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Spheres of moral concern, moral engagement, and food choice in the USA and Germany

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A B S T R A C T

Given that researchers have demonstrated that different degrees of moral concern for valued entities (Biospheric, Altruistic, Egoistic) are linked with different attitudes and behaviors, the scope and degree of moral concern for any individual may have implications for how potential moral conflicts in the food system are navigated. We developed a measure of moral engagement in the food domain. We recruited adult subjects (N = 495) from the USA and Germany. In both countries, moral engagement with food exhibited high internal reliability. In both countries, as hypothesized, we found that moral engagement around food was significantly associated with greater degrees of Altruistic and Biospheric concern. In both countries, the impact of Altruistic and Biospheric spheres of concern on dietary intake and sustainable eating patterns was significantly mediated by moral engagement with food. The data suggest moral engagement with food is an appropriate construct for investigating both the ways in which underlying value orientations are operationalized with respect to concerns in the food system, and how these values mobilize people towards more sustainable eating patterns.

1. Introduction

Food choice is laden with many moral and ethical implications (Thompson, 2015), not the least of which includes its impact on the environment. While a few studies have examined the determinants of sustainable food intake (e.g., de Boer, Hoogland, & Boersema, 2007; Pelletier, Laska, Neumark-Sztainer, & Story, 2013; Schösler, de Boer, & Boersema, 2014; Lindeman & Vänäänen, 2000), much remains to be done in order to reach an in-depth understanding of the factors driving morally-engaged food choice. As issues of climate change, sustainability, and concerns over fresh water supply loom ever larger, moral engagement around issues in the food system is an increasingly salient topic of research. When accounting for agricultural land use changes, fertilizer production, and fuel use in food production, processing, and distribution, estimates have attributed up to 30% of all worldwide greenhouse gas emissions to the food system (Bellarby, Foereid, Hastings, & Smith, 2008). In order to mitigate the impact of the food system on climate change, some experts have calculated that improving the energy efficiency of food production and agricultural techniques alone will not suffice, and that dietary behavior change will be necessary to reduce emissions to target levels (Garnett, 2011). Preliminary research has done an excellent job at starting to uncover how differences in underlying value systems position people to morally engage with issues in the food system (de Boer et al., 2007), but it remains unknown how concern for specific entities, such as the biosphere, humanity, or one's self influences moral engagement in the food system, nor is it known how these orientations may vary across different cultural contexts.

There is a particular advantage of engaging moral issues in the process of altering the food system to meet environmental challenges. When an activity or ideological position gains moral force, through a process of moralization (Rozin, 1999), it tends to be pursued more forcefully by individuals, and to recruit institutional and governmental support. The case of cigarette smoking in the USA over the last four or so decades illustrates the power of moralization. More closely aligned to the food system, vegetarians whose principal motivation for avoiding meat is moral, rather than personal health, are more likely to find meat disgusting and hence less likely to be tempted by it, and are more likely to recruit multiple beliefs that support their meat avoidance (Rozin, Markwith, & Stoess, 1997).

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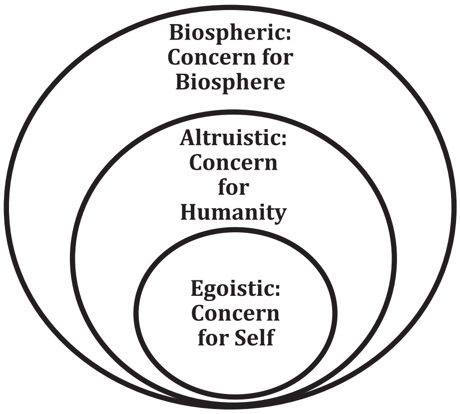

Fig. 1. Visual depiction of the Spheres of Moral Concern.

Research has demonstrated that attitudes towards environmental issues and even sustainable food choices are rooted in more general personal value orientations, such as those measured by the Schwartz values survey (de Boer et al., 2007; Schultz, 2001; Schwartz, 1992, 1994; Stern & Dietz, 1994). It has also been shown that personal values lead to varying levels of concern for risks posed to individuals, other human beings, or the biosphere (Schultz, 2001; Stern & Dietz, 1994). We refer to the scope of concern as the spheres of moral concern (Fig. 1), and, using the labels applied by Stern and Dietz (1994), refer to these spheres as being Egoistic, Altruistic, and Biospheric. Research has shown that people can be characterized according to which of these different three spheres of concern they hold (Schultz, 2001; Rhead & Upham, 2015; Burn, Winter, Hori, & Silver, 2012). Schultz (2000) proposed that these spheres of moral concern stem from the degree to which the individual includes the valued entities into their sense of self, such that an increased sense of connection with humanity or the biosphere will lead to a greater concern for these entities (Schultz, 2002). Research has shown that these spheres of concern do indeed reflect the degree to which people perceive themselves as being connected to these entities, and that the spheres are differentially associated with levels of perceived overlap between the self, other people, and nature (Schultz, 2002; Schultz, Shriver, Tabanico, & Khazian, 2004).

