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Examining the "Veggie" Personality: Results from a Representative German Sample

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Abstract

An increasing proportion of people choose to follow a vegetarian diet. To date, however, little is known about if and how individual differences in personality relate to following a vegetarian diet. In the two studies presented here, we aimed to (1) estimate the prevalence of self-defined vegetarians in two waves of a German representative sample (N = 4,496 and 5,125, respectively), (2) analyze the effect of socio-demographic variables on dietary behavior, and (3) examine individual differences between vegetarians and meat eaters in personality traits, political attitudes, and health-related variables. In Study 1, a strict definition of vegetarians was used, while in Study 2 the definition was laxer, to include also individuals who only predominantly followed a vegetarian diet. The prevalence of self-defined vegetarians was 2.74% in Study 1, and 5.97% in Study 2. Participants who were female, younger, and more educated were more likely to report following a vegetarian diet in both studies, and vegetarians had higher income as compared to meat eaters in Study 2. We also found differences between vegetarians and meat eaters with regard to personality traits, political attitudes, and health-related variables. Stepwise logistic regression analyses showed a unique effect beyond socio-demographic variables for openness (Studies 1 and 2), conscientiousness (Study 1), trust (Study 2), conservatism (Studies 1 and 2), and level of interest in politics (Study 1) on diet: Individuals with higher scores in openness and political interest had a higher probability of being vegetarian, whereas people with higher scores in conscientiousness and conservatism had a smaller likelihood of being vegetarian. We conclude that there are individual differences between vegetarians and meat eaters in socio-demographics, personality traits, and political attitudes.

Keywords: Vegetarian diet, personality traits, Big Five, prevalence, meat eating, political attitudes.

Examining the "Veggie" Personality: Results from a Representative German Sample

1. Introduction

Vegetarianism and veganism have a growing international following, and the choice to stop eating meat or other animal products is a widely discussed and social relevant issue. A representative survey conducted in 2006 in Germany found that only 1.6% of respondents reported not eating meat (Max-Rubner Institut, 2008); in a more recent representative survey conducted by the Robert-Koch Institute, the percentage of vegetarians had increased to 4.3% (Mensink, Barbosa, & Brettschneider, 2016). Vegetarianism and veganism are not only influencing food choices, but are part of a growing social movement regarding animal welfare and animal rights. In line with this assumption, there is a growing body of research investigating individual differences in political and animal-rights related attitudes, with regard to how they correlate with diet (Dhont & Hodson, 2014; Monteiro, Pfeiler, Milburn, & Patterson, 2017). However, few studies to date have examined broader personality differences between vegetarians and meat eaters. In the present two studies, we therefore aimed to fill this gap by investigating individual differences between vegetarians and meat eaters in socio-demographic variables, personality traits, political attitudes, and health-related variables in two waves of a German representative sample.

1.1. Definitions of vegetarian diet

A vegetarian diet is commonly defined as one that excludes both red and white meat, including fish and seafood (Ruby, 2012), while a vegan diet excludes all animal products (Rosenfeld & Burrow, 2017). However, not all vegetarians adhere to these definitions (Ruby, 2012), with many self-defined vegetarians still consuming red or white meat products, as well as fish or seafood (Barr & Chapman, 2002; Gossard & York, 2003; Krizmanic, 1992; Kwan & Roth,

2004; Willets, 1997). These findings indicate that people may self-identify as vegetarians, but still eat meat occasionally. Moreover, estimates of the prevalence of vegetarianism fluctuate over time, country, and specific study. The prevalence of a vegetarian diet has varied between 2% and 10% in the past 20 years in Germany (Mensink et al., 2016), and between 2% and 9% in other Western Europe countries and the United States (Leitzmann, 2014). Given these considerable differences, clearly defining vegetarianism is crucial to creating comparable studies on vegetarianism.

1.2. Individual differences between vegetarians and meat eaters

Gender, age, and socioeconomic status are the sociodemographic factors most associated with diet (Lea & Worsley, 2001; Stoll-Kleemann, 2014). Women are more often vegetarian than men (Allen, Wilson, Ng, & Dunne, 2000; Neumark-Sztainer et al., 1997; Tobler, Visschers, & Siegrist, 2011). Meat has long been a symbol of male strength and dominance over nature (Rothgerber, 2013; Ruby & Heine, 2011), and even in present times, meat is seen as the archetypical food for men (Adams, 2010; Rozin, Hormes, Faith, & Wansink, 2012; Sobal, 2005). In contrast, the consumption of fruits, vegetables, and grains is generally associated with femininity and weakness (Beardsworth & Bryman, 1999; Fraser, Welch, Luben, Bingham, & Day, 2000).

Other studies have found that vegetarians are younger and have a higher level of education compared to meat eaters (Aston, Smith, & Powles, 2013; Wiig & Smith, 2008). Leahy et al. (2010) found a positive association between a vegetarian diet and income, while Darmon and Drewnowski (2008) found that people of higher socioeconomic status reported eating lower quantities of fatty meats. However, social norms and culture play an important role in these relationships. For example, in emerging economies such as China, meat consumption is

positively related to income (Garnett & Wilkes, 2014), as this continues to be a way to display one's wealth.

With respect to personality traits, the Big Five personality traits (i.e., openness, conscientiousness, agreeableness, extraversion, and neuroticism; Digman, 1990) have been associated with what people eat (Brummett, Siegler, Day, & Costa, 2008; Goldberg & Strycker, 2002; Keller & Siegrist, 2015). Conscientiousness has been negatively associated with unhealthy eating (Bogg & Roberts, 2004), while extraversion and openness have been shown to have positive relationships with healthy eating (Brummet et al., 2008; Keller & Siegrist, 2015). Steptoe et al. (1995) also reported that willingness to try new foods is related to openness, and Conner et al. (2017) found that openness and extraversion were related to greater fruit and vegetable consumption in young adults.

