RESEARCH PAPER

Are Character Strengths and Attitudes towards Vegetarian Food Related?

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Abstract

One aspect of sustainable consumption behavior is the shift to a vegetarian diet. This study investigates if individual factors, like character strengths, are related to attitudes toward vegetarian food. Additionally, the study examines potential variations in character strengths between vegetarians/vegans and omnivores, as well as whether there are differences in explicit and implicit affective attitudes towards vegetarian and meat-based diets. A total of 210 participants filled out a demographic questionnaire, a scale measuring character strength, an explicit rating task, and an affective priming task that involved images of both vegetarian and meat-based food. The results showed that there was no difference in the explicit and implicit rating of meat-based food compared to vegetarian food for omnivore people. Vegetarians/vegans rated vegetarian food explicitly and implicitly more positively than meat-based food. Only the four character strengths of prudence, appreciation of beauty and excellence, humor, and teamwork, besides the diet type (vegetarians/vegans vs. omnivores), predicted the explicit attitudes toward vegetarian food. Vegetarians/vegans and omnivores only differed in the character strengths of love of learning and forgiveness. This study provides evidence that the explicit and implicit attitudes towards vegetarian food are concordant for vegetarians and vegans with their diet choice. Furthermore, the relationship between character strengths and explicit attitudes toward vegetarian food is weak, which hints that those individual transformative qualities (Woiwode et al., 2021) toward sustainable attitude and behavior should be investigated carefully and in-depth.

Keywords Virtues · Veganism · Vegetarianism · Love of learning · Explicit and implicit attitudes

1 Introduction

Sustainability can be defined as the use of resources in a way that the capacity of the earth is not exceeded (European Commission-Environment, 2016). Sustainable

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consumption aims to reduce the impact of goods on the environment by reducing the environmental impact of consumption (Kumar & Yadav, 2021). Geiger et al. (2018) defined sustainable consumption as "individual acts of satisfying needs in different areas of life by acquiring, using, and disposing of goods and services that do not compromise the ecological and socio-economic conditions of all people (currently living or in the future) to satisfy their own needs." Although it is well-recognized that consumer behavior is very complex and does not depend only on individual's choice but is also socially, spatially, and culturally shaped (Fischer et al., 2021), it is important to investigate the role of the individual in more depth. Individual factors that play a role are socio-demographic (Panzone et al., 2016) and personality factors (Gustavsen & Hegnes, 2020; Hirsh, 2010; Luchs & Mooradian, 2012).

1.1 A Vegetarian Diet – One Aspect of Sustainability

One aspect of sustainable consumption behavior is the shift to a plant-based diet. Plant-based diets, that is vegetarian and vegan diets, are closely associated with reduced water and land use (Pradhan et al., 2013) and reduced greenhouse gas emissions (Weber & Matthews, 2008). According to the United Nations, a global development towards a plant-based diet can significantly save the world from the tremendous damage of climate change (Alvaro, 2017).

Concerning individual differences in sustainable behavior in general, it was shown that there is a large correlation between sustainable attitudes in general and all major BIG FIVE personality traits except neuroticism (Soutter & Mõttus, 2021). Regarding the openness aspect, openness to experience instead of intellect is essential for pro-environmental attitudes (Hopwood et al., 2022). Furthermore, there seem to be differences in personality traits between omnivores and non-omnivores as one aspect of pro-environmental attitudes: Omnivores appear to be more authoritarian, socially dominant, bias-oriented, and self-centered than vegetarians and vegans (Holler et al., 2021). In contrast, vegetarians and vegans tend to be more open to new experiences, compatible, spiritual, intelligent, and empathetic (Tan et al., 2021). and have higher self-compassion values (Voll et al., 2023).

It has been shown that pro-environmental behavior can predict short-term and future adherence to a plant-based diet (Krizanova et al., 2021). There are different reasons for choosing a vegetarian or vegan diet; health and ethical reasons were often mentioned (Siebertz et al., 2022). In his literature review, Rosenfeld (2018) concluded that animal welfare, health, and environmental reasons were the most dominant motivators for a vegetarian diet in developed Western nations. Because attitudes are one essential aspect regarding the change of behavior, the investigation of attitudes toward vegetarian food is essential.

1.2 Attitudes toward Vegetarian Food

Mainly explicit attitudes were investigated regarding different aspects of sustainable behavior. However, dual-process theories claim that behavior, decision, thinking, and attitudes are due to two distinct processes, one characterized by an automatic and the

other by a controlled process (Gawronski & Creighton, 2013). Attitudes for which people do not have an explicit awareness are often called implicit attitudes (Rydell & McConnell, 2006). Whereas the explicit attitudes are investigated with direct questions, the uncontrolled attitudes are retrieved with specific procedures, for example, the Implicit Association Test (Greenwald et al., 1998) or the affective priming paradigm (deHouwer et al., 2009). In former studies, a low congruence between explicit and implicit sustainability orientations has been shown (Steiner et al., 2018). The authors discuss that this low correlation could stem from self-reporting bias and social desirability. However, inaccurate self-reports can also come from a lack of awareness of personal attitudes.

Until now, only one study has investigated the explicit and implicit attitudes toward sustainable vegetarian and meat-based food (Siebertz et al., 2022). Regarding the implicit attitudes, all participants had a higher positive implicit attitude towards vegetarian food than meat-based nutrition. The explicit attitudes on the other hand were related to their own diet (Siebertz et al., 2022). The explicit attitudes towards meat-based food were explicitly rated more positively by omnivores, whereas the ones towards vegetarian food were rated more positively by vegetarians/vegans.

Recently it has been acknowledged that an inner transformation is relevant for reaching a transition towards more sustainability, towards an outer transformation (Woiwode et al., 2021). There are several transformative qualities which are seen to be relevant for this internal change to foster sustainable behavior, as it is awareness, connection, insight, purpose, and agency. Those internal transformative qualities, which were identified through an extensive literature review, are important for peoples learning, everyday life and their decision they take and might facilitate a paradigm shift to more sustainable behavior (Wamsler et al., 2021). One of the inner transformational qualities is the purpose which includes the activation and reflection of one's values (Wamsler et al., 2021; Woiwode et al., 2021). According to the model of Wamsler et al. (2021), the relationship between "values" and attitudes toward sustainable nutrition will be investigated.

1.3 The Relation between Character Strengths and Sustainability

The definition of values is manifold, and, in this study, we focus on character strengths which can be seen as values in action (Park & Peterson, 2006). Character strengths are defined as "…positive traits reflected in thoughts, feelings, and behaviours " (Park et al., 2004, p. 603). Twenty-four character strengths were detected, which can be divided into the following six virtues: wisdom (e.g., creativity), courage (e.g., honesty), humanity (e.g., kindness), justice (e.g., fairness), temperance (e.g., forgiveness), and transcendence (e.g., hope). The strengths differ between individuals, and the strength most positive in an individual can be termed signature strengths (Peterson & Seligman, 2004). On these positive traits, people can reflect on and improve them. A meta-analysis has demonstrated that character strength interventions can improve several outcomes, for example, positive affect or happiness or a decrease in depression (Schutte & Malouff, 2019).