Using Schwartz's (1977) norm-activation model of altruistic behaviors, it has been suggested that the degree of concern for specific environmental issues is related to knowledge and awareness of the consequences of behavior on a valued entity (Milfont, Duckitt, & Cameron, 2006; Schultz et al., 2005; Stern & Dietz, 1994). According to Schwartz (1970, 1977), a personal moral norm encompasses a felt sense of moral obligation that arises when people perceive that an object of value, such as other people or the environment, is at risk for being harmed, and that they have the agency to prevent those adverse consequences from occurring. People with these value orientations evaluate their behavioral decisions, in part, based on their effects on these valued entities. Personal moral norms regarding the treatment of these valued entities function by the same activation mechanisms, regardless of the underlying sphere of moral concern (Stern & Dietz, 1994). In this paper, we not only investigate the underlying sphere of moral concern, but we introduce moral engagement as a construct which captures the personal moral norm with respect to food choices.

Prior research suggests that the degree of involvement with food may mediate the impact of values on sustainable food choice (de Boer & Schösler, 2016; de Boer et al., 2007), and that different motivational orientations may predispose people towards making certain sustainable food choice changes over others (de Boer, de Witt, & Aiking, 2016). While that sheds important light on the consumer choice process, in this paper we sought to explore the specific impact of the spheres of moral concern on sustainable food choice, as potentially mediated by moral engagement in the food system. Given that researchers (Schultz, 2001; Schultz et al., 2005) have demonstrated that different spheres of moral concern are linked with different attitudes and behaviors, and also that Schultz (2000) has demonstrated that these can be targeted by interventions, the sphere of moral concern may have implications for how moral conflicts in the food system are navigated, as well as suggest targets for intervention. Food choice is a highly complex behavior that is dictated by biological necessity as well as a host of other factors. In this paper, we sought to examine how the sphere of concern might impact the level of moral engagement around food issues and dietary behavior.

To our knowledge, this is the first study to examine how the sphere of moral concern relates to morally-engaged food choice. Given that sphere of concern has been associated with concern for relevant valued entities, we posited that a broader sphere of concern (Altruistic, Biospheric) would be associated with higher levels of moral engagement around food. Since different food choices cause different degrees of harm to the environment, human communities, and animal welfare, it seems plausible that a greater degree of moral concern for these entities would facilitate greater moral engagement around the impact that food choices have on them. For instance, someone with a greater degree of moral concern for the biosphere would be more troubled by the impacts of food choices on the biosphere, and therefore be more morally engaged around these food choices. Similarly, someone with a greater Altruistic sphere of concern might be more concerned with the impacts of food choices on human communities, and therefore be more morally engaged around food choices which impact the health and wellbeing of present and future human communities. We also wanted to explore how moral engagement around food would relate to food choice. We predicted that a broader sphere of concern, mediated through increased moral engagement in the food system, would be associated with a higher intake of more sustainable foods, (i.e., fruits, vegetables, whole grains), and a lower intake of less sustainable foods (e.g., meat and highly processed snack food; Ruini et al., 2015). Though defining and measuring sustainable food choices is an incredibly complex task, research suggests that plant-based diets are more sustainable than meat-based diets, and further, diets that are more sustainable involve greater consumption of fruits and vegetables, organic and local foods, and lesser consumption of red meat, processed snack foods, and fast food (Carlsson-Kanyama, 1998; Kramer, Moll, Nonhebel, & Wilting, 1999; Pieniak, Żakowska-Biemans, Kostyra, & Raats, 2016; Pimentel & Pimentel, 2003; Ruini et al., 2015; Temme et al., 2015; Weller et al., 2014).

Previous studies have shown that moral concerns can translate into different dietary choices (de Boer et al., 2007; Pelletier et al., 2013; Schösler et al., 2014; Lindeman & Vanaanen, 2000), though none have specifically looked at sphere of moral concern, nor general moral engagement with the food system. Further, while Lindeman and Vanaanen (2000) introduced a measure for assessing ethical food choice motives, this is the first study to formally and specifically operationalize the construct of moral engagement around the food system, a broader and more distal construct than food choice motives, reflecting the felt sense of connection, participation and obligation towards the food system as opposed to the motivations underlying specific food choices. Please see Fig. 2 for a visual depiction of the theoretical model we were exploring.

