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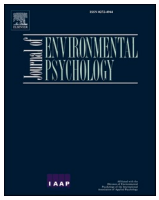

It is just wrong: Moral foundations and food waste

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ABSTRACT

Household food waste is one of the major obstacles to meeting global emission targets. Yet, it seems that we still do not fully understand why some people are more driven than others in their engagement to reduce household food waste. Here, we take a new perspective and examine (a) the perceived morality of food waste as a driver for food waste behavior and (b) whether interventions that associate food waste with either the moral foundation of harm or disgust can increase both intentions to reduce food waste and to engage more in future meal planning. Across two study phases (N = 698 and 446; respectively), we found support for our hypothesis that the belief that food waste is morally wrong is negatively associated with self-reported food waste. Moreover, we found that a harm manipulation, relative to a disgust manipulation and a control condition, increased participants' intention to reduce food waste and future meal planning intentions via food waste moral judgment, but only for those individuals who were at mean or higher values on the care foundation. A disgust manipulation, in contrast, compared to a harm manipulation, directly elicited stronger intentions to reduce food waste and to plan meals, but again only for those who endorsed the associated purity foundation. Our findings suggest different cognitive mechanisms for individuals who ground their morality in the care and the purity foundations and thus have several implications for practice and future research.

1. Introduction

Household food waste is one of the major contributors to global greenhouse gas emissions and thus represents a main obstacle to meeting global emission targets and sustainability goals (Clark et al., 2020; United Nations Environment Programme, 2021). In attempts to tackle emissions, there has been extensive research into the drivers of household food waste (e.g., Hebrok & Boks, 2017; Stöckli, Niklaus, & Dorn, 2018). Moreover, researchers and practitioners have designed and tested a myriad of intervention studies with the aim of reducing food waste (Zamri et al., 2020); yet without overwhelming success (Hebrok & Boks, 2017; Reynolds et al., 2019). However, a recent integrative study suggested that the prevailing focus on changing short-term behaviors and cognitions may be overlooking a vital set of interventions based on long-term cognitions: Addressing such an omission is important because long-term cognitions are more general, and thus inherently more inclusive, than more specific short-term cognitions such as attitudes (Bretter, Unsworth, Russell, et al., 2022). Such long-term cognitions include personal values and morals and, indeed, we have some understanding of how personal values relate to food and other pro-environmental behaviors (Bretter & Schulz, 2023; De Groot & Steg, 2007). However, a mixture of personal values can exist simultaneously and thus may give rise to cognitive tensions when one of them is made salient in a food waste intervention (e.g., self-enhancement versus self-transcendent values). Moral foundations, on the other hand, refer to distinct fundamental lenses through which moral judgements are made that rarely stand in conflict with each other (Feldman, 2021). Thus, morals may provide a more effective long-term, non-conflictual cognition on which to base food waste interventions than either short-term cognitions or personal values.

Moral systems are "interlocking sets of values, practices, institutions, and evolved psychological mechanisms that work together to suppress or regulate selfishness and make social life possible" (Haidt, 2008, p. 70). They are based on a foundation of moral beliefs predicated on care/harm, purity/disgust, reciprocity/fairness, ingroup/loyalty, and/or authority/respect, with the care/harm and purity/disgust foundations being independent of the social context (Haidt & Graham, 2007). Moral judgments are made about one's, and others', behaviors based on the degree to which the behaviors match the individual's moral foundation. In the study of morality therefore, we can distinguish moral

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beliefs based on particular foundations (e.g., it is important to know whether people are being harmed) and moral judgements (e.g., food waste is wrong), from personal values (Feldman, 2021; Wolsko, 2017).

Indeed, there are some initial suggestions of an association between morality and food waste coming from broad-ranging works designed to identify a variety of motivations behind food waste (Parizeau, von Massow, & Martin, 2015; Schanes & Stagl, 2019). For example, La Barbera, Riverso, and Verneau (2016) found in their interviews that participants often invoked the moral foundation of care/harm in providing reasons for why food waste is bad (i.e., "Reducing world hunger", p. 133). Additionally, Ghani and colleagues (2013) speculated (but did not test) that moral foundations may be important to examine in better understanding food waste; and, in explaining their findings, Parizeau et al. (2015) similarly speculated that moral foundations were likely confounding factors that they did not account for. However, given that these studies tend to be either inductive (e.g., La Barbera et al., 2016) or interpreting behavior as morally-driven (e.g., Karim Ghani, Rusli, Biak, & Idris, 2013; Parizeau et al., 2015), we do not know whether morals are systematically related to food waste. Moreover, we do not know how effective morals may be as the platform for food waste reduction interventions. Across two phases ($N_1 = 698$; $N_2 = 446$) we test our hypotheses and show that a moral judgment of food waste, that is the belief that food waste is morally wrong, is negatively associated with self-reported food waste. In the second phase, we also examined whether interventions that utilize moral foundations can be successful in promoting intentions to reduce food waste and plan meals. We show that interventions based on the dimensions of care/harm and purity/disgust (i.e., those that can be practicably manipulated; Feinberg & Willer, 2013) may be promising in increasing intentions to reduce food waste for individuals whose morality is grounded in these respective moral domains.

In the remainder of this paper, we will first review the literature on food waste and morality and integrate these with findings from broader environmental psychology to develop our hypotheses. Then, we will elaborate on our methodology and results before outlining their implications for research and practice.