However, to our knowledge, only five studies have examined the association between the Big Five and a vegetarian diet. In a Swiss convenience sample, Keller and Siegrist (2015) found that agreeableness and conscientiousness were negatively associated with meat consumption, while extraversion, neuroticism, and openness were not associated with diet. Goldberg and Strycker (2002) reported that the avoidance of meat fats was positively related to openness in a US community sample. In a large sample of Estonians, Mõttus et al. (2012) investigated meat consumption as part of a traditional diet, and found that extraversion and openness were negatively associated with a traditional diet. In a study of older adults in Scotland, Mõttus et al. (2013) further reported that openness, conscientiousness, and agreeableness were positively associated with a health-aware diet that included less meat consumption. Kessler et al. (2016) investigated personality traits in an online survey of members and supporters of the German Vegetarian Society. In this study, vegetarians showed significantly less extraversion, along with higher openness, agreeableness, and conscientiousness compared to meat eaters; in addition,

vegans reported significantly less neuroticism and extraversion, as well as higher openness, agreeableness, and conscientiousness compared to meat eaters (Kessler et al., 2016).

In sum, research to date has yielded inconsistent results regarding the associations between personality difference and diet: Although four of five studies examining the association between the Big Five and a vegetarian diet reported a positive relation between openness and a vegetarian diet, and three of five studies reported a positive association between a vegetarian diet and agreeableness and conscientiousness, results regarding the association between diet and extraversion and neuroticism have been inconsistent. Furthermore, all of these studies used non-representative convenience samples, and three examined a vegetarian diet indirectly, via a dietary pattern (e.g., traditional diet, health-conscious diet) that included meat consumption.

Another line of research has investigated the relationship between dietary groups and political attitudes. As meat consumption can be viewed as a social and traditional norm in the Western world (Beardsworth & Bryman, 2004; Fiddes, 1992), it may be associated with conservative attitudes. This assumption has been confirmed by recent research showing that a vegetarian diet is negatively associated with both conservatism (Monteiro et al., 2017) and with right-wing ideologies (Allen, Wilson, Ng, & Dunne, 2000; Dhont & Hodson, 2014; Veser, Taylor & Singer, 2015). Moreover, research has shown that political values are in general an important motive in food choices (Chen, 2007; Honkanen, Verplanken, & Olsen; 2006).

Past studies indicate that perceived healthiness of food and health-related issues generally tend to be an important factor influencing food choice (Roininen, Lähteenmäki, & Tuorila, 1999; Scheibehenne, Miesler, & Todd, 2007; Steptoe, Pollard, & Wardle, 1995). As a growing body of research has linked meat consumption with an increased risk of obesity, heart disease, and cancer (Chao et al., 2005; Sinha, Cross, Graubard, Leitzmann, & Schatzkin, 2009; Wang & Beydoun, 2009), it is not surprising that health concerns are one of the most important motives for changing

to a vegetarian diet (Dibb & Fitzpatrick, 2014, Tobler et al., 2011). Based on these findings, it could be argued that following a vegetarian diet might be associated with better self-reported levels of health relative to meat eaters.

1.3. The present studies

We had three goals with the present studies: The first was to investigate the prevalence of self-defined vegetarians (including vegans) in a German representative sample. The second was to examine the relationships between the socio-demographic variables of age, gender, education, and income on dietary behavior. The third was to investigate individual differences between vegetarians and meat eaters in broader personality traits, political attitudes, and health-related variables. We also analyzed individual differences between vegetarians and meat eaters after controlling for socio-economic variables.

Based on prior research, we hypothesized that, compared to meat eaters, vegetarians were more likely to be female and younger, and to have more education and a higher income. We also anticipated individual differences between vegetarians and meat eaters in the Big Five personality traits, as well as in level of conservatism and in self-reported health. We predicted that vegetarians would have higher scores in openness and conscientiousness, be less conservative, and report perceiving themselves as more healthy. We also explored differences between diet groups for several other personality traits. By controlling for socio-demographic variables in our exploratory analyses, we hoped to determine whether the personality differences found between diet groups could be explained by these factors.

2. Study 1

Although prior research has shown individual differences between vegetarians and meat eaters, it has produced inconsistent results. Moreover, studies that have demonstrated relationships between personality variables and diet using representative samples are scarce. The

goal of Study 1 was therefore to examine individual difference in socio-demographics, personality traits, political attitudes, and self-reported health between meat eaters and strictly defined vegetarians in a representative German survey.

2.1. Method

The data used in Study 1 were provided by the German Socio-Economic Panel (SOEP) of the German Institute for Economic Research (Wagner, Frick, & Schupp, 2007) and the Innovation Sample of the SOEP in 2014 (SOEP-IS; Schupp et al., 2014). The SOEP-Core panel is a large longitudinal representative survey of private households and persons in Germany that started in 1984. The SOEP-IS panel is a subsample of the SOEP-Core panel designed for short-term experiments, as well as long-term surveys that are not possible in the SOEP-Core (see Richter & Schupp, 2012). The SOEP-IS meets the SOEP's criteria for representative sampling of the entire German population (Kroh, Kühne, & Siegers, 2017; Richter & Schupp, 2015). Annual SOEP-IS interviews have started in 2012, and each year new modules are selected in a peer-reviewed competition. Diet was assessed in the 2014 SOEP-IS, and the individual difference variables used in the present study were assessed in the 2013 and 2014 SOEP-CORE. We matched both data sets via a unique identifier for each person.

2.1.1. Participants

In 2014, the SOEP-IS contained N = 4,496 individuals (52.3% female, 47.7% male), all of whom responded to the question about diet (see Section 2.1.2). Their mean age was 51.84 years (SD = 18.36).

2.1.2. Measures

Diet was assessed with one item ("Are you vegetarian or vegan?"), based on the provided definition of "Vegetarians are people who do not eat meat and if so also avoid fish. Vegans do not eat any product of animals". Diet was coded with 1 = *yes, I am vegetarian*, 2 = *yes, I am*

vegan, 3 = *no*. In the 2014 SOEP-IS, $N = 13$ individuals indicated that they were vegan and $N = 110$ persons identified as vegetarian. To increase statistical power, we combined vegetarians and vegans into one group (vegetarians = 1) for our analyses.