2. Research questions

The main aim of this study was to investigate the relationship between spheres of concern, moral engagement around food, and dietary behavior, in both the United States and Germany. Specifically, we posited that broader spheres of concern would be associated with greater moral engagement around food, and that greater moral engagement around food would be associated with more sustainable and healthy food choices (i.e., higher intake of fruits and vegetables, and lower intake of red meat, soda, and processed snacks). Last, we expected that the effects of sphere of concern on food choice would be

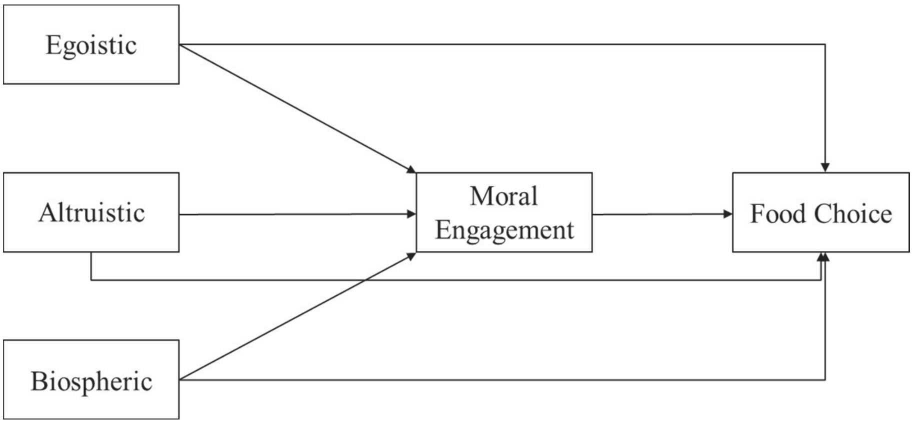

Fig. 2. Visual depiction of the Theoretical Model: Spheres of Moral Concern, Moral Engagement and Food Choice.

mediated by moral engagement around food. We chose these two countries because they were similar enough in important respects, such as both being Western with trends favoring organic and natural foods (Schösler, de Boer, & Boersema, 2013), but also with different enough populations to potentially provide insights regarding the relationships under investigation.

3. Methods

This investigation was part of a larger international study looking at psychological factors underlying eating behavior (see also Sproesser et al., 0000a; Sproesser et al., 0000b). For this study, we included measures examining sphere of concern for global problems, moral engagement around food choice, and dietary intake. In the larger study we collected data from three adult samples: USA (on MTurk), Germany, and India (on MTurk). In the USA and India, participants were recruited via Amazon's Mechanical Turk, a website with a large participant pool, and paid $2 for completing the questionnaire. Research has shown that MTurk participants have more demographic diversity than standard samples of American college students, and that data obtained through this system is at least as reliable as data obtained through more traditional methods (Buhrmester, Kwang, & Gosling, 2011). In Germany, participants were recruited online via a German university list-serve, with snowball sampling originating from the university contacts. In Germany, participants were not paid for participating in the survey. Instead, ten vouchers for Amazon.de, worth 10€ each, were drawn by lottery as incentive. The Institutional Review Boards of the University of Pennsylvania and the University of Konstanz granted ethics approval for this project.

However, for this study we used only the data collected in the USA and Germany, for several reasons. Firstly, we viewed the Indian results as a pilot study, because the spheres of concern scale and the food morality items were written with targets of respondents from Western developed cultures, and thus might not be valid for use in an Indian sample. Since Indians on MTurk speak English, we considered this a low cost exploratory venture. Given that there are distinct and different links between food and morality in the Hindu Indian world compared to Germany and the USA (e.g., Appadurai, 1981), and that our instruments had been designed for use in Western, industrialized countries, we concluded that the instruments were not sufficiently valid for use in the Hindu Indian world. Also, the lack of representativeness of an Indian online sample, with use of the English language and with a smaller proportion of Indians having access to the internet could be criticized. For the sake of transparency, we include an analysis of the entire sample, including the Indian data, in a supplement to this research paper.

Table 1
Sample demographics.

	Germany (n = 297)	USA (n = 198)
% women	81%	43%
Mean age in years (SD)	36 (14.8)	35 (11.1)
Mean BMI in kg/m^2 (SD)	24 (4.7)	27 (6.8)
Mean SES (SD)	5.9 (1.2)	4.3 (1.3)

4. Translation

The questionnaire was originally designed in English, and administered in that language for Americans. For use in our German sample, it was translated to German and then back-translated into English by two bilingual (German-English) individuals. Discrepancies were resolved through discussion.