2. Literature review

2.1. Food waste and morals

To date, some authors have speculated on the impact of morals on food waste. Karim Ghani et al. (2013), for example, argued that local authorities should take citizen's moral beliefs about food into account in furthering food waste separation; Parizeau et al. (2015) also posited that food waste is likely to be affected by moral standards; and, in their review, Hebrok and Boks (2017) also suggest that morality may impact food waste, particularly for specific demographic groups. Yet empirically, the idea that food waste may be perceived as a moral issue has received little attention. It has emerged during a few inductive qualitative studies, but these have generally had limited samples. La Barbera et al. (2016), for example, interviewed undergraduate students and found that food waste behavior seemed to have an underlying moral domain, while two focus groups conducted by Refsgaard and Magnussen (2009) found that moral acceptance of waste separation was important. Similarly, in their interview study of 15 householders, Graham-Rowe, Jessop, and Sparks (2014) found that participants believed that saving food rather than wasting it is the 'right thing to do' and Schanes and Stagl (2019), in their interviews with 16 personal contacts, found that participants seemed to have moral standards that dictate whether food waste is judged as good or bad.

Given this promising start, it is surprising that there has not been a large-scale systematic study to examine whether morals are, indeed, significantly associated with food waste. Instead, such rigorous research has tended to focus either on behaviors or long-term goals such as personal values (Bretter, Unsworth, Russell, et al., 2022). As noted above, personal values differ from morals because they can co-exist leading to conflict between values, while morals rarely do (Feldman, 2021). This omission is problematic because, if food waste is associated with moral judgments, then this could be the basis of a strong set of interventions. As noted by Waldmann, Nagel, and Wiegmann (2012), "*Moral judgments […] are typically accompanied by strong affect and emotions, which endow them with a force that goes beyond general conventional norms. Moral rules or norms are typically viewed as authority independent, as ends that have to be honored, as particularly important, and by some people as universally valid*" (p.384).

Indeed, although quantitative studies examining morality are rare in the food waste literature (Stancu, Haugaard, & Lähteenmäki, 2016; Visschers, Wickli, & Siegrist, 2016), some evidence exists in the literature on general environmental psychology (Truelove, Carrico, Weber, Raimi, & Vandenbergh, 2014). Here investigations suggest that the attachment to moral principles is associated with recycling and energy conservation behaviors (Krettenauer & Lefebvre, 2021; Lu, Zou, Chen, & Long, 2020). Other studies show that moral status is associated with meat consumption (Loughnan, Haslam, & Bastian, 2010) and dietary preferences (De Backer & Hudders, 2015). In their recent review, Lau et al. (2021) conclude that morals are key to predicting and understanding individual decision-making related to these types of environmental behaviors. However, although this gives some support for our hypothesis, direct extrapolation is not possible due to the unique nature of food waste reduction. In addition to being associated with more tangential biospheric identities like other environmental behaviors (Whitmarsh & O'Neill, 2010), food and food waste are also associated with a person's central familial identities (Aschemann-Witzel, Giménez, Grønhøj, & Ares, 2020; Moisio, Arnould, & Price, 2004; Visschers et al., 2016). Given that the activation of different identities can lead to different moral judgements (Leavitt, Reynolds, Barnes, Schilpzand, & Hannah, 2012), we cannot assume that previous findings will generalize to food waste behavior. This particularity of food waste provides further emphasis on the need to examine food waste and morality in a single study.

In summary, there are intriguing hints in the existing literature that food waste will be associated with moral judgements. Although neither set of extant evidence allows us to draw a solid conclusion, we believe that the combination of the two streams of literature - both food waste research and moral pro-environmental research – provides a base for empirically assessing our fundamental assumption that.

Hypothesis 1. The extent to which food waste is seen as morally wrong (i.e., moral judgement of food waste) is negatively associated with self-reported food waste

2.2. Targeting interventions for moral foundations

If morals do underlie food waste behavior, as H_1 suggests, it is important to understand how morals can be leveraged in order to reduce food waste. Overall, an intervention that strengthens the moral judgement of food waste should increase one's determination to reduce it. However, as noted above, there are different foundations of morality which means that the beliefs that might lead one person to make a moral judgment are different to those that would lead another (Graham et al., 2011; Haidt & Graham, 2007). Therefore, we need to consider how to target the intervention to best strengthen moral judgements of food waste (Haidt & Graham, 2007).

As already mentioned, morality comprises five foundations: care/harm, purity/disgust, reciprocity/fairness, ingroup/loyalty, and authority/respect (Graham et al., 2011; Haidt & Graham, 2007). While the existence of some sort of social environment is necessary to assess the latter three, be it the existence of leaders (authority/respect), tribes (ingroup/loyalty), or a social exchange (reciprocity/fairness), it is not for the former two, care/harm and purity/disgust. As a result, research that explores the effect of interventions on the environmental behavior

of individuals removed from the social context (i.e., experimental studies) often focuses on these (Feinberg & Willer, 2013), given the methodological and practical challenges of incorporating such context into the study design and future real-world interventions. For the same reason, we follow existing research and focus on the moral foundations of care/harm and purity/disgust and their association with food waste. Moral judgments of the care/harm dimension refer to the extent to which individuals show compassion for the suffering of others, such as animals, the biosphere, or individuals (Graham et al., 2011). Judgments of purity/disgust, on the other hand, refer to the extent to which cleanliness and 'being pure' are important to the individual (Graham et al., 2011).