Socio-demographic variables

The socio-demographic variables that we analyzed were age, gender, education, and household after-tax income assessed in 2014. Education was assessed at the individual level using multiple items and was based on the International Standard Classification of Education (ISCED-1997). These categories are: 0 = in school, 1 = school dropout, 2 = lower secondary education, 3 = upper secondary education, 4 = post-secondary non-tertiary education, 5 = first stage of tertiary education, and 6 = second stage of tertiary education (for details, see Organization for Economic Co-Operation and Development, 1999). The monthly household after-tax income was generated in the SOEP and given in Euros (Schwarze, 1995).

Personality variables

We investigated the following personality variables: The Big Five personality traits, trust, patience, impulsivity, and risk aversion (all of which were assessed in the SOEP-CORE in 2013), as well as current life-satisfaction and affective well-being (which were assessed in 2014).

The Big Five personality traits (i.e., openness, conscientiousness, extraversion, agreeableness, and neuroticism) were measured using a 15-item German short version of the Big Five Inventory (BFI-S, Gerlitz & Schupp, 2005; see Hahn, Gottschling, & Spinath, 2012, for information regarding validity). The openness trait reflects the tendency to be willing to try new things, open to emotion, and to be sensitive to aesthetics. Conscientiousness is characterized by displaying self-discipline, acting dutiful, and preferring planned behavior. Extraverted individuals tend to be enthusiastic and action-oriented, like to talk and assert themselves. Agreeableness is a tendency to show general concern for social harmony, to value getting along with others, and to be trusting

and helpful. The neuroticism trait is characterized by experiencing more negative emotions, being emotional instable, and having low tolerance for stress and aversive stimuli. All five personality traits were measured using three items on a 7-point Likert scale ranging from 1 (*does not apply at all*) to 7 (*applies completely*). Cronbach's alpha for the Big Five personality traits were: openness: $\alpha = .59$, conscientiousness: $\alpha = .59$, extraversion: $\alpha = .66$, agreeableness: $\alpha = .43$, and neuroticism: $\alpha = .62$.

Trust was measured using three items (e.g., "People can generally be trusted"; $\alpha = .54$) on a 4-point Likert scale (1 = *totally disagree*, 4 = *agree completely*) based on the scales used in the General Social Survey (GSS) and in the World Values Survey (WSS); an additional item was also added (for further information see Dohmen, Falk, Huffman, & Sunde, 2008).

Patience and impulsivity were assessed with one item each (Vischer et al., 2013; patience: "Would you describe yourself as an impatient or patient person in general?"; impulsivity: "Do you generally think things over for a long time before acting – in other words, are you not impulsive at all? Or do you generally act without thinking things over a long time – in other words, are you very impulsive?") on a scale ranging from 0 (patience: *very impatient;* impulsivity: *not at all impulsive*) to 10 (patience: *very patient;* impulsivity: *very impulsive*).

Risk aversion (Dohmen et al., 2011; Kahneman & Tversky, 1979; "Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?") was measured on an 11-point scale (0 = *risk averse*, 10 = *fully prepared to take risks*).

Current life-satisfaction was assessed using on item ("How satisfied are you with your life, all things considered?"; Schimmack, Krause, Wagner, & Schupp, 2009), with answers given on a 0 to 10 scale (0 = *completely dissatisfied,* 10 = *completely satisfied*).

Affective well-being was assessed using three items (Schimmack, Diener, & Oishi, 2002; e.g., "Thinking back on the last four weeks, please state how often you have experienced each of

the following feelings very rarely, rarely, occasionally, often, or very often. How often have you felt angry?", α = .65) on a 5-point Likert-type scale (1 = *very rarely*, 5 = *very often*).

Optimistic attitude about the future was assessed using one item ("When you think about the future, are you …?"; Trommsdorff, 1994) on a 4-point scale (1 = *pessimistic* to 4 = *optimistic*).

Political attitudes

Political attitudes were assessed in 2014. One item assessed conservatism on an 11-point Likert-type scale ("In politics people sometimes talk of left and right. Where would you place yourself on a scale from 0 to 10 where 0 means the left and 10 means the right?"). One item assessed level of political interest ("Generally speaking, how much are you interested in politics? A lot, heavily, not so much interested, or not interested at all?"), with answers given on a 4-point Likert scale (1 = *not interested at all*, 4 = *a lot interested*)

Self-reported health

Satisfaction with health and self-reported health status were measured using one item each in 2014. Satisfaction with health ("How satisfied are you with your health") was assessed on an 11-point Likert-type scale (0 = *totally unhappy*, 10 = *totally happy*), while current health status ("How would you describe your current health?") was assessed on a 5-point Likert scale (1 = *bad*, 5 = *very good*).

2.2. Results

2.2.1. Prevalence of vegetarianism and veganism

In the SOEP-IS 2014 sample, $N = 123$ (2.74%) individuals reported being vegetarian ($N = 110$, 2.45%) or vegan ($N = 13$, 0.29%), while $N = 4{,}373$ individuals (97.26%) indicated that they consumed meat.

Women and men significantly varied in how often they reported following a vegetarian diet ($chi^2 = 22.19$, $p < .001$). Of the $N = 123$ vegetarians, almost three times as many women ($N = 90$, 73.17%) followed a vegetarian diet than men ($N = 33$, 26.83%).

2.2.2. Individual differences between diet groups

To test difference between the diet groups, we conducted several *t*-tests (see Table 1). As hypothesized, vegetarians were younger and more educated compared to meat eaters; however, there was no significant difference between these groups in their household after-tax income. Vegetarians had significantly higher scores in openness, lower scores in conscientiousness, and higher levels of trust than individuals who ate meat. Individuals who reported not to eat meat displayed significantly lower levels of conservatism and greater political interest compared to meat eaters. With regard to current health status, vegetarians reported significantly better health than meat eaters. There were no significant differences between diet groups for any of the other study variables.