To measure character strength, the *Value of Action Inventory of Strengths* (VIA-IS) has been validated (Peterson & Seligman, 2004). The VIA-IS uses several

items to investigate one character strength. However, to our best knowledge, only two studies used the VIA-IS to investigate the relationship towards sustainable behavior. In the first study with Mexican participants, it was shown that all character strengths were significantly associated with all aspects of sustainable behavior (r=0.21 to r=0.48). Furthermore, the factor structure of six virtues could be confirmed, but also a higher order of "common virtues" could be confirmed. Sustainable behavior was retrieved with four scales (pro-social, ecological, frugal, and equitable behavior) summarized in a common factor (Corral-Verdugo et al., 2015). The results showed a high correlation between all character strengths and aspects of sustainable behavior, but the relation was higher if common factors for both concepts were established. In the second study of Valor et al. (2020) with Spanish participants, only seven character strengths (appreciation of beauty and excellence: ß=0.11, kindness: ß=0.11 leadership: ß=0.11, love of learning: ß=0.12, modesty and humanity: ß=0.12, perspective: ß=0.09, and self-regulation: ß=0.23) were significantly related to sustainable consumption, which was retrieved with one scale of only six items. The study of Valor et al. (2020) is a starting point for this study to investigate the relation of character strengths to one aspect of sustainability attitude, the choice of a vegetarian and vegan diet. In a third study, it was shown that the character strengths of zest, kindness, leadership, humility, prudence, fairness, and forgiveness were related to environmental self-efficacy, and zest and leadership also to generalized self-efficacy (Moeller & Stahlmann, 2019). However, in their study, the authors did not use the original VIA-IS scale but the character strengths rating form, which investigates each character strength only with one item.

The studies do not clearly depict the relationship between character strengths and sustainable behavior. Whereas in the study of Corral-Verdugo et al. (2015) all character strengths were related to the measurement of sustainable behavior, in the study of Valor et al. (2020) only seven were related. One reason for these different results might be the use of different measurement methods for sustainable behavior.

1.4 The Main Goals of this Study

The main goals of this study are twofold: First, it will be investigated if the results of Siebertz et al. (2022) regarding the implicit and explicit attitudes towards vegetarian[1] and meat-based food can be replicated. Because the explicit attitudes are related to the own diet (Siebertz et al., 2022), the diet type was included as a relevant factor.

Second, vegetarian attitudes will be investigated in more detail: This study adds to the study of Corral-Verdugo et al. (2015) and Valor et al. (2020) by investigating the relation of character strengths not only to questions of general sustainable consumption behavior but to the explicit and implicit attitudes regarding vegetarian food. We assume that not only the diet type (vegetarians/vegans vs. omnivores) but

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[1] For better readability, we only write vegetarian and not vegetarian/vegan food.

also the character strengths are related to explicit attitudes. In detail, the following hypotheses will be investigated:

1. According to the study of Siebertz et al. (2022), it is assumed that explicit attitudes of vegetarians/vegans towards vegetarian food items are more positive than towards meat-based food. In contrast, omnivores are assumed to explicitly rate meat-based items more positively than vegetarian food items. Regarding implicit attitudes, vegetarian nutrition is rated more positively than meat-based items. Exploratorily, the diet type (vegetarians/vegans vs. omnivores) will be integrated as a between-subject factor.
2. Due to the study of Corral-Verdugo et al. (2015) and Valor et al. (2020), positive correlations between character strengths and explicit attitudes towards vegetarian food are expected. According to Valor et al. (2020) it is assumed that the 24 character strengths predict the explicit attitudes towards vegetarian food and the seven character strengths of appreciation of beauty and excellence, kindness, leadership, love of learning, modesty and humanity, perspective, and self-regulation and the chosen diet type (vegetarian/vegan vs. omnivorous) are significant. For these seven character strengths, we expect medium-large correlations ($r > 0.2$) according to Valor et al. (2020). The relation of character strengths to the implicit attitudes toward a vegetarian diet is investigated exploratorily as there are no precise predictions based on the literature.
3. We also investigate the differences in the character strengths and virtues between vegetarians/vegans and omnivores. Due to the study of Tan et al. (2021), who showed higher values of vegetarians compared to non-vegetarians in empathy, intelligence, and spirituality, we expect higher values of vegetarians/vegans compared to omnivores in the virtues of wisdom, humility, and transcendence. The possible difference between vegetarians/vegans and non-vegetarians/non-vegans in the other three virtues is investigated without a clear prediction. According to the study of Corral-Verdugo et al. (2015) who confirmed the six-factor structure with the different virtues we decided to analyze the different character strengths within the respective virtue.

2 Methods

2.1 Participants

After outlier exclusion, 210 participants (120 women, 88 men, and two diverse) were considered in the final sample of this study. One hundred twenty-nine were omnivores, and 81 were vegetarians or vegans. There was no age difference between the omnivores and the vegetarians/vegans, $t(203) = 0.871$, $p = 0.192$, 95% CI [-0.931, 2.406]. The proportion of men and women in the groups of omnivores and vegetarians/vegans differed significantly from each other, X^2 (1, $N = 208$) = 19.891, $p < .001$. Furthermore, vegetarians/vegans found the theme of nutrition more important

Table 1 Mean (*SD*) of age and importance of nutrition, and frequency of gender, family status and level of education

	Age	Gender	Family status[1]	Level of education	Importance of nutrition[2]
Omnivores (*N*=129)	23.95 (6.376)	Women: 45.7% Men: 54.3%	Single: 48.1% Permanent relationship: 45.7% Married: 6.2%	'Mittlere Reife ': 0.8% A-levels: 80.6% Bachelor degree: 13.2% Master degree: 5.4%	3.95 (0.818)
Vegetarians/ vegans (*N*=81)	23.22 (5.035)	Women: 75.3% Men: 22.2% Diverse: 2.5%	Single: 40.7% Permanent relationship: 50.6% Married: 7.4%	A-levels: 75.3% Bachelor degree: 18.5% Master degree: 6.2%	4.32 (0.722)

Annotations: [1]Missing data for one person from the group of vegetarians and vegans. [2]categories: 1 = not important at all, 2 = not important, 3 = neutral, 4 = important, 5 = very important. 'Mittlere Reife ' = school leaving certificate after 10 years of school

than omnivores found it, $t(203) = -3.317$, $p < 0.001$, 95% CI [-0.586, -0.149]. All demographic data are presented in Table 1.