Broadly, although care/harm and purity/disgust are distinct moral foundations, research has found that both are associated with pro-environmental behaviors (Jia, Soucie, Alisat, Curtin, & Pratt, 2017), but for reasons associated only with that foundation (Feinberg & Willer, 2013). Accordingly, the degree to which individuals judge morality through the lens of the care/harm or the purity/disgust dimension determines what people will pay attention to when considering whether food waste is morally wrong. Moreover, research on moral self-regulation indicates that self-perceptions of one's moral image affect subsequent moral behavior where one engages more in moral behavior after one's self-image has been threatened (Truelove et al., 2014; Zhong, Liljenquist, & Cain, 2009). In other words, if individuals reflect on their behavior and judge it to be morally wrong according to their moral foundation, moral self-regulation will result in a change of future behavior to enhance the self-view. This view neatly aligns with literature that demonstrates individuals are more likely to engage in pro-environmental behavior if it is perceived as self-concordant (Unsworth, Davis, Russell, & Bretter, 2021), compared to when it is not (Unsworth & McNeill, 2017).

Integrating these various strands suggests that associating food waste with a particular moral foundation should therefore strengthen the belief that food waste is morally wrong, but only for those people who ground their morality in that foundation (Wagemans, Brandt, & Zeelenberg, 2018). More specifically, associating food waste with harm to the environment (i.e., the care/harm foundation) will make those individuals who ground their morality in the care/harm foundation perceive food waste as more morally wrong, compared to those who do so via the purity/disgust foundation. Conversely, associating food waste with a lack of hygiene and smell (i.e., the purity/disgust foundation), will make those who ground their morality in the purity/disgust foundation perceive it as more morally wrong, compared to those who do so via the care/harm foundation. We hypothesize.

Hypothesis 2. For those who endorse the care/harm foundation, an intervention that associates food waste with harm will result in stronger judgement that food waste is morally wrong, compared to a control condition and an intervention that associates food waste with disgust.

Hypothesis 3. For those who endorse the purity/disgust foundation, an intervention that associates food waste with disgust will result in stronger judgement that food waste is morally wrong, compared to a control condition and an intervention that associates food waste with harm.

Given that moral judgments are commonly associated with intentions (Ajzen, 1991; Small & Lew, 2021), we hypothesize that moral judgements on food waste will also be associated with individuals' intention to reduce food waste. However, we also wanted to examine whether such moral judgements influence intentions to engage in specific food management behaviors (FMB) that can reduce food waste. One FMB that has reliably been associated with a reduction of food waste is meal planning (Bretter, Unsworth, Russell, et al., 2022; Stefan, van Herpen, Tudoran, & Lähteenmäki, 2013). Once individuals are made aware of the fact that meal planning can help to reduce food waste (Quested, Marsh, Stunell, & Parry, 2013; van Geffen, van Herpen, & van Trijp, 2020), we hypothesize that moral judgements on food waste will be positively associated with the intention to engage in meal planning behaviors. We therefore hypothesize.

Hypothesis 4. The belief that food waste is morally wrong (i.e., moral judgement) will be positively associated with intentions to a) reduce food waste and b) engage in future meal planning behaviors.

3. Method

3.1. Overview

We have received ethical approval for our work from the University Ethics Committee. To test our hypotheses, we conducted two related phases of work. The purpose of Phase 1 was to examine whether individuals judge food waste as morally wrong, thereby testing H_1. As moral foundations (i.e., care/harm and purity/disgust) may underlie such moral judgments, Phase 2 then explored whether messages that associate food waste with one of these moral foundations may strengthen the belief that food waste is morally wrong for individuals that adhere to that particular foundation (i.e., testing H_2, H_3 and H_4). We designed both on Qualtrics and invited participants through Prolific, a commonly used survey panel (see Bretter, Unsworth, & Robinson, 2022). Although we could have tested all hypotheses in a single sitting, we did so in two separate phases, inviting participants from Phase 1 to participate in Phase 2 because it allowed us to measure variables at different time points, thus reducing the risk of consistency and desirability biases as well as common method variance (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). For Phase 1, we designed a survey that measured participants' values, self-reported food waste, demographics, and their moral judgment of food waste (for more detail, see below). Moreover, in preparation for Phase 2, we also measured participants' moral foundations in Phase 1. Phase 2, conducted approximately one week after Phase 1, encompassed an experiment designed to activate moral judgments on food waste based on distinct messages to examine whether these messages elicit different responses to participants' intention to reduce food waste and to engage in meal planning behaviors (for more detail, see below). We calculated the required minimum sample size for Phase 1 *a priori* using GPower v. 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007). We used a small effect size of $f^2 = 0.02$ (Knez, 2016), $\alpha = 0.05$, a power of .80 and at least six predictors as input variables (food waste morals, three value-orientations, and demographics such as age or gender) for the linear multiple regression model. The minimum sample size was $N_{min1} = 688$ participants. We could not calculate the required sample size for Phase 2 *a priori* because wrongly estimating a Pillai's trace (V) may lead to an under or over-powered experiment (Lenth, 2001). Instead, we provide a post-hoc sensitivity analysis (see Phase 2). In the following sections, we elaborate in more detail on the procedures, measures and analyses of each.