To test whether these significant individual differences between diet groups held after controlling for socio-demographic variables, we conducted hierarchical regression analyses with individual difference variables as dependent variables; the effects of socio-demographic variables were entered in the first step, and diet group was entered in the second step. As can be seen in Table 2, socio-demographic variables accounted for significant variance in openness, $F(4, 4020) = 41.09$, $p < .001$, conscientiousness, $F(4, 4017) = 37.38$, $p < .001$, trust, $F(4, 4018) = 93.12$, $p < .001$, conservatism, $F(4, 4052) = 17.81$, $p < .001$, political interests, $F(4, 4215) = 275.44$, $p < .001$, and current health status, $F(4, 4214) = 133.55$, $p < .001$. Including diet group in the second step led to a significant increase in the explained variance of openness, $F_{\Delta}(1, 4019) = 7.80$, $p = .005$, conscientiousness, $F_{\Delta}(1, 4016) = 11.63$, $p < .001$, conservatism, $F_{\Delta}(1, 4051) = 26.89$, $p < .001$, and political interest, $F_{\Delta}(1, 4214) = 18.93$, $p < .001$. However, the effect of diet group on

current health status found in the *t*-tests did not hold when sociodemographic variables were controlled for trust, $F_{\Delta}(1, 4017) = 3.78$, $p = .052$, and current health status, $F_{\Delta}(1, 4213) = 0.27$, $p = .606$.

Finally, to test whether any of the personality traits show a *unique* additional effect beyond the socio-demographic variables (i.e. testing the importance of those personality variables against each other), we conducted a stepwise logistic regression analysis. Here, we treated diet as an outcome variable and included socio-demographic variables in the first block, and all significant individual difference variables in the second block (see Table 3). In the first block, sex, age, and education were significant predictors of diet. In the second block, openness, conscientiousness, conservatism, and political interest were all significant predictors of diet. Individuals with higher scores in openness and political interest had a higher probability of being vegetarian, whereas people with higher scores in conscientiousness and conservatism had a smaller likelihood of being vegetarian. Thus, all the included individual difference variables showed a unique effect on diet.

2.3. Discussion

Study 1 showed a prevalence of vegetarians of about 2.74% using a large representative German sample (ages 17–96). In Study 1 we investigated individual differences between vegetarians and meat eaters with regard to socio-demographic variables, personality traits, political attitudes, and subjective health. As we had expected, our findings highlighted that vegetarians are more often female, younger, and more educated compared to meat eaters. Moreover, vegetarians were more open, more trusting, less conscientious, less conservative, and more interested in politics; they also reported better self-reported health compared to meat eaters. After controlling for socio-demographic variables, however, diet group played a significant role

in explained variance of openness, conscientiousness, conservatism, and political interest, while it no longer played a significant role in the explained variance in trust and current health.

3. Study 2

Study 1 provided evidence regarding individual differences between strict vegetarians and meat eaters with respect to socio-demographic variables, openness, conscientiousness, and political attitudes. In Study 2, we examined these relationships between individual differences and diet group after applying a laxer definition of a vegetarian diet.

3.1. Method

3.1.1. Participants

In the 2015 SOEP-IS, $N = 5{,}125$ individuals (2,669 women, 2,409 men, 47 individuals who did not indicate their gender) answered the diet question (see Section 3.1.2). Their mean age was 52.42 years ($SD = 18.34$). Please note that as the 2015 SOEP-IS contained 3,868 persons who were also sampled in 2014 (a 75.47% overlap), the 2015 sample included a total of $N = 1{,}257$ new individuals (24.53%) who did not take part in the 2014 SOEP-IS.

3.1.2. Measures

In the 2015 SOEP-IS, participants indicated if they "predominantly or exclusively follow a vegetarian or vegan diet" (1 = vegan, 2 = vegetarian, 3 = no). This question is different from the diet assessment made in the 2014 SOEP-IS, in which (a) participants were asked if they were vegetarian or vegan, a definition of these diet types was explicitly given, and (b) the qualifier "predominantly" was not mentioned. Thus, the definition of "vegetarian diet" was laxer in the 2015 SOEP-IS. In the 2015 SOEP-IS, $N = 278$ individuals identified as vegetarians and $N = 28$ as vegans. To increase our statistical power, we combined the vegetarians and vegans (vegetarians = 1; meat eaters = 0) for our analyses of diet groups.

In Study 2, we analyzed the same individual difference measures as we did in Study 1.

3.2. Results

3.2.1. Prevalence of vegetarianism and veganism

In the SOEP-IS 2015 sample, $N = 306$ individuals (5.97%) indicated being predominantly or exclusively vegetarian ($N = 278$, 5.42%) or vegan ($N = 28$, 0.55%), while $N = 4{,}819$ (94.03%) reported not following a vegetarian or vegan diet. As in Study 1, there was a significant difference between women and men regarding how often they reported following a vegetarian diet ($chi^2 = 65.81$, $p < .001$). Women were far more likely than men ($N = 227$ vs. $N = 75$, respectively; $N = 4$ did not indicate their gender) to report following a vegetarian diet.

3.2.2. Individual Difference Variables

As in Study 1, we conducted several *t*-tests to investigate differences between the diet groups (see Table 3). In the 2015 SOEP-IS sample, vegetarians were younger and more educated, and reported a higher household after-tax income compared to meat eaters. Regarding personality variables, vegetarians were more open, and gave higher scores in trust and optimism about the future than meat eaters. Vegetarians were less conservative and more interested in politics than people who reported to eat meat. Additionally, vegetarians reported a better current health status and a higher satisfaction with their health compared to meat eaters.