2.1.1 Study Design and Sample Size Calculation

For the first hypothesis, an experimental design with either the dependent variable "explicit attitude" or "implicit attitude" and the between-subject factors food image "vegetarian vs. meat-based" and diet type "vegetarians/vegans vs. omnivores" was conducted. Concerning the first hypothesis, Siebertz et al. (2022) found a large effect of $d = 0.84$ for the interaction regarding the attitudes between images of vegetarian and meat-based items and the diet type. To recreate such effects at an alpha-level of $\alpha = 0.05$ and a power of $1-\beta = 0.80$, a power analysis with G*power for Analysis of Variance resulted in $N = 16$ participants to detect significant differences in the explicit affective attitudes toward images of vegetarian and meat-based food dependent on the diet type (Faul et al., 2007). For the implicit attitudes, the power analysis for t-tests (matched pairs) with G*power ($d = 0.3$, an alpha-level of $\alpha = 0.05$ and a power of $1-\beta = 0.80$) resulted in $N = 27$ participants to detect significant differences in the implicit affective attitudes toward images of vegetarian and meat-based food (Faul et al., 2007). If the *diet type* was integrated as a between-subject factor, a medium effect size of $d = 0.3$, an alpha-level of $\alpha = 0.05$, and a power of $1-\beta = 0.80$, a power analysis with G*power for Analysis of Variance resulted in $N = 34$ participants to detect significant differences in the implicit affective attitudes toward images of vegetarian and meat-based food dependent on the *diet type* (Faul et al., 2007).

For hypothesis 2, a correlational design was chosen. Assuming large effect sizes (Gignac & Szodorai, 2016) for the correlations ($r = 0.3$) between character strengths and explicit attitudes towards vegetarian food, the power analysis (power of $1-\beta = 0.80$) resulted in $N = 145$ participants independent of *diet type* (Faul et al., 2007). A power analysis for the linear regression, with a medium effect size of $f^2 = 0.15$, an alpha-level of $p = 0.05$, a power of $1-\beta = 0.80$, and 25 possible predictors for the dependent variable explicit attitudes towards vegetarian food (24 character strengths and *diet type*), resulted in $N = 172$ (Faul et al., 2007).

For the third hypothesis, six MANOVAs with the between-subject factor *diet type* (vegetarians/vegans, omnivorous) and the respective character strengths for each virtue were conducted. With a medium effect size of $f(v) = 0.25$, an alpha-level of $p = 0.05$, and a power of $1-\beta = 0.80$, a power analysis for each MANOVA resulted in $N = 196$ in the case that a virtue consists of five character strengths, such as the virtue wisdom (Faul et al., 2007). If the virtue is composed of fewer character strengths, as it is the case for the virtue of humanity, even fewer participants are needed.

Inclusion criteria comprised an age over 18 years and the availability of a computer for conducting the study. Participants were recruited through the newsletter of the participating universities and social media. The study was preregistered at osf (https://osf.io/jdgew/?view_only=79ed5f4d080e49908598a37d4ccbc2df).

2.2 Material

In this study, a demographic questionnaire, the Values in Action Inventory of Character Strengths, and the measurement of explicit and implicit attitudes were applied.

2.2.1 Demographic Data

Questions concerning gender, age, family status, level of education, and the importance of nutrition were asked. Furthermore, diet type ("What does your current diet consist of?": vegetarian/vegan, omnivorous) was registered. Participants had to evaluate the reasons for the choice of the respective diet on a 5-point Likert scale from 1 = *not at all applicable* to 5 = *completely applicable*. The following reasons had to be evaluated: health, moral ethical, sustainability, indulgence, allergy, financial reason, and muscle building. Furthermore, they had to evaluate how important nutrition was for them in general. In this study, the same demographic questionnaire was used as in the study of Siebertz et al. (2022).

2.2.2 Virtues and Character Strengths

Virtues and character strengths were investigated with the German Values in Action Inventory of Strengths 120-Item Short Form (Höfer et al., 2020). The original values in the Action Inventory of Strengths (VIA-IS) is a 240-item self-reported questionnaire measuring 24 character strengths (Park et al., 2004), where also a short form exists. The German Values in Action Inventory of Strengths (Short Form) consists of 120 items, with different items for each of the 24 character strengths, which can be classified according to Peterson and Seligman (2004) into the six virtues of wisdom (creativity, curiosity, judgment, love of learning, perspective), courage (bravery, integrity/honesty, persistence, zest), humanity (kindness, love, social intelligence), transcendence (appreciation of beauty and excellence, gratitude, hope, humor, spirituality), justice (teamwork, fairness, leadership), and moderation (forgiveness/mercy, modesty/humility, prudence, self-regulation/self-control). The questionnaire uses a 5-point Likert scale from 1 = *not like me at all* to 5 = *very much like me*. The short form is comparable regarding the validity and reliability of the original VIA 240 long form (Höfer et al., 2020). For each character strength, the reliability was measured with McDonald's ω. The reliability was sufficient (McDonald's ω > = 0.7) for 16 of the 24 character strengths but not for social intelligence (McDonald's ω = 0.698), humility (McDonald's ω = 0.522), teamwork (McDonald's ω = 0.613), fairness (McDonald's ω = 0.658), leadership (McDonald's ω = 0.493), forgiveness (McDonald's ω = 0.690), judgment (McDonald's ω = 0.677), and honesty (Cronbach's α = 0.622).[2]

To investigate hypothesis 2, the 24 character strengths were included in the analysis, and for hypothesis 3 the six virtues.

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[2] In the supplementary material we present the results of a hierarchical confirmatory factor analysis. The proposed structure could not be verified in each case.

Fig. 1 Experimental paradigm

2000ms

315ms

135ms

max. 1750ms

valuable
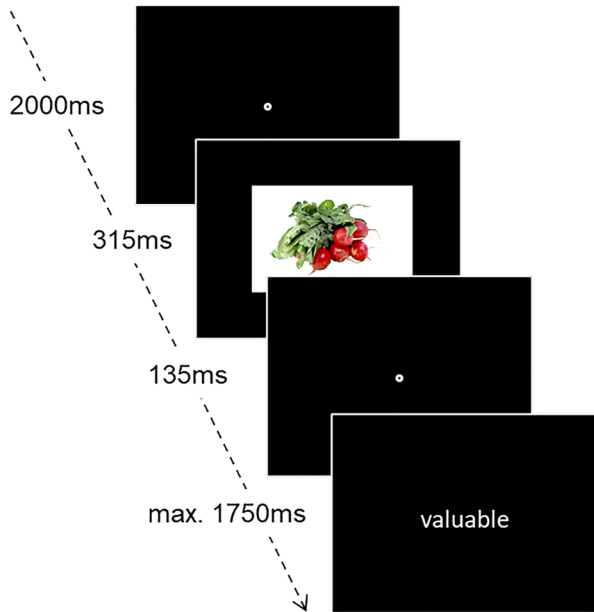
2.2.3 Explicit Affective Attitudes

For the explicit rating task, five pictures of food with meat and five pictures of veg-etarian food were chosen from the database of Blechert et al. (2019). Both groups of pictures were matched in familiarity, arousal, and valence using the ratings included in the database. The explicit evaluative rating task consisted of the following ques-tion: "How much do you like the food in the photo?" (1 = *very much*, 7 = *not at all*). Participants had five seconds to respond to provoke a spontaneous reaction. The mean score for the explicit rating for each category (vegetarian and meat-based products) was calculated.