3.2. Phase 1

3.2.1. Participants, procedure, and measures

The purpose of this survey was to test H_1, namely that food waste moral judgements are independently negatively associated with self-reported food waste. Accordingly, our survey included several constructs. After obtaining consent, we measured participants' egoistic ($\alpha = 0.76$), altruistic ($\alpha = 0.81$), and biospheric values ($\alpha = 0.91$) using 13-items adapted from De Groot and Steg (2007) on a 7-point scale from (1) = "*Not at all important to me*" to (7) = "*Very important to me*". We measured these personal values as covariates to be able to control for them in a separate robustness step in our analysis. Next, on a 6-point scale from (1) = "*Not at all relevant*" to (6) = "*Extremely relevant*", we measured participants' moral foundations using the 12-item questionnaire for the care/harm ($\alpha = 0.69$) and purity/disgust ($\alpha = 0.79$) dimensions developed by Graham, Haidt, and Nosek (2009, 2011). Then, on a 6-point scale from (1) = "*Not at all morally wrong*" to (6) = "*Very*

morally wrong" we measured participants' moral judgment of food waste by adapting the single item used by Sweetman and Newman (2020; "To what extent do you think food waste is morally wrong?"). We measured participants' self-reported food waste on a slider scale from 0 to 100%, following the procedure outlined by Bretter, Unsworth, Russell, et al. (2022). Specifically, we asked them to indicate the percentage of food thrown away in the last two weeks separately for the four most commonly thrown-away items (i.e., bread, milk, chicken and potatoes; WRAP, 2020). Importantly, per food item, we included a question asking participants to indicate whether they have bought any of these food items recently so that only participants who bought an item (e.g., bread) were asked how much of the item they wasted. A composite measure of participants' self-reported food waste was then calculated using the mean of the four separate food items. Finally, we measured participants' demographics. In total, we recruited 698 participants for this study (age: $M = 41.02$ years, $SD = 11.11$ years; gender: male = 217, female = 475, other/prefer not to say = 6). Aligned with the ethical principles of Prolific, they were paid an average of £7.12 per hour to complete the 5-min questionnaire.

3.2.2. Results

The means, standard deviations and correlations are shown in Table 1.

We conducted hierarchical regression analysis using our overall food waste measure as the dependent variable and, in the first step, food waste moral judgement as the independent variable. The results are presented in Table 2. As expected, we found a negative association of moral judgments of food waste with our food waste measure ($\beta = -.10$; $p = .011$). In other words, the more participants thought food waste was morally wrong, the smaller was their self-reported food waste. Next, we accounted for participants' biospheric, altruistic, and egoistic value orientations as additional predictors of food waste. Although biospheric values were negatively associated with food waste ($\beta = -0.09$; $p = .047$), the effect of food waste moral judgment remained ($\beta = -0.08$; $p = .044$). Finally, we added demographics as independent variables. Here, age ($\beta = -0.13$; $p = .001$) and moral judgments ($\beta = -0.08$; $p = .054$) remained as the sole predictors of self-reported food waste. Although the p-value for moral judgment in this final test was slightly higher than the traditional level of .050, the beta weight is similar to those listed above that are considered "significant". Given the problems associated with delineating a threshold cutoff of "significant/not significant" in rejecting the null hypothesis (Greenland et al., 2016), we follow current guidelines by the American Statistical Association (Wasserstein & Lazar, 2016) and interpret this finding in its context, suggesting that this finding is in line with the others. Overall, therefore, we suggest that a moral judgment of food waste is associated with food waste behavior providing support for H_1.

3.2.3. Discussion

The purpose of Phase 1 was to test the hypothesis that the extent to which individuals judge food waste as morally wrong is negatively associated with food waste behavior. In support of H_1, we found such an association above and beyond the traditional influencers of food waste of values and demographics. Given that distinct moral foundations (i.e., care/harm and purity/disgust) may underlie such moral judgments of food waste, it seems plausible that messages linking food waste to one of these moral foundations may strengthen the belief that food waste is morally wrong for individuals that adhere to that particular foundation. Moreover, this strengthened belief may then result in an increased intention to reduce food waste and to engage in meal planning behaviors. Phase 2 examined these moderated mediations and thus tested H_2, H_3 and H_4.

3.3. Phase 2

3.3.1. Participants, procedure and measures

The purpose of Phase 2 was to test our moderated mediation hypotheses (H_2, H_3 and H_4) using an experimental design that enabled a more rigorous test than a correlational design. We deliberately invited the same participants that had participated in Phase 1 to participate in Phase 2 to effectively reduce the risk of common method variance and desirability biases (see 3.1 Overview). In particular, we examined whether messages linking food waste to the moral foundation of care/harm, compared to the purity/disgust foundation, result in stronger beliefs that food waste is morally wrong for individuals adhering to the care/harm foundation (H_2). Conversely, we examined whether messages that connect food waste to the purity/disgust foundation, compared to the care/harm foundation, result in stronger beliefs that food waste is morally wrong for individuals adhering to the purity-disgust foundation (H_3). Moreover, we tested whether this strengthened moral belief of food waste is positively associated with an increased intention to (a) reduce food waste and (b) engage in meal planning behaviors (H_4). We chose meal planning behavior because it has been reliably associated with food waste in past research (Stefan et al., 2013). A conceptual model of these tests is presented in Fig. 1.