As in Study 1, we conducted hierarchical regression analyses with all variables that showed significant relationships with diet as dependent variables, to test whether the individual differences between diet groups held after controlling for socio-demographic variables. Socio-demographic variables were entered in the first step, diet group in the second step (see Table 4). Including socio-demographic variables led to a significant increase in explained variance of openness, $F(4, 3488) = 33.49$, $p < .001$, trust, $F(4, 3488) = 88.67$, $p < .001$, optimism about the future, $F(4, 4496) = 32.52$, $p < .001$, conservatism, $F(4, 4335) = 19.16$, $p < .001$, political interest, $F(4, 4504) = 303.98$, $p < .001$, satisfaction with health, $F(4, 4508) = 80.67$, $p < .001$, and

current health status, $F(4, 4506) = 123.79$, $p < .001$. Adding diet group as a predictor in the second step significantly accounted for explained variance in openness, $F_{\Delta}(1, 3487) = 30.86$, $p < .001$, trust, $F_{\Delta}(1, 3487) = 8.99$, $p = .003$, conservatism, $F_{\Delta}(1, 4334) = 29.15$, $p < .001$, and political interest, $F_{\Delta}(1,4503) = 14.76$, $p < .001$. In contrast, associations between diet group and optimism, satisfaction with health, and current health status found in the *t*-tests were not significant after controlling for socio-demographic variables: optimism, $F_{\Delta}(1, 4495) = 0.70$, $p = .405$, satisfaction with health, $F_{\Delta}(1, 4507) = 0.41$, $p = .521$, and current health status, $F_{\Delta}(1, 4505) = 2.25$, $p = .134$.

We also conducted an analogous set of hierarchical regression analyses with the variables that showed *p*-values between .05 to .10 in the *t*-tests (conscientiousness, neuroticism, and risk aversion), however, including diet group in the second step did not lead to a significant increase in explained variance (all $p > .23$).

As in Study 1, we conducted a stepwise logistic regression analysis to test whether any of the personality traits shows a unique additional effect beyond the socio-demographic variables on diet (see Table 6). In the first block, sex, age, and education were significant predictors of diet. In the second block, openness, trust, and conservatism were significant predictors of diet, only political interest was not a significant predictor. Individuals with higher scores in openness and trust had a higher probability of being vegetarian, whereas people with higher scores in conservatism had a smaller likelihood of being vegetarian. Thus, openness, trust, and conservatism, but not political interest showed a unique effect on diet.

3.3. Discussion

In Study 2 we used a laxer definition of a vegetarian (including vegan) diet. In the 2015 SOEP-IS, we found that approximately 6% of a representative German sample self-defined as vegetarian or vegan. People who indicated that they predominantly or exclusively ate vegetarian

or vegan were more often female, younger, and more educated; additionally, in contrast to Study 1, they reported a higher household after-tax income compared to meat eaters. With respect to personality traits, the vegetarians in Study 2 scored significantly higher in openness, trust, and optimism than meat eaters. Vegetarians in Study 2 had reported lower levels of conservatism, greater interest in politics, and both more satisfaction with their health and better current self-reported health status compared to individuals who ate meat. After controlling for socio-demographic variables in multiple hierarchical regression analyses, diet group was a significant predictor of openness, trust, conservatism, and political interest, but not of either optimism about the future or subjective health variables.

4. General Discussion

In the present research we investigated (a) the prevalence of self-defined vegetarians in a German representative sample, (b) the effects of socio-demographic variables on dietary behavior, and (c) individual differences between vegetarians and meat eaters in broader personality traits, political attitudes, and health-related variables. We analyzed these questions using data from two waves of a German representative sample (the SOEP-IS).

4.1. Prevalence of a vegetarian diet

A recent study by the Robert-Koch Institute (Mensink et al., 2016) reported a 4.3% prevalence of vegetarians in a German representative sample. In the present research, the prevalence of vegetarians was much lower when using the strict definition of diet type given in Study 1 (2.74%: 0.29% vegan and 2.45% vegetarian), and much higher in Study 2 (5.97%: 0.55% vegan and 5.42% vegetarian), which employed a laxer definition. The difference between the prevalence in both studies was significant, $\chi^2 = 200.73$, $p < .001$. On average, the prevalence found in our studies was comparable with Mensink et al.'s (2016). Based on these findings, it seems that how diet is assessed influences estimated prevalence. In Study 1 individuals were

asked if they self-identified as either vegans or vegetarians ("Are you vegan or vegetarian?") and definitions of these diet types were given; in Study 2, the diet question was more behaviorally based ("Are you predominantly or exclusively following a vegetarian diet"). This laxer definition therefore includes not only strict vegetarians, but also people who occasionally consume meat or fish. It should be acknowledged that the higher prevalence of a vegetarian diet observed in Study 2 compared with Study 1 could be an effect of (a) the different definitions used in the two studies or (b) real changes in behavior (i.e., a larger number of people are following a vegetarian diet in 2015 compared with 2014) or (c) both. Unfortunately, the two factors (different definitions and real changes in behavior) are inseparably confounded with each other. In our view, it seems more plausible that the higher prevalence in 2015 was due to the laxer definition of a vegetarian diet than due to an increase in people who changed their behavior within 1 year by a factor of 2.2. Thus, we are more inclined to attribute the increase in prevalence from 2014 to 2015 to an effect of the (laxer) definition than to real changes in behavior. However, future longitudinal studies using the same definitions are needed to disentangle the effects of definitions and real behavioral change.

Taken together, the findings of these three studies of German representative samples emphasize how important the definition of vegetarian diet is (i.e., strict or lax behaviorally based vs. self-defined group membership) in predicting participant response, leading to varying estimates of prevalence.

Other recent studies that did not use representative samples have offered higher estimated prevalence of vegetarians and vegans in Germany. For example, the German Vegetarian Society (VEBU, *Vegetarierbund Deutschland*) has summarized results of different online surveys conducted in 2006, reporting the prevalence of a vegetarian diet as being between 7.6% and 9.8%

(for an overview see VEBU, 2015). However, all of these online studies employed convenience and self-selected samples, and therefore offer limited evidence regarding the general population.