4.1. *Participants*

A total of 561 people participated in our online survey (Unipark survey software, Globalpark AG, Hürth) including 357 participants in Germany and 204 people in the USA. When conducting our analysis, we excluded responses from 66 participants (12%) because they either filled out less than 75% of the survey, or failed at least two attention checks. Specifically, we filtered data according to responses on three catch questions ("*I regularly eat rocks*," "*I enjoy eating plastic*," and "*I think that the earth is a cube*,") measured on 7-point agree-disagree scales (scores including and above 4, indicating neutrality or some degree of agreement, were scored as unacceptable). Sample characteristics of the remaining 495 participants are displayed in Table 1. Missing data from these 495 participants on study variables were imputed using the Expectation Maximization algorithm in SPSS (Gold & Bentler, 2000). Missing values were below 5% for all imputed variables.

5. Demographics

Participants indicated their gender, age, height, and weight[1]. They also indicated their socioeconomic status, using a question adapted from the Cantril Ladder (Cantril, 1965). Participants were asked to situate themselves on a socioeconomic ladder with 9 rungs relative to other people in their society. Scores ranged from 1 to 9, with 5 being the middle, 9 being the highest and 1 being the lowest (for an overview, see Table 1).

We investigated whether there were meaningful differences

[1] Due to past research indicating gender differences with respect to meat intake (Ruby, 2012), we also conducted our analyses controlling for gender and found that our pattern of inferences remained substantively unchanged.

Table 2
Mean scores and standard deviations for moral engagement and spheres of concern.

Country		Mean	SD
USA			
	Moral Engagement	3.89	1.50
	Biospheric	5.31	1.60
	Altruistic	5.59	1.30
	Egoistic	5.57	1.24
Germany			
	Moral Engagement	4.43	1.32
	Biospheric	5.51	1.10
	Altruistic	5.43	1.12
	Egoistic	5.25	1.19

between the study sample and excluded subjects and found no significant differences in terms of gender (66% vs. 77% women, $\chi^2(2) = 2.33, p = 0.312$), age (35 vs. 34 years, $F(1, 541) = 0.38, p = 0.537$), or BMI (25 vs. 23 kg/m^2, $F(1, 526) = 2.97, p = 0.085$). However, study sample participants had a lower SES (5.2 vs. 5.7, $F(1, 539) = 4.73$, $p = 0.030$) than the excluded subjects.

6. Spheres of concern

The value basis of environmental concern measure (Schultz, 2000; Schultz, 2001) encompasses 12 environmental concern items, rated with a 7-point scale anchored by "not at all important" (1) to "extremely importance" (7) with a "neutral" (4) midpoint. The measure begins with the prompt: "I am concerned about environmental problems because of the consequences for…" Four items assess each value foundation of environmental concern: Biospheric (birds, animals, plants, and trees), Altruistic (future generations, people in the community, children, and humanity), and Egoistic (my health, my lifestyle, my prosperity, and my future).

Given our focus on food, we asked participants about their motivations for concern over *global problems* rather than their motivation for concern over *environmental problems* more specifically: *"People around the world are generally concerned about global problems because of the consequences that result from harming nature. However, people differ in the consequences that concern them the most. Please rate each of the following items from 1 (not important) to 7 (extremely important) in response to the question: I am concerned about global problems because of the consequences for… Plants, Marine life, Birds, Animals, Me, My lifestyle, My health, My future, People in my community, All people, Children, Future generations."*

Each of the spheres of concern had excellent internal consistency; Egoistic (USA $\alpha = 0.88$, Germany $\alpha = 0.90$), Altruistic (USA $\alpha = 0.90$, Germany $\alpha = 0.82$), and Biospheric (USA $\alpha = 0.96$, Germany $\alpha = 0.90$). As such, we averaged the four items for each sphere to create a single composite score for each sphere.

7. Moral engagement around food

We generated our set of question items for assessing moral engagement based on discussions with nutrition and psychology faculty, prior work of the researchers (Rozin, 1999; Rozin, 2005; Rozin, Remick, & Fischler, 2011), an extensive review of the literature, and qualitative responses gleaned from two early pilot studies. In these two pilot studies, both conducted via Mechanical Turk in the USA ($n > 200$ in each), we asked participants to respond to the open-ended question, "*What is the meaning of food in your life?"*

In analyzing the qualitative data, we categorized responses according to themes that emerged repeatedly among the responses, particularly focusing on responses indicating moral engagement with food. Following the detailed content analysis of the open-ended responses, we generated a set of 4 items assessing various aspects of moral engagement around food.