We, therefore, created an experiment based on a food waste messaging campaign. Following a single-factor design, we allocated participants randomly to one of three message conditions: Harm, disgust, and control. Importantly, the messages related to the moral foundations used specific themes associated with those specific foundations (Graham et al., 2009). Therefore, we created a more comprehensive manipulation by diversifying our messages to include several themes of disgust and harm. In the harm condition, we presented participants with three messages that link the production, disposal and wastage of food to the suffering of animals and the environment (e.g., "*Food waste harms the environment*"). In the disgust condition, we presented participants with three messages that associate the production, disposal and wastage of food with unpleasant smells and a lack of hygiene (e.g., "*Food waste attracts dirty animals and pests*"). Before displaying the three messages on one page, participants were shown the

Table 1
Means, standard deviations, reliabilities and correlations for phase 1.

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10
1. Gender	1.70	0.49										
2. Age	24.02	11.11	−.05									
3. Income	7.46	3.68	−.03	−.12								
4. Education	3.72	1.30	−.04	−.10	.18							
5. FW Moral Judgment	4.36	1.00	.00	.05	−.04	.03						
6. Care Moral Foundation	4.64	0.68	.22	−.01	.01	−.08	.16	(.70)				
7. Purity Moral Foundation	3.38	0.96	.11	.00	−.01	−.18	.07	.29	(.80)			
8. Egoistic Values	3.43	1.01	−.07	−.18	.16	.09	.05	.00	.32	(.76)		
9. Altruistic Values	5.62	1.00	.13	−.04	.01	.04	.22	.52	.12	.12	(.81)	
10. Biospheric Values	5.31	1.21	−.02	.11	−.06	.04	.34	.28	.03	.02	.50	(.91)
11. Food Waste	7.02	11.79	−.02	−.14	.03	−.03	−.10	−.01	.07	.05	.00	−.09

Note: Bivariate N ranges from 661 to 698. For all $|r| \geq 0.08$, $p < .05$. For all $|r| \geq 0.11$, $p < .01$. Cronbach's coefficient alpha is provided along the diagonal in parentheses.

Table 2
Results of the regression analyses.

Model	*Dependent variable*	*Predictor variable*	B	*SE*	*β*	*p*	*F*	R^2
1	Food waste					.011	6.48	.01
		Constant	12.09	2.05		<.001		
		Food waste moral judgment	−1.17	.46	−.10	.011		
2	Food waste					.013	3.21	.02
		Constant	9.88	3.28		.003		
		Food waste moral judgment	−0.98	.49	−.08	.044		
		Egoistic values	0.60	.46	.05	.187		
		Altruistic values	0.74	.54	.06	.172		
		Biospheric values	−0.92	.46	−.09	.047		
3	Food waste					.002	3.09	.04
		Constant	16.02	4.04		<.001		
		Food waste moral judgment	−0.94	.48	−.08	.054		
		Egoistic values	0.32	.47	.03	.491		
		Altruistic values	0.68	.55	.06	.220		
		Biospheric values	−0.75	.47	−.08	.108		
		Gender	−0.81	.95	−.03	.390		
		Age	−0.14	.04	−.13	.001		
		Income	0.03	.13	.01	.835		
		Education	−0.38	.35	−.04	.285		

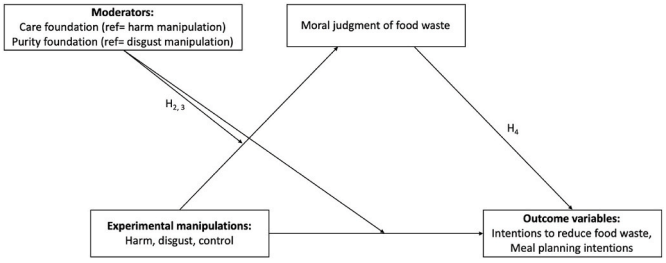

Fig. 1. Conceptual model of Phase 2. Ref = reference group for the regression models. If the reference group is the harm manipulation, the care foundation will be the moderator. If the disgust manipulation is the reference group, the purity foundation will be the moderator.

instruction "*Please read the following sentences very carefully*". The messages displayed in each condition are provided in the Appendix. The control condition did not receive any moral messaging. All participants then read a message just before our dependent variables were measured that read "*Planning meals helps you to reduce your food waste*". We included this message because we needed to associate the reduction of food waste to a particular behavior – meal planning – to be able to measure intentions to perform that behavior as the dependent variable.

After these manipulations, we measured the extent to which participants believed food waste is morally wrong using the same item as in Phase 1. Then, on a 5-point scale from (1) = "*Never*" to (5) = "*At every opportunity*", we measured participants' intention to reduce food waste (α = 0.89) and intention to plan meals (α = 0.73) with the question "*How often do you intend to do the following in the next two weeks?*" using the three-item and five-item measures, respectively, from Bretter, Unsworth, Russell, et al. (2022).

As stated above, one week after Phase 1, we invited the same participants to participate in Phase 2. In total, 446 participants (age: M = 41.16 years, SD = 11.01 years; gender: male = 144, female = 297, other/prefer not to say = 5) participated in Phase 2 (Harm condition: 148 participants; disgust condition: 148 participants; control condition: 150 participants). They were paid an average of £11.24 per hour to complete the 5-min experiment.

3.3.2. Results

The correlations, means and standard deviations can be found in Table 3. Our hypothesis was based on moral foundations theory and focused on the need for targeted interventions rather than a one-size-fits-all moral intervention. We began with H_2 and the harm intervention. We analyzed our data using model 8 in SPSS PROCESS (Hayes, 2017). We entered our conditions as a multicategorical independent variable (with the harm intervention as the reference group), food waste moral judgment as the mediator, the moral foundation of care (measured in Phase

Table 3
Correlations, means and standard deviations for Phase 2.