4.2. Individual differences between vegetarians and meat eaters

In light of prior research, we anticipated individual differences between meat eaters and vegetarians in socio-demographic variables, personality traits, political attitudes, and health-related variables. With regard to the effect of socio-demographic variables, we found that vegetarians are more often female, younger, and more educated (Studies 1 and 2), and have a higher income (Study 2). These findings are comparable to prior studies that have reported that women are more likely than men to be vegetarians (Allen et al., 2000; Neumark-Sztainer et al., 1997; Tobler et al., 2011), and that younger and more educated people are more likely than older and less educated people, respectively, to follow a vegetarian diet (Aston et al., 2013; Wiig & Smith, 2008). Although income has previously been positively related to a vegetarian diet (Leahy et al., 2010), in the present research we found a relationship between income and diet only when using a laxer definition of a vegetarian diet (Study 2).

With respect to individual differences between vegetarians and meat eaters in personality traits, our *t*-tests indicated that vegetarians had higher scores in openness (Studies 1 and 2) and lower scores in conscientiousness (Study 1), and that they reported more trust (Studies 1 and 2) and optimism (Study 2). The different findings in Studies 1 and 2 revealed minor different results in individual differences between vegetarians and meat eaters and indicated that some of these differences might be due to the different definitions of diet used in these studies.

Openness has been negatively associated with meat consumption (Goldberg & Strycker, 2002; Mottus et al., 2012, 2013) and vegetarians often score higher in openness compared to meat eaters (Kessler et al., 2016). Because most people in Western societies are raised as meat eaters, trying vegetarian or vegan foods and changing to a vegetarian diet should therefore

logically also be related to openness to new experiences, and open individuals have indeed been found to be more open to new foods (Steptoe et al., 1995).

In contrast to our finding in Study 1, in which vegetarians had lower scores in conscientiousness than meat eaters, prior studies have consistently reported that conscientiousness is negatively related to meat consumption (Keller & Siegrist, 2015; Kessler et al., 2016). It should be noted, however, that the present studies compared self-reported and self-identified vegetarians and meat eaters, and did not assess actual meat consumption.

As meat consumption is part of the traditional and social norm in Western societies (Dhont & Hodson, 2014; Joy, 2010; Monteiro et al., 2017), we anticipated that a vegetarian diet would be negatively associated with conservatism. Both of our studies confirmed this expected difference between vegetarians and meat eaters for both conservatism and political interest. The most commonly reported motivation for choosing a vegetarian diet is ethical concerns about the raising and slaughtering of animals (e.g., Beardsworth & Keil, 1991; Fox & Ward, 2008; Hussar & Harris, 2009). It could therefore be argued that vegetarians reported having more political interest because they are more interested in politically relevant issues like environmental protection, animal ethics, or sustainability.

Regarding individual differences in health-related variables, *t*-tests in both studies revealed that vegetarians reported a better current self-reported health status than meat eaters, while Study 2 was the only study in which a difference in personal satisfaction with one's health varied by diet group.

In a further set of analyses we tested if the effect of diet on these individual differences held after controlling for socio-demographic variables to reveal the pure (adjusted for socio-demographic variables) personality differences between diet groups. We found that the effect of diet held only for openness (Studies 1 and 2), conscientiousness (Study 1), trust (Study 2),

conservatism (Studies 1 and 2), and political interest (Studies 1 and 2), but not for optimism (Study 2), current health status (Studies 1 and 2), and satisfaction with health (Study 2). Thus, the effects of diet on optimism and health-related variables appeared to be based on the effect of socio-demographic variables.

Because we used two different definitions to assess vegetarian diet, it could be argued that the diet question in Study 1 using a strict definition only identified individuals who self-defined as vegetarians, while the laxer definition used in Study 2 included individuals who predominantly followed a vegetarian diet, but who also occasionally consumed meat products. We argue that the operationalization of self-defined diet group in Study 1 might be a better test of analyzing individual differences between vegetarians and meat eaters compared to Study 2, as in Study 1 a strict definition of vegetarians was given. Independent of the different definitions that were used in the two studies, however, we found consistent evidence for individual differences between vegetarians and meat eaters in openness, conservatism, and political interest.

Finally, we tested the importance of the personality variables against each other. We found a unique additional effect of openness, (Study 1 and 2), conscientiousness (Study 1), trust (Study 2), conservatism (Study 1 and 2) and political interest (Study 1) on diet. Thus, all the included individual differences variables showed a unique additional effect on diet.

Taken together, the present research showed that there are not only differences between self-defined vegetarians and meat eaters in socio-demographics, but also in openness and political attitudes. Moreover, our findings indicate that there are also personality differences between vegetarians and meat eaters when including individuals who occasionally eat meat in the vegetarian diet group.

4.3. Limitations and future directions

As the present studies examined representative samples, conclusions regarding the German general population can be extrapolated. Furthermore, by comparing two different definitions of a vegetarian diet and controlling for the effect of socio-demographics, we were able to reveal the pure personality differences between diet groups. In doing so, the present studies provide evidence for personality differences between vegetarians and meat eaters.

It should be noted, however, that the present research is limited by its cross-sectional design, and no conclusions can be made regarding the causality of the association between diet and the examined individual differences. Longitudinal studies are needed to investigate whether personality traits and political attitudes affect dietary behavior, or whether dietary behavior affects changes in personality traits and political attitudes and to provide causal evidence for these relationships.

Another limitation of the current studies is that the participant sample in the 2015 SOEP-IS overlapped that of the 2014 SOEP-IS by about 75%. Studies 1 and 2 are therefore not independent of each other, with the 2014 SOEP-IS instead being a stricter subsample of the 2015 SOEP-IS (which employed a laxer definition of vegetarian diet).

A further limitation of the present studies is that individuals were asked a) to self-report identification as vegetarians and whether they b) predominantly or exclusively follow a vegetarian diet; however, we did not assess actual meat consumption. This is a key distinction, as previous studies have shown that self-identified vegetarians do not necessarily completely abstain from meat, fish, or chicken (Ruby, 2012). For example, a recent survey conducted by the Robert-Koch Institute found that self-defined vegetarians reported consuming an average of 49 grams of meat and 22 grams of fish per day (Mensink et al., 2016). Similarly, in a study of female vegetarians in the US, 40% of respondents reported consuming meat products (Kwan & Roth,

2004). As it could also be argued that this inconsistency between self-defined vegetarians and actual meat consumption could be caused by different definitions of a vegetarian diet, future studies could benefit from (a) assessing both self-defined diet group and actual meat consumption, (b) investigating if results depending on how diet is defined and operationalized, and (c) examining how these different definitions of vegetarian diet relate to personality traits.