Participants answered the following four items on a 7-point scale anchored by "strongly disagree" (1) to "strongly agree" (7) with a "neither agree nor disagree" (4) midpoint: "*My values directly shape my food choices", "My food choices matter to the world", "My food choices reflect my connection to nature",* and *"When I eat I am actively participating in the food system that led to the creation/production of that food*".

The four items measuring moral engagement around food were also highly internally consistent (USA $\alpha = 0.85$, Germany $\alpha = 0.83$), and we therefore averaged each participant's score on the four items to create a composite score for moral engagement around food.

8. Dietary intake

We asked participants about their intake of vegetables (raw and cooked), fruits, whole grains, red meat, poultry, seafood, sugar-sweetened soda, and processed snacks and junk foods using questions adapted from a validated dietary screener used in the National Health and Nutrition Examination Survey in the USA (NHANES, 2009–2010). Participants were asked "*During the past month, how many servings did you consume of the following foods?"* and then given specific food items, such as red meat or poultry, with the ten items on the response scale ranging from never, one serving in the last month, 2–3 servings in the last month, and increasing in frequency up to 4 or more servings per day. Based on these responses, consumption of each food category was then converted into servings per week (e.g., none = 0; one serving per week = 1; 1 serving per day = 7).[2]

9. Results

9.1. Spheres of concern, moral engagement, and dietary intake

All analyses were performed in IBM SPSS and AMOS (Version 22 for Windows). The mean scores for the spheres of concern and moral engagement can be seen in Table 2. Responses on the spheres and moral engagement scales ranged from 1 to 7 (with 7 being the highest).

Associations between the different spheres of moral concern and moral engagement around food by country can be seen in Table 3. In the USA and Germany, Egoistic showed a small to medium correlation with moral engagement whereas Biospheric and Altruistic displayed a medium to large correlation. Moreover, in the USA and Germany, Altruistic and Egoistic showed a large correlation. Interestingly, whereas the correlation between Biospheric and Altruistic was large and the correlation between Biospheric and Egoistic was medium in the USA, these correlations were only of medium and small size, respectively, in Germany.

Associations of dietary intake with spheres of concern and moral engagement are displayed in Table 4. Concerning the relationship between moral engagement and dietary intake, moral engagement around food was positively associated with intake of raw vegetables, cooked vegetables, and fruits, and negatively associated with intake of soda and processed snacks in both the USA and Germany. Additionally, in Germany, moral engagement around food was also positively associated with intake of whole grains, and negatively associated with intake of red meat and poultry.

Turning to the relationship between spheres of concern and dietary intake, in the USA, Biospheric was positively associated with (cooked and raw) vegetable intake. In Germany, it was negatively associated with red meat, poultry, and soda intake. Following a somewhat similar pattern, in the USA, Altruistic was positively associated with (cooked and raw) vegetable, fruit, and whole grain intake, and negatively associated with soda consumption. In Germany it was positively

[2] To secure our results, we reran all analyses with the ordinal dietary intake data (e.g., none, 1 per week, 2 per day) and respective analyses for ordinal data. These analyses revealed highly comparable results.

Table 3
Correlations between moral engagement and spheres of concern.

USA	1	2	3
1. Moral Engagement			
2. Biospheric	0.37^{***}		
3. Altruistic	0.33^{***}	0.56^{***}	
4. Egoistic	0.17^{*}	0.37^{***}	0.55^{***}
Germany	**1**	**2**	**3**
1. Moral Engagement			
2. Biospheric	0.39^{***}		
3. Altruistic	0.29^{**}	0.32^{***}	
4. Egoistic	0.19^{***}	0.16^{**}	0.47^{***}

Note: $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

associated with raw vegetable, fruit, and whole grain intake, and negatively associated with poultry and soda intake. The relationship between Egoistic and food intake was seldom significant. In the USA, it was not significantly associated with any of the food categories, though in Germany, it was positively associated with cooked vegetable and fruit intake. In general, statistically significant correlations were in the range of a small effect size (Cohen, 1988).

9.2. *Spheres of concern and moral engagement*

To test the joint impact of spheres of moral concern on moral engagement around food, we ran a regression analysis within each country. Without longitudinal evidence, however, we cannot make any assumptions about causality amongst these variables. As can be seen in Table 5, in both the US and German samples, both the Altruistic and Biospheric spheres of concern significantly predicted moral engagement around food, whereas the Egoistic sphere of concern did not. In the US sample, the spheres of concern accounted for 15% of the variance in moral engagement with food and in the German sample, 18% of the variance.