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Gender	1.69	0.50												
2. Age	24.16	11.01	−.07											
3. Income	7.44	3.69	−.02	−.16										
4. Education	3.70	1.27	−.04	−.09	.20									
5. Harm Condition[a]	0.33	0.47	−.04	.09	.00	.03								
6. Disgust Condition[a]	0.33	0.47	.02	−.04	.03	.04	−.50							
7. Control Condition[a]	0.34	0.47	.02	−.04	−.04	−.07	−.50	−.50						
8. Care/Harm Moral Foundation	4.61	0.68	.23	.00	.03	−.08	.02	.02	−.04					
9. Purity/Disgust Moral Foundation	3.37	0.97	.17	−.04	−.06	−.24	−.09	.05	.05	.31				
10. FW Moral Judgement Phase 1	4.31	0.99	.00	.05	−.01	.01	.01	.05	−.06	.20	.08			
11. FW Moral Judgement Phase 2	4.51	0.96	.04	.06	−.03	−.06	.12	.01	−.13	.23	.13	.62		
12. Intentions to Reduce FW	4.16	0.86	.15	.05	.01	−.01	−.04	.06	−.02	.31	.05	.37	.38	
13. Intentions to Plan Meals	3.86	0.74	.19	−.02	.08	−.01	−.05	.06	−.01	.22	.08	.19	.21	.65

Note: N = 446; [a] Dummy variable where 1 = participated in condition and 0 = not in condition; *For all* $|r| \geq 0.10$, $p < .05$. *For all* $|r| \geq 0.13$, $p < .01$.

1) as the moderator, and baseline food waste moral judgments (from Phase 1) as a covariate. We included baseline moral judgements of food waste as a covariate because we wanted to examine whether our manipulations affected moral judgements beyond already existing judgements. In other words, we wished to examine the change that occurred in moral judgements ostensibly due to our manipulation. Thus, we needed to account for the variance of moral judgements (from Phase 1) in the model for the most stringent test of our hypotheses. We then ran two analyses: one regressed on to participants' intention to reduce food waste and one on to intention to plan meals. The results are displayed in Table 4 and illustrated in Fig. 2.

As expected, we found interactions between endorsement of the care foundation and the harm manipulation, compared to both the disgust manipulation (B = −.32, p = .015) and the control manipulation (B = −0.22, p = .072) on food waste moral judgment, our mediator. Conditional effect analysis showed that the harm manipulation, relative to both the disgust and control conditions, did not have any effect on our mediator (B = 0.02, p = .893; B = −0.15, p = .195; respectively) at lower values of the care foundation (16th percentile; 4.00). At the mean value (50th percentile; 4.67) and higher values of the care foundation (84th percentile; 5.33), however, there was such an effect compared to both the disgust (B = −0.20, p = .023; B = −0.41, p = .001; respectively) and control conditions (B = −0.29, p = .001; B = −0.44, p < .001; respectively). More specifically, the judgement that food waste was morally wrong was higher in the harm condition (M = 4.68 (for mean values of care foundation); M = 4.89 (for high values of care foundation)), relative to the disgust (M = 4.49 (for mean values of care foundation); M = 4.48 (for high values of care foundation)) and control conditions (M = 4.39 (for mean values of care foundation); M = 4.45 (for high values of care foundation)). Thus, our results support H_2.

As shown in Table 4, and replicating Phase 1, food waste moral judgment, in turn, was positively associated with participants' intention to reduce food waste (B = 0.19, p < .001), even when we controlled for baseline food waste moral judgments. Thus, our results suggest a moderated mediation effect of our harm manipulation, relative to the disgust manipulation and the control condition, on participants' intention to reduce food waste via food waste moral judgment, but only for those individuals who were at mean or higher values on the care foundation. Indeed, compared to the disgust manipulation, the conditional effect analysis supported this moderated mediation of the harm manipulation for medium values (B = −0.04; 95% CI [−0.0815, −0.0051]) and higher values (B = −0.08; 95% CI [−0.1524, −0.0269]) of the care foundation, but not for lower values (B < 0.01; 95% CI [−0.0465, 0.0561]). Similarly, conditional effects analysis supported the moderated mediation for the harm manipulation, compared to the control condition, for medium (B = −0.05; 95% CI [−0.1061, −0.0205]) and higher values (B = −0.08; 95% CI [−0.1578, −0.0284]), but not for lower values of the care foundation (B = −0.03; 95% CI [−0.0832, 0.0190]). Thus, our results support H_4 for participants' intention to reduce food waste.

In terms of participants' intentions to engage in future meal planning behaviors, we again found a positive association with our mediator, food waste moral judgments (B = 0.11, p = .013), even when controlling for pre-existing food waste moral judgment. As with the intention to reduce food waste, our results supported the moderated mediation hypothesis where our harm condition, compared to both the disgust and the control condition, affected participants' intention to engage in future meal planning behaviors, mediated by food waste moral judgments, but only for those who, at least moderately, endorsed the care foundation. This overall moderated indirect effect of the harm manipulation, compared to the disgust manipulation, is supported by our relative conditional effect analysis for medium (B = −0.02; 95% CI [−0.0551, −0.0013]) and high values (B = −0.05; 95% CI [−0.1044, −0.0077]) of the care foundation, but not for low values (B < 0.01; 95% CI [−0.0290, 0.0344]). The moderated indirect effect for the harm manipulation, compared to the control condition, is also supported for medium (B = −0.03; 95% CI [−0.0709, −0.0066]) and high values (B = −0.05; 95% CI [−0.1050, −0.0098]) of the care foundation, but not for low values (B = −0.02; 95% CI [−0.0547, 0.0109]). Thus, H_4 is supported for both participants' intention to reduce food waste and their intention to

Table 4
Regression output to test H_2 using the harm manipulation as the reference group.