Additionally, it could be that different motivations for diet choice play a role in how consistent individuals are following a vegetarian or vegan diet. The main motivations to convert to a vegetarian or vegan diet are concerns about the ethics of raising and slaughtering animals (e.g. Fox & Ward, 2008; Rozin, Markwith, & Stoess, 1997; White, Seymour, & Frank, 1999). Other than ethical concerns for animals, personal health, the environmental impact of meat consumption, disgust of meat, or spiritual purity are often reported as motivations for choosing a vegetarian diet (see Ruby, 2012, for an overview). Motivations for being vegetarian, however, are not static and can be modified over time (Beardsworth & Keil, 1992).

Vegetarianism or veganism can also be a trendy lifestyle among urban youth. Further research is needed to examine how these different motivations are associated with different personality traits, and what the level of consistency is between how people self-identify and what they actually consume.

Finally, it should be noted that the effects of diet on individual difference variables were relatively small after controlling for socio-demographics, and it could be argued that these small effect sizes do not necessarily indicate relevant differences between the personalities of vegetarians and meat eaters. However, according to Greenwald, Banaji, and Nosek (2015) "[…] statistically small effects can have societally large effects under two conditions – if they apply to many people or if they apply repeatedly to the same person." (pp. 557).

4.4. Conclusion

The present studies provided evidence for individual differences between vegetarians and meat eaters in socio-demographics, personality traits, and political attitudes in a representative German sample. The prevalence of self-defined vegetarians was 2.74% in Study 1 using a strict definition, and 5.97% in Study 2 using a laxer definition. Independent of the different definitions that were used in both studies, we found consistent evidence for individual differences between vegetarians and meat eaters in gender, age, and education as well as in openness, conservatism, and political interest.

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Table 1

Means and standard deviations of study variables and individual differences between diet groups tested with *t*-tests in SOEP-IS 2014

	Vegetarians	Meat eaters				
Variables	*M* (*SD*)	*M* (*SD*)	*t*	*p*	*d*	95% *CI*
Socio-economic Variables						
Age	46.55 (17.24)	51.99 (18.37)	3.240	.001	.296	[.12, .48]
Education	3.78 (1.10)	3.02 (1.11)	-7.405	< .001	-.680	[-.86, -.50]
Household Income	2,949.75 (1,364.93)	2,805.65 (1,610.68)	-0.962	.336	-.090	[-.27, .09]
Personality Variables						
Openness	5.19 (1.08)	4.67 (1.23)	-4.570	< .001	-.423	[-.60, -.24]
Conscientiousness	5.48 (1.01)	5.85 (0.93)	4.272	< .001	.396	[.21, .58]
Extraversion	4.96 (1.19)	4.89 (1.18)	-0.691	.490	-.064	[-.25, .12]
Agreeableness	5.52 (0.87)	5.46 (0.96)	-0.720	.472	-.067	[-.25, .11]
Neuroticism	3.98 (1.30)	3.80 (1.30)	-1.487	.137	-.138	[-.32, .04]
Affective Well-Being	3.36 (0.47)	3.35 (0.43)	-0.220	.826	-.020	[-.20, .16]
Patience	6.23 (2.24)	6.08 (2.38)	-0.691	.489	-.064	[-.25, .12]
Impulsivity	5.49 (2.46)	5.42 (2.31)	-0.355	.722	-.033	[-.21, .15]
Risk aversion	4.75 (2.22)	4.64 (2.45)	-0.496	.620	-.046	[-.23, .14]
Trust	2.50 (0.60)	2.33 (0.53)	-3.619	< .001	-.335	[-.52, -.15]
Optimism	3.28 (0.73)	3.19 (0.81)	-1.180	.238	-.108	[-.29, .07]
Current Life satisfaction	7.29 (2.16)	7.43 (1.65)	0.909	.364	.083	[-.10, .26]
Political Attitudes						
Conservatism	3.90 (1.67)	4.78 (1.55)	6.131	< .001	.563	[.38, .74]
Political interests	2.70 (0.86)	2.38 (0.87)	-3.942	< .001	-.360	[-.54, -.18]
Health Variables						
Satisfaction with Health	7.02 (2.48)	6.71 (2.21)	-1.491	.136	-.137	[-.32,.04]
Current Health Status	3.58 (1.04)	3.38 (0.97)	-2.187	.029	-.200	[-.38, -.02]

Note. N = 120–123 vegetarians vs. N = 4,142–4,373 meat-eaters.

Table 2

Hierarchical regression analyses predicting individual difference variables from socio-demographic variables and diet (SOEP-IS 2014)

	Openness[1]			Conscientiousness[1]			Trust[1]			Conservatism[1]		
	ΔR^2	β	p	ΔR^2	β	p	ΔR^2	β	p	ΔR^2	β	p
Step 1	.039***			.036***			.085***			.017***		
Sex		.07	<.001		.07	<.001		.01	.762		-.05	.004
Age		-.05	.004		.15	<.001		.04	.019		.05	.002
Education		.17	<.001		-.07	<.001		.24	<.001		-.12	<.001
Income		.01	.452		.05	.004		.11	<.001		.05	.005
Step 2	.002**			.003***			.001			.006***		
Diet		.04	.005		-.05	<.001		.03	.052		-.08	<.001

Note. [1]N = 4,022-4,057; [2]N = 4,214-4,220. ***p < .001; **p < .01.

Table 2 (continued)

	Political Interests[2]			Current Health Status[2]		
	ΔR^2	β	p	ΔR^2	β	p
Step 1	.207***			.113***		
Sex		-.23	<.001		-.05	.001
Age		.29	<.001		-.26	<.001
Education		.27	<.001		.12	<.001
Income		.07	<.001		.08	<.001
Step 2	.004***			.000		
Diet		.06	<.001		.01	.606

Table 3

Hierarchical logistic regression predicting diet from socio-demographic variables, personality traits, and political attitudes (SOEP-IS 2014).