9.3. *Does moral engagement mediate the effect of sphere of concern on food choice?*

We then proceeded to examine whether the effects of sphere of

Table 4
Correlations between moral engagement around food, sphere of moral concern, and dietary intake.

Country	Moral	Biospheric	Altruistic	Egoistic
USA				
Vegetables (raw)	0.37^{***}	0.21^{**}	$\mathbf{0.21}^{**}$	0.07
Vegetables (cooked)	0.16^{*}	0.17^{*}	0.18^{*}	0.06
Fruits	$\mathbf{0.23}^{***}$	0.08	$\mathbf{0.21}^{**}$	0.11
Whole grains	0.10	0.00	0.16^{*}	0.07
Red meat	−0.05	−0.06	−0.06	−0.01
Poultry	−0.10	−0.03	−0.02	−0.07
Seafood	−0.08	−0.01	0.00	−0.06
Soda/pop	-0.16^{*}	−0.08	-0.16^{*}	−0.01
Processed snacks & junk food	-0.19^{**}	−0.02	0.00	0.06
Germany				
Vegetables (raw)	$\mathbf{0.23}^{***}$	0.08	0.19^{***}	0.07
Vegetables (cooked)	$\mathbf{0.26}^{***}$	0.09	0.11	0.12^{*}
Fruits	$\mathbf{0.24}^{***}$	0.11	0.15^{**}	0.08
Whole grains	$\mathbf{0.22}^{***}$	0.09	0.13^{*}	0.14^{*}
Red meat	$\mathbf{-0.22}^{***}$	$\mathbf{-0.21}^{***}$	−0.10	−0.10
Poultry	$\mathbf{-0.32}^{***}$	$\mathbf{-0.25}^{***}$	-0.14^{*}	−0.02
Seafood	−0.01	−0.02	0.08	0.05
Soda/pop	-0.23^{***}	-0.20^{***}	-0.13^{*}	−0.02
Processed snacks & junk food	-0.18^{**}	−0.09	0.01	−0.06

Note: $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$. Bolded correlations are those 0.20 or more.

Table 5
Multiple regressions of spheres of concern on moral engagement around food.

		B	t	Sig.	Adj R^2
USA					0.15
	Biospheric	**0.25**	**3.40**	**0.001**	
	Altruistic	**0.24**	**2.29**	**0.023**	
	Egoistic	−0.05	−0.57	0.570	
Germany					0.18
	Biospheric	**0.41**	**6.06**	**0.001**	
	Altruistic	**0.18**	**2.41**	**0.017**	
	Egoistic	0.08	1.13	0.259	

concern on dietary intake were mediated by moral engagement around food (for a graphical example depicting the effects of spheres of concern, mediated by moral engagement, for raw vegetable intake in the USA, see Fig. 3). In testing these relationships in each country, we examined all food categories for which there was a significant correlation with moral engagement around food (a total of five in the USA and eight in Germany). We used the PROCESS syntax provided by Hayes (2013) in order to test our model, which examined the indirect effects of spheres of moral concern, through moral engagement with food, on dietary intake. For all analyses, we utilized a bias-corrected bootstrap with 5000 iterations, with a 95% confidence interval (CI). The indirect effects of spheres of moral concern on dietary intake variables through moral engagement with food can be seen in Table 6.

Overall, in Germany and the USA, in addition to any direct effects on dietary intake, Biospheric and Altruistic sphere of moral concern indirectly predicted intake of most foods through moral engagement, which functioned as a mediating variable.

Specifically, in the USA, the indirect effects of both Biospheric and Altruistic were significant for raw vegetable and fruit intake (positive), as well as for processed snack intake (negative). The indirect effects of Egoistic were not significant for any food categories.

In Germany, the indirect effects of both Biospheric and Altruistic were significant for raw vegetable, cooked vegetable, fruit, and whole grain intake (positive), as well as for red meat, poultry, soda, and processed snack intake (negative). Again, the indirect effects of Egoistic were not significant for any food categories.