2.2.4 Affective Priming Task

Implicit attitudes were assessed using an affective priming paradigm (Fazio et al., 1995; Hutcherson et al., 2008) using the same pictures as in the explicit rating task. We added a short practice trial for the affective priming task with four pictures of non-food products. Figure 1 shows an exemplary trial of the affective priming task. At the beginning of a trial, a fixation point was shown for 2000 ms in the middle of the screen, followed by a picture of a food product, which was presented for 315 ms. After another 135 ms fixation point, a positive or negative word appeared in the middle of the screen, which was chosen randomly from a set of four negative and four positive words chosen from the Berlin Affective Word List (BAWL-R) (Vö et al., 2009). The participants had to decide as quickly as possible if the word was

positive or negative using the arrow keys. The word was presented for a maximum of 1750 ms, see Fig. 1.

Each picture has been combined with each word, resulting in 80 trials. Reaction times when categorizing picture-primed positive words were subtracted from reaction times when categorizing picture-primed negative words. This subtraction was done separately for pictures showing meat and vegetarian products and averaged, respectively. Hence, a higher difference score demonstrated a more positive evaluation.

Trials were excluded from analysis if they were answered within 100 ms or incorrectly. A participant was deemed an outlier if less than half of the trials remained for this participant, and 31 participants were excluded by this procedure. The remaining participants completed 75.27 trials on average ($SD = 7.60$). The missing trials were imputed by the mean of the affect food-type combination of the participant.

2.3 Procedure

The whole experiment lasted about 20 min and was implemented online using the programs OpenSesame (Mathôt et al., 2012) and SurveyJS on Jatos.org (Lange et al., 2015). After retrieving the demographic data, the VIA-IS, the explicit and the implicit tasks were conducted, all tasks following the order in which they were mentioned in this section.

2.4 Statistical Analysis

For the explicit and the implicit attitudes, two repeated measurements ANOVAs with the between-subject factor *diet type* (vegetarians/vegans vs. omnivores) and the within-subject factor *food images* (vegetarian vs. meat-based) were conducted. In addition to the preregistration, we calculated the correlation between explicit and implicit attitudes separately for vegetarian and meat-based food images.

Second, correlations have been calculated between all 24 character strengths separately for the factor *diet type* (vegetarians/vegans vs. omnivores) and the explicit and implicit attitude toward vegetarian food. According to Gignac and Szodorai (2016), correlations of 0.10, 0.20 and 0.30 should be considered small, medium, and large. After this, two multiple regressions with Enter method for the explicit and implicit attitudes towards vegetarian food were conducted with the predictors of the 24 character strengths and the factor *diet type*.

Third, for each of the five virtues, one MANOVA with the between-subject factor *diet type* (vegetarian/vegans vs. omnivores) and the character strengths, which composes the respective virtue, were conducted.

In addition to the preregistration, we calculate sensitivity analyses to examine the role of gender and age. For this, we included both variables as co-variates in the repeated measurements ANOVAs and the MANOCVAs. Furthermore, the reasons for the choice of diet were compared between groups of vegetarians/vegans and omnivores with independent t-tests. Because seven reasons were analyzed and seven t-tests were conducted, the alpha level was set to 0.007.
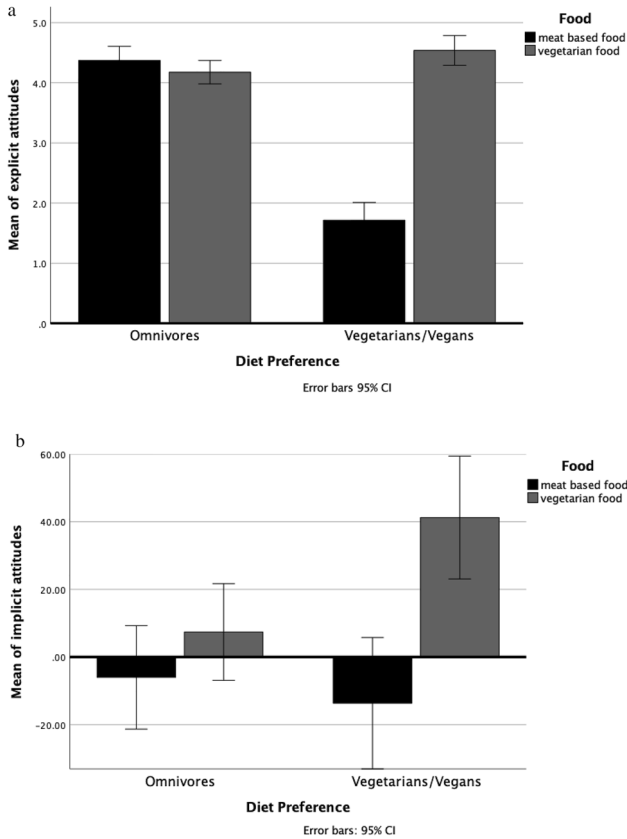
Fig. 2 Explicit (**a**) and implicit (**b**) attitudes towards meat and vegetarian food dependent on the chosen diet

3 Results

3.1 Explicit and Implicit Attitudes

The repeated measure ANOVA for the explicit rating showed a main effect of the factor *food images*, $F(1, 208) = 100.277$, $p < 0.001$, partial $\eta^2 = 0.325$, and *diet type*, $F(1, 208) = 95.458$, $p < 0.001$, partial $\eta^2 = 0.315$, as well as an interaction between both factors, $F(1, 208) = 132.194$, $p < 0.001$, partial $\eta^2 = 0.389$. There was no difference in the rating of omnivores for the meat-based food ($M = 4.37$, $SD = 1.46$) compared to the vegetarian food ($M = 4.18$, $SD = 1.103$, $t(128) = 1.199$, $p = 0.233$, 95% CI [-0.127, 0.516], Cohen's $d = 0.106$. For the vegetarians/vegans there was a more favorable rating regarding the explicit rating for vegetarian food ($M = 4.54$, $SD = 1.160$) compared to the pictures of the meat-based food, ($M = 1.72$, $SD = 1.14$), $t(80) = -13.648$, $p < 0.001$, 95% CI [-3.232, -2.410], Cohen's $d = -1.516$, see Fig. 2a.