	R^2_{pseudo}	*Odds Ratio*	*p*	95% *CI*
Block 1	.09***			
Sex		3.01	< .001	[1.96, 4.64]
Age		0.98	.003	[0.97, 0.99]
Education		1.82	< .001	[1.53, 2.16]
Income		1.00	.184	[1.00, 1.00]
Block 2	.15***			
Openness		1.25	.013	[1.05, 1.50]
Conscientiousness		0.70	< .001	[0.57, 0.85]
Conservatism		0.74	< .001	[0.65, 0.84]
Political interest		1.54	.001	[1.20, 2.00]

Note. N = 3,876. ***p < .001.

Table 4

Means and standard deviations of study variables and individual differences between diet groups tested with *t*-tests in SOEP-IS 2015

	Vegetarians	Meat-eaters				
Variables	*M* (*SD*)	*M* (*SD*)	*t*	*p*	*d*	95% *CI*
Socio-economic variables						
Age[1]	46.66 (17.82)	52.79 (18.32)	5.645	< .001	.335	[.22, .45]
Education[1]	3.66 (1.16)	3.02 (1.09)	-9.464	< .001	-.581	[-.70, -.46]
Household Income[1]	2,981.82 (1,778.33)	2,750.37 (1,576.46)	-2.341	.019	-.146	[-.27, -.02]
Personality Variables						
Openness[2]	5.27 (1.09)	4.66 (1.21)	-7.266	< .001	-.509	[-.65, -.37]
Conscientiousness[2]	5.75 (0.95)	5.86 (0.92)	1.795	.073	.126	[-.01, .25]
Extraversion[2]	5.00 (1.18)	4.90 (1.17)	-1.156	.248	-.081	[-.22, .06]
Agreeableness[2]	5.52 (0.98)	5.47 (0.95)	-0.766	.444	-.054	[-.19, .08]
Neuroticism[2]	3.96 (1.33)	3.79 (1.30)	-1.865	.062	-.131	[-.27, .01]
Affective Well-Being[2]	3.33 (0.42)	3.36 (0.43)	0.715	.475	.050	[-.09, .19]
Patience[2]	6.06 (2.29)	6.10 (2.35)	0.191	.849	.013	[-.12, .15]
Impulsivity[2]	5.42 (2.45)	5.43 (2.29)	0.114	.910	.008	[-.13, .15]
Risk aversion[2]	4.93 (2.26)	4.64 (2.43)	-1.710	.087	-.120	[-.26, .02]
Trust[2]	2.50 (0.54)	2.33 (0.53)	-4.574	< .001	-.320	[-.46, -.18]
Optimism[1]	3.29 (0.72)	3.18 (0.82)	-2.182	.029	-.133	[-.23, -.01]
Current Life-satisfaction[2]	7.48 (1.74)	7.53 (1.69)	0.455	.649	.032	[-.11, .17]
Political Attitudes						
Conservatism[1]	4.09 (1.56)	4.75 (1.57)	6.811	< .001	.427	[.30, .55]
Political interests[1]	2.54 (0.84)	2.41 (0.87)	-2.620	.009	-.160	[-.28, -.04]
Health Variables						
Satisfaction with Health[1]	7.05 (2.17)	6.73 (2.22)	-2.411	.016	-.147	[-.27, -.03]
Current Health Status[1]	3.60 (0.96)	3.39 (0.96)	-3.519	< .001	-.215	[-33, -.09]

Note. [1] N = 270–302 vegetarians vs. N = 4,580–5,076 meat-eaters; [2] N = 215–216 vegetarians vs. N = 3,598–3,600 meat-eaters.

Table 5

Hierarchical regression analyses predicting individual difference variables from socio-demographic variables and diet group (SOEP-IS 2015)

	Openness[1]			Trust[1]			Optimism[2]			Conservatism[3]		
	ΔR^2	β	p	ΔR^2	β	p	ΔR^2	β	p	ΔR^2	β	p
Step 1	.037***			.092***			.028***			.017***		
Sex		.08	<.001		-.00	.974		-.00	.845		-.04	.005
Age		-.04	.013		.04	.016		-.11	<.001		.05	.002
Education		.16	<.001		.25	<.001		.03	.085		-.11	<.001
Income		.01	.540		.12	<.001		.09	<.001		.07	<.001
Step 2	.008***			.002**			.000			.007***		
Diet		.09	<.001		.05	.003		.01	.405		-.08	<.001

Note. [1]N = 3,513; [2]N = 4,527-4,539, [3]N = 4.364. ***p < .001, **p < .01.

Table 5 (continued)

	Political Interest[2]			Satisfaction with Health[2]			Current Health Status[2]		
	ΔR^2	β	p	ΔR^2	β	p	ΔR^2	β	p
Step 1	.213***			.067***			.099***		
Sex		-.22	<.001		-.04	.003		-.04	.002
Age		.30	<.001		-.16	<.001		-.23	<.001
Education		.28	<.001		.11	<.001		.12	<.001
Income		.07	<.001		.10	<.001		.09	<.001
Step 2	.003***			.000			.000		
Diet		.05	<.001		.01	.521		.02	.134

Table 6

Hierarchical logistic regression predicting diet from socio-demographic variables, personality traits, and political attitudes (SOEP-IS 2015).

	R^2_{pseudo}	Odds Ratio	*p*	95% *CI*
Block 1	.08***			
Sex		3.21	< .001	[2.28, 4.52]
Age		0.99	.001	[0.98, 0.99]
Education		1.64	< .001	[1.43, 1.88]
Income		1.00	.961	[1.00, 1.00]
Block 2	.12***			
Openness		1.41	< .001	[1.22, 1.63]
Trust		1.42	.026	[1.04, 1.92]
Conservatism		0.82	< .001	[0.74, 0.90]
Political interest		1.19	.086	[0.97, 1.46]

Note. N = 3,363. ***p < .001.