10. Discussion

Though environmental values have been linked with pro-environmental behavior and sustainable food choices by a number of prior research studies (Boeve-de Pauw & Van Petegem 2013; de Boer & Schösler, 2016; de Boer et al., 2007; Klöckner, 2013; Milfont et al., 2006; Schultz et al., 2005), this is the first study to investigate the relationship between the spheres of moral concern, moral engagement with food, and sustainable food choice. To the best of our knowledge, this was also the first study to examine how the construct of moral engagement with food is predicted by general underlying value orientations, and how it mediates their effect on food choice. Prior studies have indicated that while environmental values and pro-environmental behavior are often highly linked, the pathways from value systems to behaviors differ according to context (Boeve-de Pauw & Van Petegem, 2013), suggesting that empirical research is necessary to elucidate the mechanisms underlying these pathways. Building on this growing body of research, this was the first study to begin empirically investigating the pathways whereby value systems translate into pro-environmental dietary behavior. The cross-sectional empirical approach utilized herein is not sufficient to make any assumptions about causality amongst these variables, however, and further studies should collect longitudinal evidence in order to elucidate causal pathways.

Prior research has indicated that more sustainable eating patterns involve greater consumption of fruit, vegetables, and whole grains, and lesser consumption of red meat, poultry, processed snack foods, and

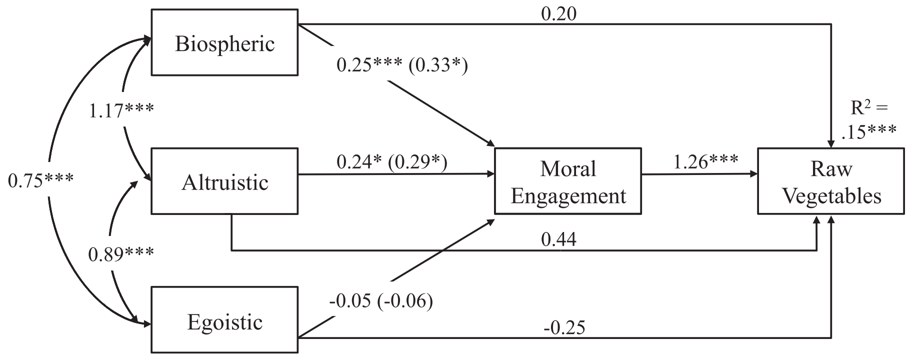

Fig. 3. Mediational model of the effects of spheres on concern through moral engagement of food on raw vegetable intake (USA).

soda (Carlsson-Kanyama, 1998; Kramer et al., 1999; Temme et al., 2015). Our findings demonstrate that people with a greater degree of Biospheric and Altruistic concern are more likely to exhibit these dietary patterns. In the USA and Germany, as hypothesized, we found that a broader sphere of moral concern, (i.e., Altruistic and Biospheric, as opposed to Egoistic spheres of concern) significantly predicted moral engagement around food, and moreover, through its effects on moral engagement around food, also predicts more sustainable eating patterns. Specifically, in the US and Germany, the impact of Altruistic and Biospheric spheres of concern on dietary intake was significantly mediated by moral engagement around food, a new construct that we have formally operationalized, and one far more proximal to food choice than are underlying value systems. In both countries, moral engagement with food also exhibited high internal reliability. Therefore, we feel it is an appropriate construct for investigating the ways in which underlying value orientations are reflected with respect to concerns around the food system.

One might discuss whether the markers of a sustainable diet used in this study are oversimplified. As research has shown (Saxe, 2014), fruit and vegetables imported over long distances may be less sustainable than diets with a greater reliance on local foods, even if those diets include meat. Therefore, the two markers of fruit and vegetable consumption should not on their own be taken as evidence of the sustainability of a diet. However, there is empirical support indicating that on average, plant-based diets are more sustainable than meat-based diets, and that patterns of greater fruit and vegetable consumption relative to meat intake are indicators of greater dietary sustainability (Pimentel & Pimentel, 2003; Ruini et al., 2015). In fact, in the double pyramid model presented by Ruini et al. (2015), fruit and vegetables are considered the foods with the lowest environmental impact (making no caveat regarding their origin), and the researchers found that the vegetarian diets they analyzed had an environmental footprint that was 2.8 times lower than the omnivorous diet they analyzed, whereas the vegan diet was 3.3 times lower.

Our two groups were not equivalent, nor were they representative samples. In Germany, participants were a convenience sample, and may have been a self-selecting group, and in both countries, more highly educated people were overrepresented. While these sampling differences may have led to differences in the participant pools, this research investigation involved a descriptive study of both samples, rather than a comparison of differences between them. Furthermore, we make no claims about the external validity of these relationships. Rather, this study was the first step towards understanding these constructs in greater detail.