The repeated measure ANOVA for the implicit rating showed a main effect of the factor *food images*, $F(1, 207) = 16.010$, $p < 0.001$, partial $\eta^2 = 0.072$, no significant main effect for *diet type*, $F(1, 207) = 2.304$, $p = 0.131$, partial $\eta^2 = 0.011$, but a significant interaction between both factors, $F(1, 207) = 5.904$, $p = 0.016$, partial $\eta^2 = 0.028$. There was a more favorable rating regarding the implicit rating for vegetarian food ($M = 41.236$, $SD = 82.73$) compared to meat-based food ($M = -13.665$, $SD = 103.384$), by vegetarians/vegans, $t(79) = -3.228$, $p < 0.001$, 95% CI [-88.759, -21.045], Cohen's $d = -0.361$. For omnivores, there was no difference between the implicit attitudes towards meat-based food ($M = -6.020$, $SD = 77.133$) compared to vegetarian food images ($M = 7.394$, $SD = 82.210$), $t(128) = -1.607$, $p = 0.111$, 95% CI [-29.936, 3.105], Cohen's $d = -0.141$, see Fig. 2b.

There was no significant correlation between the explicit and implicit attitudes towards meat-based images, $r = 0.086$, 95% CI [-0.051, 0.219], nor between the explicit and implicit attitudes towards vegetarian food images, $r = 0.112$, 95% CI [-0.023, 0.244], whereas the last correlation could be considered as not significant but relatively small (Gignac & Szodorai, 2016).

3.2 Relation of Character Strengths and Attitudes towards a Vegetarian Diet

The correlations between the 24 character strengths and the explicit and implicit attitudes towards vegetarian food for omnivores and for vegetarians/vegans are presented in Table 2.

For the omnivores, there were (relatively) small correlations ($0.1 <= r < 0.2$) between the explicit attitudes and the character strengths of bravery, self-regulation, social intelligence, love of learning, appreciation of beauty and excellence, humility, and humor as well as between the implicit attitudes and love and humility. Only the correlation between prudence and the explicit attitudes could be considered as moderate.

For the vegetarians/vegans, there were (relatively) large correlations ($0.3 <= r < 0.4$) between zest and the explicit attitudes, and moderate correlations between the explicit attitudes and the character strengths of spirituality, love, forgiveness, appreciation of beauty and excellence, gratitude, and humility. Furthermore, there were small correlations between creativity, perseverance, self-regulation, hope, social intelligence, leadership, curiosity, fairness, prudence, and teamwork. A large correlation was detected between the implicit attitude and zest, moderate correlations were detected for perseverance, hope, curiosity, and fairness and small correlations for creativity, self-regulation, leadership, love of learning, prudence, humor, and judgment.

The first regression analysis showed that 18.4% ($R = 0.429$) of the variance in the explicit attitude toward vegetarian food was explained by the 24 character strengths and the *diet type*, $F(25, 184) = 1.660$, $p = 0.031$. However, only the predictors prudence ($\beta = -0.267$, $p = 0.015$), appreciation of beauty and excellence, ($\beta = 0.188$, $p = 0.035$), humor ($\beta = -0.199$, $p = 0.028$), teamwork ($\beta = 0.184$, $p = 0.046$), and *diet type* ($\beta = 0.174$, $p = 0.017$), reached significance.

Table 2 Correlations between the study variables for omnivores (below the diagonal) and vegetarians/vegans (above the diagonal)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1 Explicit score	-	.238*	.252*	-.034	.165	.194	.193	.231*	.256*	.077	.130	.205	-.018	.071	.066	.137	.275*	.049	.177	-.050	.117	.189	.121	.269*	.173	.323**
2 Implicit score	-.017	-	-.065	.039	.147	.218	.209	.079	-.042	.056	.250*	.035	.125	.159	.013	.130	-.091	.164	.285**	.089	.117	.115	-.069	-.045	.097	.321**
3 Appr. beau. & ex.[1]	.157	.013	-	.040	.350**	.282*	.199	.263*	.352**	.050	.158	.140	.272*	-.088	.358**	.012	.344**	.189	-.051	.195	-.033	-.009	.042	.323**	-.039	.322**
4 Bravery	.138	.073	-.049	-	.470**	.354**	-.023	-.155	.070	.240*	.213	-.231*	.199	.213	-.142	.246*	.133	.176	.164	.227*	.036	.058	-.092	.216	-.192	.249*
5 Creativity	.088	-.027	.183*	.444**	-	.429**	-.021	-.003	.137	.121	.259**	-.058	.373**	.258**	.099	.299**	.193	.370**	.234**	.281*	.196	.049	.067	.238*	-.009	.413**
6 Curiosity	.014	.097	.264**	.339**	.575**	-	.170	.068	.339**	.121	.518**	.005	.244*	.096	.198	.249*	.349**	.531**	.316**	.284**	.019	.219*	.004	.210	.078	.702**
7 Fairness	.032	-.023	.311**	.154	.072	.245**	-	.151	.056	.467**	.143	.237*	.207	.082	.477**	.341**	.194	.057	.322**	.001	.255*	.160	.285**	.236*	.498**	.111
8 Forgiveness	-.007	-.019	.179*	-.051	.012	.142	.363**	-	.196	.094	.171	.397**	.091	.125	.317**	.176	.181	-.015	.143	.152	.255*	.220*	.061	.142	.063	.220*
9 Gratitude	-.005	-.003	.485**	.089	.263**	.430**	.224*	.272**	-	.076	.514**	.306**	.192	-.100	.291**	.058	.084	.070	.146	.076	.138	.191	.124	.259*	-.024	.482**
10 Honesty	-.002	-.035	.157	.364**	.102	.301**	.236**	.201*	.258**	-	.099	.231*	.018	.405**	.297**	.349**	.186	.021	.381**	.303**	.422**	.250*	.301**	.030	.144	.109
11 Hope	.033	.061	.103	.276**	.352**	.512**	.091	.214*	.484**	.281**	-	.107	.354**	.052	.248*	.136	.318**	.257*	.395**	.198	.121	.111	.158	.215	.034	.682**
12 Humility	-.114	-.138	.168	-.093	-.068	-.037	.342**	.325**	.266**	.279**	-.033	-	.020	.054	.218	.256**	-.061	.058	.127	.182	.276*	.257*	.229*	.047	.315**	.023
13 Humor	-.120	-.039	.001	.221*	.280**	.379**	.288**	.241**	.347**	.395**	.362**	.162	-	-.006	.130	.293**	.085	-.028	-.041	.243*	.053	-.031	.049	.066	.140	.416**
14 Judgment	-.094	-.028	.043	.141	.409**	.207*	.050	.086	.087	.117	.177*	.099	.078	-	-.251*	.274**	-.068	.124	.469**	.467**	.599**	.110	.154	.026	-.111	.010
15 Kindness	.000	.005	.357**	.001	.073	.289**	.509**	.440**	.388**	.488**	.249*	.272**	.503**	.036	-	.110	.335**	.125	.052	-.088	.086	.143	.189	.142	.218	.272*
16 Leadership	.062	-.017	.108	.366**	.294**	.357**	.481**	.096	.193*	.301**	.236**	.146	.358**	.227**	.356**	-	-.011	.195	.346**	.255**	.380**	.393**	.230**	.092	.276*	.245*
17 Love	-.030	.159	.315**	-.019	.091	.243**	.205*	.148	.400**	.266**	.422**	.135	.193*	.069	.362**	.052	-	.018	.053	.005	-.006	.164	.146	.192	.051	.427**
18 Love of learning	.167	.026	.308**	.189*	.383**	.429**	.066	.146	.209*	.052	.242**	-.122	-.065	.167	.004	.143	.050	-	.254**	.138	-.104	.128	-.068	.212	.070	.367**