Model	*Dependent variable*	*Predictor variable*	B	*SE*	*p*	*F*	R^2
1/2	Food waste moral judgment (Phase 2)				<.001	51.43	.41
		Constant	0.76	.40	.061		
		Disgust manipulation	1.30	.62	.035		
		Control condition	0.73	.57	.197		
		Care/harm foundation	0.31	.08	<.001		
		Disgust × care foundation	−0.32	.13	.015		
		Control × care foundation	−0.22	.12	.072		
		Food waste moral judgment (T1)	0.57	.04	<.001		
1	Intentions				<.001	18.46	.23
		Constant	1.37	.41	.001		
		Disgust manipulation	−0.54	.63	.390		
		Control condition	0.17	.58	.774		
		Food waste moral judgment (T2)	0.19	.05	<.001		
		Care/harm foundation	0.24	.09	.006		
		Disgust × care foundation	0.15	.14	.279		
		Control × care foundation	−0.01	.12	.935		
		Food waste moral judgment (T1)	0.17	.05	<.001		
2	Planning intentions				<.001	6.42	.09
		Constant	2.51	.39	<.001		
		Disgust manipulation	−0.82	.60	.172		
		Control condition	−0.18	.54	.739		
		Food waste moral judgment (T2)	0.11	.05	.013		
		Care/harm foundation	0.12	.08	.146		
		Disgust × care foundation	0.21	.13	.107		
		Control × care foundation	0.06	.12	.606		
		Food waste moral judgment (T1)	0.05	.04	.279		

Note. Experimental conditions and interaction terms are relative to the harm manipulation.

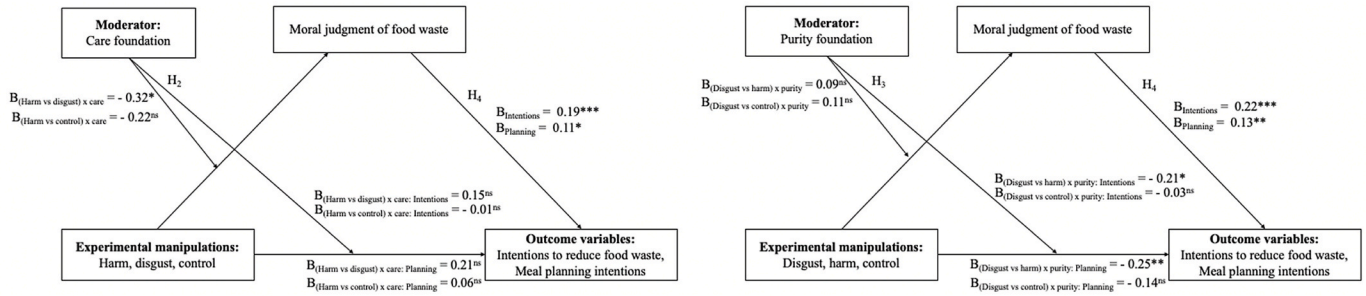

Fig. 2. Results of the regression models with the harm manipulation as a reference group (left) and with the disgust manipulation as a reference group (right).

engage in future meal planning behaviors. Importantly, these effects are purely driven by the moral judgements mediator and the manipulations do not have a direct effect on our outcome variables. Further, these results remain even when we control for biospheric, altruistic, and egoistic values (see Supplemental Materials), thus providing additional robustness to our results.

Hypothesis 3 focused on the purity moral foundation. Again, we conducted our analysis using model 8 in SPSS PROCESS (Hayes, 2017) with the multicategorical experimental conditions as the independent variable, but this time with the disgust manipulation as the reference group. Further, we entered food waste moral judgement as the mediator, the moral dimension of purity (measured at Phase 1) as the moderator and baseline food waste moral judgments (measured at Phase 1) as the covariate. Finally, we then entered either participants' intention to reduce food waste or their intentions to plan meals as the dependent variable. The results are displayed in Table 5 and illustrated in Fig. 2.

For our mediator, we did not find any notable effects (thus not supporting H_3). However, our analysis revealed an interaction between the disgust manipulation (relative to the harm manipulation) and the moral foundation of purity, directly affecting participants' intention to reduce food waste (B = −0.21, p = .021). In particular, we found the direct effect of the disgust manipulation, compared to the harm manipulation, on participants' intention to reduce food waste (B = −0.35, p = .006) only for those who scored high (84th percentile; 4.33), but not for those who scored low (16th percentile; 2.33; B = 0.06, p = .624) or medium (50th percentile; 3.33; B = −0.15, p = .112) on the purity foundation. Those who strongly endorsed the purity foundation showed a higher intention to reduce food waste in the disgust condition (M = 4.30), compared to the harm condition (M = 3.94).