This was the first study to examine how broad, underlying value orientations, specifically spheres of moral concern, might be operationalized with respect to food choice. It makes intuitive sense to determine that being concerned about harm incurred to the biosphere would result in a different moral calculus than being concerned about harm incurred to the individual self, or to one's community. Therefore, we were not surprised to see that people who had a greater degree of Biospheric and Altruistic moral concern (i.e., more concerned for the effects of global problems on the biosphere or on humanity, rather than on their individual self) would feel a greater sense of moral engagement with respect to the food system, one of the primary arenas where individuals can make daily decisions that reflect their concern for the environment. Further, we had also hypothesized that greater moral engagement would be associated with significantly healthier and more sustainable food intake, and that it would function as a mediator for the effects of sphere of moral concern on food intake. The food system is a

Table 6
Unstandardized indirect effects of sphere of concern through moral engagement on dietary intake.

	Biospheric			Altruistic			Egoistic		
	Indirect effect	LLCI	ULCI	Indirect effect	LLCI	ULCI	Indirect effect	LLCI	ULCI
USA									
Vegetables (raw)	**0.33**	**0.11**	**0.69**	**0.29**	**0.03**	**0.69**	−0.06	−0.31	0.20
Vegetables (cooked)	0.09	−0.03	0.33	0.12	−0.04	0.38	−0.02	−0.19	0.04
Fruits	**0.21**	**0.04**	**0.50**	**0.21**	**0.03**	**0.54**	−0.04	−0.24	0.12
Soda/pop	−0.10	−0.32	0.02	−0.09	−0.35	0.02	0.02	−0.04	0.18
Processed snacks & junk food	**−0.18**	**−0.44**	**−0.04**	**−0.19**	**−0.49**	**−0.03**	0.05	−0.09	0.23
Germany									
Vegetables (raw)	**0.35**	**0.12**	**0.64**	**0.15**	**0.03**	**0.38**	0.07	−0.03	0.24
Vegetables (cooked)	**0.33**	**0.17**	**0.55**	**0.14**	**0.03**	**0.30**	0.06	−0.04	0.19
Fruits	**0.47**	**0.22**	**0.79**	**0.21**	**0.04**	**0.44**	0.08	−0.05	0.29
Whole grains	**0.31**	**0.12**	**0.58**	**0.13**	**0.02**	**0.32**	0.06	−0.03	0.18
Red meat	**−0.09**	**−0.16**	**−0.03**	**−0.04**	**−0.10**	**−0.01**	−0.01	−0.05	0.01
Poultry	**−0.10**	**−0.17**	**−0.05**	**−0.05**	**−0.09**	**−0.01**	−0.02	−0.06	0.01
Soda/pop	**−0.13**	**−0.25**	**−0.05**	**−0.06**	**−0.15**	**−0.01**	−0.02	−0.08	0.01
Processed snacks & junk food	**−0.18**	**−0.36**	**−0.04**	**−0.08**	**−0.21**	**−0.01**	−0.03	−0.13	0.01

Note: All tests use a confidence interval of 95%. Bolded items are statistically significant ($p < 0.05$), as the lower limit of the confidence interval (LLCI) and upper limit of the confidence interval (ULCI) do not cross zero.

major contributor to greenhouse gas emissions, and different dietary choices result in varying degrees of environmental impact (Carlsson-Kanyama, 1998; Kramer, Moll, Nonhebel, & Wilting; Temme et al., 2015). Though it makes sense that people with a greater Biospheric and Altruistic sphere of moral concern would make more sustainable food choices, this is the first study in which these relationships were empirically verified, and the first study to identify moral engagement as a mediator in this pathway. Further research ought to tease out the various mechanisms through which these spheres of concern are operationalized.

Prior research has indicated that involvement in food mediates the relationship between values and sustainable food choice (de Boer & Schösler, 2016; de Boer et al., 2007). Thus, further research should explore whether involvement may mediate the impact of the spheres of moral concern on moral engagement with food and/or sustainable food choices. Similarly, it is likely that the perceived impact of food choice on valued entities might also mediate the relationship between the spheres of concern and moral engagement with food, as well as with sustainable food choices (de Boer & Schösler, 2016). Future research should explore this as another potential mediating variable.

The implications of this research are important from the perspective of sustainability and health promotion policy, two issues which are increasingly linked (Hamm, 2008) Now that there is empirical evidence linking different spheres of moral concern and moral engagement to significantly different dietary intake patterns, a case can be made for targeting these in interventions aimed at improving dietary behavior for the sake of sustainability and/or health promotion. In an intervention setting, it might be possible to highlight the connection between food choices and their impacts on valued entities as a way to increase consumers' willingness to choose more sustainable foods. Additionally, it might be possible to target the mediating variable of moral engagement, and use education and activities to target increased moral engagement as an avenue for increasing the consumption of sustainable foods. Here we provide evidence that moral engagement and sphere of moral concern significantly impact dietary choice.

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