Table 2 (continued)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
19 Perseverance	.046	.025	.059	.293**	.162	.193*	.167	.238**	.211*	.393*	.312*	.289**	.192*	.322**	.208*	.302**	.255**	.184*	-	.226*	.494**	.490**	.114	.161	.100	.221*
20 Perspective	-.018	.036	-.042	.280**	.427**	.331**	-.046	.048	.168	.239**	.425**	-.140	.337**	.374**	.091	.364**	.154	.197*	.117	-	.418**	.116	.169	.033	-.034	.251*
21 Prudence	-.231**	-.034	.113	-.032	.175*	.130	.134	.202*	.171	.273**	.213*	.376**	.141	.697**	.202*	.171	.231**	.049	.338**	.240**	-	.404**	.336**	.087	.138	-.022
22 Self-regulation	.121	.080	.095	.242**	.160	.281**	.121	.060	.251**	.244**	.272**	.153	.082	.248**	0.068	.174*	.199*	.119	.376**	.133	.342**	-	.073	.022	.196	.142
23 Social intelligence	-.120	.082	.382**	-.070	.141	.304**	.416**	.339**	.372**	.355**	.265**	.259**	.398**	.126	.567**	.309**	.397**	.126	.195*	.220*	.240**	-.037	-	.152	.337**	.063
24 Spirituality	.073	.077	.272**	.109	.128	.131	.137	.280**	.325**	.144	.269**	.078	.014	.017	0.146	.120	.206*	.222*	.157	.137	.068	.152	.156	-	.153	.263*
25 Teamwork	.084	.040	.158	.042	.085	.364**	.483**	.361**	.314**	.407**	.179*	.319**	.431**	.142	.532**	.428**	.314**	.048	.443**	-.039	.278**	.253**	.385**	-.016	-	.133
26 Zest	.021	.042	.202*	.190*	.325**	.606**	.227**	.187*	.443**	.290**	.635**	.096	.390**	.083	.326**	.304**	.401**	.270**	.356**	.138	.158	.287**	.274**	.282**	.346**	-

[1]$Appr.\ beau.\ \&\ ex.$ Appreciation of beauty and excellence

$*\ p < .05$

$**\ p < .01$

The second regression analysis explaining the variance in the implicit attitude toward vegetarian food did not reach significance, $F(25, 184) = 0.839$, $p = 0.688$.

3.3 Virtues of Vegetarians and Vegans Compared to Omnivores

Furthermore, we calculated MANOVAS for each virtue. First, the multivariate analysis for the virtue wisdom with creativity, curiosity, judgment, love of learning, and perspective as dependent variables using Pillai's trace showed no significant effect of the *diet type*, $F(5, 204) = 2.026$, $p = 0.076$, partial $\eta^2 = 0.047$. However, analyzing the single character strengths we found that for the character strength love of learning, the mean value was higher for vegetarians/vegans ($M = 3.314$, $SD = 0.784$) compared to omnivores ($M = 3.009$, $SD = 0.830$), $F(1, 208) = 6.977$, $p = 0.009$, partial $\eta^2 = 0.032$. The MANOVA for the virtues moderation (forgiveness, humility, prudence, and self-regulation) was significant for the *diet type*, $F(4, 205) = 3.100$, $p = 0.017$, partial $\eta^2 = 0.057$. For the character strength forgiveness, the mean value was higher for vegetarians/vegans ($M = 3.662$, $SD = 0.616$) compared to omnivores ($M = 3.434$, $SD = 0.732$), $F(1, 208) = 5.414$, $p = 0.021$, partial $\eta^2 = 0.025$. Furthermore, the multivariate analyses showed no significant effect of the *diet type* for the virtues a) courage (bravery, honesty, persistence, and zest), $F(4, 205) = 0.977$, $p = 0.421$, partial $\eta^2 = 0.019$, b) humanity (kindness, love, social intelligence), $F(3, 206) = 0.603$, $p = 0.614$, partial $\eta^2 = 0.009$, c) transcendence (appreciation of beauty and excellence, gratitude, humor, hope, and spirituality), $F(5, 204) = 0.977$, $p = 0.433$, partial $\eta^2 = 0.023$ and neither for the virtue of justice (teamwork, fairness, leadership), $F(3, 206) = 0.393$, $p = 0.758$, partial $\eta^2 = 0.006$.

3.4 Exploratory Analysis

3.4.1 Sensitivity Analysis to Examine the Role of Gender and Age

Including age and gender as co-variates in the measurement of the explicit attitudes towards food and meat, the result showed a main effect of the factor *food images*, $F(1, 199) = 31.569$ $p < 0.001$, partial $\eta^2 = 0.137$, and *diet type*, $F(1, 199) = 71.507$, $p < 0.001$, partial $\eta^2 = 0.264$, as well as an interaction between both factors, $F(1, 199) = 104.714$, $p < 0.001$, partial $\eta^2 = 0.345$. Even there were no main effects of gender, $F(1, 199) = 3.681$, $p = 0.056$, partial $\eta^2 = 0.018$ and age, $F(1, 199) = 0.118$, $p = 0.732$, partial $\eta^2 = 0.001$, there were significant interactions between food images and gender, $F(1, 199) = 46.384$, $p < 0.001$, partial $\eta^2 = 0.189$ and food images and age, $F(1, 199) = 19.751$, $p < 0.001$, partial $\eta^2 = 0.090$. Regarding the co-variate gender, there was a more favorable rating of men regarding the explicit rating for meat-based food ($M = 4.393$, $SD = 1.733$) compared to women ($M = 2.618$, $SD = 1.577$), $t(206) = 7.689$, $p < 0.001$, 95% CI [1.3197, 2.230], Cohen's $d = 1.079$. Regarding vegetarian food, the rating of women ($M = 4.563$, $SD = 1.156$) was more positive than the ones of the men ($M = 3.957$, $SD = 1.015$), $t(206) = -3.932$, $p < 0.001$, 95% CI [-0.9106, -0.3024], Cohen's $d = -0.552$. Furthermore, there was a significant positive correlation between age and the explicit score for vegetarian food, $r = 0.196$, 95% CI [0.060, 0.325], but

not for meat-based food, (r=-0.105), 95% CI [-0.239, 0.034]. For the analyses of the implicit attitudes, there were no significant main effects or interactions with the factor gender or age (all p_s > 0.06). Furthermore, the interaction between food images and diet type was not significant anymore, $F(1, 198)$=3.174, p=0.076, partial η^2=0.016.

