. Those experiences and behaviors which help patients become healthier may not in fact help them *feel* healthier and vice versa. As health-care providers aim to develop more person-centered approaches to health care (Condon, Weston & Hill, 2017; Epstein et al., 2010), these mechanisms warrant greater examination.

The use of the Hawaii sample serves as both a strength and limitation of the current study. To our knowledge, there are no other studies which have assessed diet variables and personality traits so thoroughly, in conjunction with specific health outcomes and biomarkers of health. However, the study is necessarily limited in its generalizability. The restricted age range of participants does not allow us to generalize to younger adults or older adults. In addition, the location and culture of participants certainly impacts the availability of certain foods and frequency at which many foods are consumed. While the general factors of healthy and unhealthy foods will likely be found in other samples, their composition will differ. In addition, self-reports of food consumption are likely susceptible to bias; for instance, participants may be more likely to report on the foods they had eaten over the last week. Additional methods of measuring food consumption should be utilized to estimate the sensitivity of these findings. Furthermore, it will be important to replicate the moderation tests using more sensitive measures of socioeconomic status.

Overall, the current study found that food consumption items can be parsed into two distinct factors, healthy and unhealthy foods, which are associated with both health outcomes and with personality traits. These results help to identify mechanisms through which personality traits may predict or even influence health outcomes. In the United States, the leading causes of mortality include among them heart disease and diabetes (National Center for Health Statistics, 2017). These diseases are largely influenced by behavior, especially food consumption. The link between personality traits and dietary factors suggests that the relationship between personality and mortality is in part explained by dietary factors.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Descriptive statistics of study variables.

	Total Sample			Men			Women					
	N	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*	*d* (sex)	r_{AGE}	r_{SES}
Extraversion	665	3.41	0.53	322	3.35	0.53	343	3.46	0.52	−0.19*	−.07	−.01
Agreeableness	665	3.83	0.40	322	3.73	0.39	343	3.93	0.38	−0.53*	.01	.00
Conscientiousness	665	4.01	0.46	322	3.98	0.46	343	4.03	0.46	−0.12*	−.01	.19*
Neuroticism	665	2.58	0.56	322	2.55	0.52	343	2.62	0.59	−0.12*	−.02	−.17*
Openness	665	3.14	0.42	322	3.07	0.40	343	3.21	0.42	−0.36*	.04	.16*
Healthy foods	665	−0.02	0.89	322	−0.14	0.88	343	0.10	0.88	−0.28*	.11*	.24*
Unhealthy foods	665	0.01	0.90	322	0.16	0.95	343	−0.14	0.82	0.34*	−.09*	−.12*
Self-rated health	487	3.29	0.94	227	3.17	0.98	260	3.40	0.89	−0.24*	.06	.24*
BMI	493	28.58	6.39	237	29.91	5.76	256	27.34	6.70	0.41*	−.03	−.20*
Type II Diabetes	486	0.19	0.39	227	0.19	0.40	259	0.18	0.38	0.04	−.01	−.13*
Income	415	3.69	1.04	206	3.96	1.00	209	3.43	1.00	0.53*	.17*	.86*
Education	663	7.00	1.73	320	6.93	1.79	343	7.07	1.67	−0.08	.17*	.79*
Age at diet assessment	665	44.09	1.97	322	44.12	1.88	343	44.06	2.04	0.03	-	.23*
SES	414	0.20	0.91	205	0.34	0.93	209	0.06	0.86	0.31*	.23*	-

Note:

* $p < .05$. N = total number of non-missing responses, M = mean, SD = standard deviation. Cohen’s d is the effect size presented, with positive numbers indicating that men have higher responses; Welch’s t-tests were used to estimate significance. r_{AGE} is the correlation with age at the time of the clinic assessment; r_{SES} is the correlation with the composite SES variable.

Table 2.

Correlations of personality and health variables with food consumption factors.

	Healthy foods		Unhealthy foods		Self-rated health		BMI		Type II Diabetes	
	r	***r_p***	***r***	***r_p***	***r***	***r_p***	***r***	***r_p***	***r***	***r_p***
Extraversion	0.07	0.06	−0.01	−0.01	0.19*	0.18*	0.01	0.04	0.00	0.00
Agreeableness	0.12*	0.09*	−0.13*	−0.09*	0.14*	0.12*	−0.07	−0.01	−0.01	−0.01
Conscientiousness	0.17*	0.16*	−0.14*	−0.13*	0.23*	0.23*	−0.05	−0.04	−0.04	−0.04
Neuroticism	−0.16*	−0.17*	0.11*	0.12*	−0.33*	−0.33*	0.13*	0.15*	0.06	0.06
Openness	0.20*	0.18*	−0.16*	−0.14*	0.18*	0.16*	−0.13*	−0.10*	−0.04	−0.04
Self-rated health	0.24*	0.22*	−0.16*	−0.14*	-	-	−0.31*	−0.31*	−0.31*	−0.31*
BMI	−0.21*	−0.18*	0.09*	0.02	−0.31*	−0.31*	-	-	0.38*	0.37*
Type II Diabetes	−0.10*	−0.09*	0.06	0.05	−0.31*	−0.31*	0.38*	0.37*	-	-

Note:

*$p < .05$, r = zero-order correlation, r_p = partial correlation controlling for age and gender, BMI = body mass index (kg/m^2). Age was the age when the participant completed the diet questionnaire, unless BMI was one of the variables, in which case age at the time of the clinic assessment was used as the covariate.

Table 3.

Interactions of personality and health variables with SES with food consumption outcomes.

	Healthy foods				Unhealthy foods			
Predictor	***b***	SE_b	r_{LOW}	r_{HIGH}	***b***	SE_b	r_{LOW}	r_{HIGH}
Extraversion	0.02	0.08	0.01	0.04	−0.16	0.08	0.10	−0.05
Agreeableness	−0.05	0.11	0.07	0.03	−0.16	0.11	0.02	−0.09
Conscientiousness	−0.06	0.11	0.09	0.04	−0.15	0.11	0.00	−0.12
Neuroticism	0.04	0.08	−0.11	−0.06	0.19*	0.08	−0.04	0.15*
Openness	0.08	0.12	0.08	0.14*	−0.05	0.12	−0.04	−0.08
Self-rated Health	−0.01	0.05	0.17*	0.15*	0.01	0.05	−0.12	−0.08
BMI	0.00	0.01	−0.14	−0.14	0.00	0.01	0.03	0.03
Type II Diabetes	0.03	0.12	−0.07	−0.05	−0.01	0.12	0.04	0.03

Note:

* $p < .05$; b = unstandardized regression coefficient, SE_b = standard error of the regression coefficient; r_{LOW} = correlation between predictor and outcome when SES is one standard deviation below the mean, r_{HIGH} = correlation between predictor and outcome when SES is one standard deviation above the mean, BMI = body mass index (kg/m^2). All regressions control for age and gender. Age is the age at which participants completed the diet questionnaire, except when BMI is the predictor, in which case age is the age at which the participant completed the clinic visit.