Age and gender were also included in an exploratory manner in the MANO-VAs. For the virtue wisdom, there was a significant effect for the factor gender, $F(5, 197)$=4.159, p<0.001, partial η^2=0.095 but not for age, $F(5, 197)$=1.777, p=0.119, partial η^2=0.043. The effect of gender is due to the difference in the character strengths love of learning, $t(206)$=-2.827, p=0.005, 95% CI [-0.5411, -0.0965], Cohen's d=-0.397 and perspective, $t(206)$=2.779, p=0.006, 95% CI [0.0744, 0.4378], Cohen's d=0.390. Women showed higher values (M=3.248, SD=0.765) compared to men (M=2.925, SD=0.8528) in love of learning, whereas in the character strength perspective, men (M=3.368, SD=0.6388) showed higher values than women (M=3.248, SD=0.669). The former significant effect of *diet type* for the character strength love of learning was not significant anymore, $F(5, 197)$=1.80, p=0.114, partial η^2=0.044.

For the virtue moderation, the effect of *diet type* remained significant (p=0.017); the factors of gender and age were not significant neither for the main effect nor for the interaction with food type. There were neither significant effects for the virtue courage. For the virtue of humanity, gender, $F(3, 199)$=4.258, p=0.006, partial η^2=0.060, and age, $F(3, 199)$=3.744, p=0.012, partial η^2=0.054 were significant but not the *diet type*, $F(3, 199)$=0.034, p=0.992, partial η^2=0.001. For love, age was positively correlated, r=0.193, 95% CI [0.057, 0.321]. For all three character strengths, kindness, love, and social learning, women showed higher values compared to men (all p_s < 0.05). Additionally, there was a significant effect of gender for the virtue transcendence, $F(5, 197)$=10.993, p<0.001, partial η^2=0.218, which could be explained by the significant gender difference of the character strengths of humor, $t(206)$=2.270, p=0.024, 95% CI [0.0268, 0.3806], Cohen's d=0.319. Men (M=3.992, SD=0.5393) had higher values compared to women (M=3.788, SD=0.6708). For the virtue of justice only the co-variate of gender was significant, $F(3, 199)$=6.174, p<0.001, partial η^2=0.085. This effect is due to a gender difference in the character strength of fairness, $t(153.337)$=-3.507, p<0.001, 95% CI [-0.4233, -0.1182], Cohen's d=-0.515. Women showed higher values (M=4.2850, SD=0.454) compared to men (M=4.0142, SD=0.611) in the character strength of fairness.

3.4.2 Differences between the Reasons for a Diet Choice

For the seven t-tests with the independent variable *diet type*, there were significant differences for indulgence, $t(208)$=4.334, p<0.001, 95% CI [0.329, 0.877], Cohen's d=0.614, allergy, $t(206.984)$=2.758, p=0.006, 95% CI [0.114, 0.684], Cohen's d=0.353, financial reasons, $t(208)$=5.264, p<0.001, 95% CI [0.547, 1.202], Cohen's d=0.746, and muscle building, $t(208)$=3.573, p<0.001, 95% CI [0.313, 1.085], Cohen's d=0.506 with higher values for the omnivores compared to the vegetarians/vegans on the one side. On the other side, vegetarians/vegans rate the moral and ethical reason, $t(175.615)$=-10.133, p<0.001, 95% CI [-1.645, -1.109],

Table 3 Mean (*SD*) of the importance of different reasons for the choice of diet

	Health	Moral ethical	Sustainability	Indulgence	Allergy	Financial reason	Muscle building
Omnivores (*N*=129)	3.85 (0.936)	2.64 (0.984)	3.05 (0.883)	4.17 (0.945)	1.74 (1.296)	2.90 (1.198)	3.01 (1.422)
Vegetarians/vegans (*N*=81)	3.94 (0.979)	4.01 (0.942)	3.91 (0.911)	3.57 (1.036)	1.34 (0.795)	2.02 (1.129)	2.31 (1.310)

Annotations: [1] categories: 1 = not important at all, 2 = not important, 3 = neutral, 4 = important, 5 = very important

Cohen's $d = -1.422$, and the one due to sustainability, $t(208) = -6.844$, $p < 0.001$, 95% CI [-1.117, -0.617], Cohen's $d = -0.970$, higher than omnivores. There was no difference for the reason health between both diet groups, $t(208) = -0.633$, $p = .527$, 95% CI [-0.352, 0.188], Cohen's $d = -0.090$, see Table 3.

4 Discussion

In this study, the explicit and implicit attitudes towards vegetarian food as one aspect of sustainable behavior compared to meat-based food were examined as a replication of Siebertz et al. (2022). Second, the relationship between internal transformative qualitative factors, character strengths, and attitudes towards vegetarian food was investigated.

4.1 Explicit and Implicit Attitudes towards Vegetarian Food

In this study, the explicit attitude of vegetarians/vegans towards vegetarian food is more positive compared to meat-based items. There is no difference in the explicit rating of meat-based and vegetarian items by omnivores. Adding gender and age as co-variates in exploratory analyses showed a more positive rating of meat-based food by men compared to women, and vice versa a better rating of vegetarian food by women compared to men, which is in line with Rosenfeld (2018). Furthermore, age was positively correlated with the explicit attitude towards vegetarian food, which seemed to be contrary at first glance demonstrating the higher interest of younger people in a vegetarian/vegan lifestyle (Mensink et al., 2016). This discrepancy could be explained by the fact that we analyzed the explicit attitudes toward vegetarian food items and not towards the vegetarian lifestyle. Regarding the implicit attitudes, vegetarian nutrition is only rated more positively by vegetarians and vegans but not by omnivores. That is only partly in line with our first hypothesis, where an overall better implicit attitude towards vegetarian food was assumed, independent of the diet preference. However, the positive effect in implicit attitudes disappears if gender and age were included as co-variates. It also contradicts the results of the study by Siebertz et al. (2022), where the same implicit paradigm has been used. In their study, the implicit attitude towards vegetarian food pictures was independent of the preferred diet. For this, the results of Siebertz et al. (2022) could only be partly replicated. Furthermore, in this study, meat-based food was not rated implicitly better compared to vegetarian food by omnivores. This result is in line with the explicit rating of meat-based items by omnivores. This hints that within each group (omnivores and vegetarians/vegans), the explicit and implicit attitudes are congruent: vegetarians/vegans prefer images of vegetarian food, whereas omnivores did not show any difference.

The congruence between implicit and explicit attitudes for both groups is important. For example, Goldstein et al. (2014) found that neither the implicit nor explicit attitude alone predicted disinhibited eating, but the absolute attitude discrepancy positively predicted chocolate consumption. A discrepancy between explicit and

implicit attitudes is also detrimental for physically active behavior (Muschalik et al., 2019). The existence of a discrepancy between implicit and explicit attitudes has been demonstrated in several studies and might be due to two different processes (Gawronski & Creighton, 2013). However, if there is a higher discrepancy between both types of attitudes, the predictive power of attitudes toward a specific behavior is lessened, as for example demonstrated in one study related to alcohol use (Karpen et al., 2012). The investigation of explicit and implicit attitudes toward sustainable concepts is rare. Nevertheless, in one study, a discrepancy favoring a more positive explicit attitude towards e-cars compared to conventional cars but not in implicit attitudes has been called an individual green-washing effect (Jansen et al., 2021). How this individual green-washing effect is related to sustainable behavior and has not been investigated until now.

4.2 The Relation of Character Strengths and Attitudes toward a Vegetarian Diet

Regarding the relation of character strengths and attitudes, only the explicit attitudes could be predicted by the values prudence, appreciation of beauty and excellence, humor, teamwork, and diet preference. There was no relation between the implicit attitudes towards vegetarian food and any character strength and diet preference. The value prudence means to be careful of one's own choice and self-regulation describes the ability to regulate the own feelings, to be disciplined, and to control for example the own appetite. Both values describe highly reflective handling of knowledge that might form the explicit attitude. Self-regulation was also a relevant predictor in the study of Valor et al. (2020). The relevance of the character-strength appreciation of beauty and excellence was in line with the results of Valor et al. (2020), whereas the other five character strengths that were relevant in the study of Valor et al. (2020), which were kindness, leadership, love of learning, modesty, and humility, and perspective were not relevant in the study presented here.

The different results could be explained by different methodological approaches. Whereas in the study presented here, sustainable attitudes towards a specific concept, vegan and vegetarian food, were investigated, in the study of Valor et al. (2020), sustainable consumption as a much broader concept was retrieved with a questionnaire of six items. Those items examine a variety of practices from the acquisition of products based on social or environmental reasons or to the praxis to reduce consumption. This means that on the one side, an experimental design and on the other side, a questionnaire have been used, resulting in completely different analysis methods.

Character strengths can be seen as inner transformational qualities, especially as a subgroup of purpose which is one of the five internal qualities influencing how people process information and take decisions towards sustainable behavior (Wamsler et al., 2021). Some studies (e.g., Jansen et al., 2021) have now investigated the relationship between those internal transformational qualities and attitudes towards sustainable concepts. The result is that there is no clear picture of how they are related. Although those results do not directly contradict the assumption of the model of the relationship between internal transformative qualities and sustainable behavior, this study shows

that those assumed relations must be investigated in-depth with several various sustainable concepts and by differentiating between attitudes and behaviors.

4.3 Virtues in Vegetarians/Vegans Compared with Omnivores

Regarding the virtues and character strengths, there were only three significant differences in the character strengths of love of learning and forgiveness and the virtue moderation with higher values of vegetarians/vegans compared to omnivores. As mentioned above, love of learning describes the ability to master new topics. This is in line with a study by Tan et al. (2021), who have shown in a sample of New Zealand's students those vegetarians/vegans are more open to new experiences. Furthermore, eating plant-based food and fish was associated with openness, conscientiousness, and emotional stability in a sample of 13.892 participants from Australia (Pfeiler & Egloff, 2020). Tan et al. (2021) assume that it may be the perceptual forms of information, like for example pictures used to persuade to adopt a plant-based diet, which relates openness to adopting a plant-based diet. Because love of learning involves the cognitive processing of information, our study provides evidence that also the processing of abstract information as one feature of openness is important to explain the relation. However, the results should not be overinterpreted because according to Richardson (2011) the effect size was small, which holds also holds true for the value forgiveness. Furthermore, adding gender and age as covariates, the main effect for the diet type of the character strength love of learning disappeared.

Nevertheless, besides the character strength of love of learning, and forgiveness there were no differences in the other character strengths between vegetarians/vegans and omnivores. For this, one should be very careful with the interpretation of such possible differences. It is just the case that for the non-omnivores in this study, the topic of nutrition is more important compared with the omnivores. Although our data have shown that vegetarians and vegans choose their diet for moral and ethical reasons more often than omnivores, they do not have higher overall moral values measured with the questionnaire of character strengths.

In our study, the two groups of vegetarians/vegans and omnivores differ in the proportion of men and women participating within each group, with a higher proportion of women amongst the non-omnivores. This is in line with a study of Ruby (2012). One reason might be that meat is more associated with a male identity (Rosenfeld, 2020) and that gender identity might influence diet choice. Furthermore, some gender differences could be detected investigating the character strengths, with higher values of men compared with women for the character strengths of perspective and humor, and higher values for women compared with men for love of learning, love, kindness, social learning, and justice. This hints that in further studies on the topic of character strengths, the aspect of gender should be considered in a non-exploratory manner even the number of participants must increase.

5 Limitations

Even if it is a preregistered, adequately powered study with experimental tests of the explicit and implicit attitudes towards sustainable nutrition, the study has some limiting factors: First, it is a cross-sectional study. Hence, conclusions about causations and possible interventions are not appropriate. Second, the investigation of character strengths as relevant virtues is one approach. Another approach might be to assume a neo-Aristotelian account of virtue with an empirically adequate approach to traits, like the Whole Trait theory (Snow et al., 2020). It is criticized (Bright et al., 2014; Zyl et al., 2023) that virtues are often operationalized as preferred behavior measured on a continuous scale. This is in contrast to the Aristotelian philosophy where virtues are neutral (Bright et al., 2014). Third, the group of vegetarians and vegans has been merged, although it is well known that there are differences, for example, in their personality profiles between both groups (Kessler et al., 2016). Fourth, the study sample is well-educated limiting the generalizability of the findings. Last, the factor structure of the virtues and character-strengths must be evaluated in a different study including different studies on character strengths and virtues.

6 Conclusion

The study has shown that for both groups the explicit and implicit attitudes towards vegetarian food pictures in comparison to meat-based food are in concordance. This contradicts partly a former study by Siebertz et al. (2022). Except for the character strengths of love of learning and forgiveness with small effect sizes, there was no relation of the other character strengths towards attitudes toward sustainable nutrition. That contradicts the study of Valor et al. (2020), which, however, differs in the design and the analysis methods. Nevertheless, in addition to the studies that did not show a clear picture of the relationship between other internal transformative qualities, for example, the trait mindfulness and the attitudes towards sustainable nutrition, this study gives a hint that the relating individual transformative qualities (Woiwode et al., 2021) towards sustainable attitude and behavior should be investigated with caution and in-depth.

Declarations

Ethical Approval The study was approved by the ethical committee of the University of Regensburg (reference number: 20–1740-1–101) and has been conformed to the ethical standard laid down in the 1964 Declaration of Helsinki.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Conflict of Interest The authors declare that they have no conflict of interest.

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