Similarly, for participants' intention to engage in future meal planning behaviors, we found an interaction of the disgust manipulation, relative to the harm manipulation, with the moral foundation of purity (B = −0.25, p = .003). Again, we found this only for participants who scored high on the moral foundation of purity (84th percentile; 4.33; B = −0.37, p = .002), but not for participants who scored low (16th percentile; 2.33; B = 0.12, p = .318) or moderately (50th percentile; 3.33; B = −0.13, p = .133). Specifically, only those who scored high on the moral foundation of purity expressed higher intentions to engage in future meal planning behaviors after being exposed to the disgust manipulation (M = 4.07), compared to the harm manipulation (M = 3.69). In further support of the robustness of our findings, these results remain when we control for biospheric, altruistic, and egoistic values

Table 5
Regression output to test H_3 using the disgust manipulation as the reference group.

Model	*Dependent variable*	*Predictor variable*	B	*SE*	*p*	*F*	R^2
1/2	Food waste moral judgment (Phase 2)				<.001	49.43	.40
		Constant	1.87	.26	<.001		
		Care/harm manipulation	−0.10	.30	.728		
		Control	−0.48	.33	.148		
		Purity	0.03	.06	.682		
		Care/harm × purity	0.09	.09	.289		
		Control × purity	0.11	.09	.236		
		Food waste moral judgment (T1)	0.59	.04	<.001		
1	Intentions				<.001	14.80	.19
		Constant	2.13	.29	<.001		
		Care/harm manipulation	0.55	.31	.079		
		Control	0.07	.34	.840		
		Food waste moral judgment (T2)	0.22	.05	<.001		
		Purity	0.08	.06	.200		
		Care/harm × purity	−0.21	.09	.021		
		Control × purity	−0.03	.10	.783		
		Food waste moral judgment (T1)	0.18	.05	<.001		
2	Planning intentions				<.001	5.28	.08
		Constant	2.53	.27	<.001		
		Care/harm manipulation	0.69	.29	.017		
		Control	0.44	.32	.173		
		Food waste moral judgment (T2)	0.13	.05	.004		
		Purity	0.16	.06	.006		
		Care/harm × purity	−0.25	.08	.003		
		Control × purity	−0.14	.09	.122		
		Food waste moral judgment (T1)	0.06	.04	.195		

Note. Experimental conditions and interaction terms are relative to the disgust manipulation.

(see Supplemental Materials).

Finally, we conducted a sensitivity analysis to ensure that our sample was sufficiently large to detect our effect sizes. We used $\alpha = 0.05$, a power of .80, our sample size N = 446, number of groups = 3 (experimental conditions), number of predictors = 1 (our manipulation), response variables = 3 (food waste moral judgment (T2), intention to reduce food waste, meal planning intentions) as input variables for GPower v.3.1 (Faul et al., 2007). Our sample was sufficiently large to detect the small effect sizes we have found ($f^2(V) = 0.02$).

4. General discussion

4.1. Summary of findings

Is it morally wrong to waste food and, if so, can we leverage such moral judgements to reduce intentions to waste food? In the literature we found that, despite theoretical promise, little empirical work had been conducted to answer this question. Yet, participants in our research, both correlational and experimental phases, were strongly influenced by their moral judgements of food waste. We found strong support for our H_1 stating that the extent to which individuals believe food waste is morally wrong is negatively associated with their self-reported food waste.

Moreover, we examined whether moral domain-related manipulations can affect individuals' intention to reduce food waste and to engage in future meal planning behaviors either directly or via moral judgements and whether such effects are moderated by the extent to which individuals adhere to that particular moral foundation (e.g., care/harm or purity/disgust). When testing the harm intervention, we found that, after exposure, only those who adhere to the care/harm foundation believed more strongly that food waste is morally wrong, even when controlling for baseline moral judgement, thereby supporting H_2. These stronger moral judgements in turn were positively associated with participants' intention to reduce food waste and with their intention to plan meals, again, even after controlling for pre-existing moral judgements, thus supporting H_4. However, we found that the moderated effects of the disgust intervention led directly to the outcome variables rather than via the expected mediation of moral judgement. For those who endorsed the purity/disgust foundation, the disgust manipulation, compared to the harm manipulation, elicited higher intentions to reduce food waste and to plan meals. Our findings have several implications for practice and future research.

4.2. Implications and future research

According to our results, food waste does seem to be, at least partly, a moral issue. The assessment that food waste is morally wrong was negatively associated with self-reported food waste and intentions to reduce food waste and plan meals, even when we controlled for other personal values such as altruism. Our findings therefore extend literature in environmental psychology that has shown such associations for general environmental behaviors (Gao, Ma, Bai, Li, & Liu, 2021; Li & Wu, 2019) such that we can now include more behaviors, such as food waste, that are associated with core familial identities. Moreover, our research also extends existing speculative and qualitative work in the food waste literature (Graham-Rowe et al., 2014; Schanes & Stagl, 2019) by demonstrating the independent and generalizable effect of moral judgements. This research, therefore, opens up a new vista in food waste research. The strength of the relationship between moral judgement and food waste behavioral intentions is substantive and indicates a potent force for change. Although the initial interventions used in this study were not able to fully realize this potential, we expect that future research can develop a broad range of tools that will benefit from it. We hope that this initial study enables and encourages this growth.

One implication for the literature that is enabled by our work is in the area of emotions. A range of quantitative studies has supported the link between emotions and food waste (Russell, Young, Unsworth, & Robinson, 2017; Stancu et al., 2016; Stefan et al., 2013). Our results imply that negative emotions that are often associated with food waste, such as guilt, may be the consequence of a threat to the individuals' moral self-image (Stancu et al., 2016; Stefan et al., 2013) and that such emotions may affect future motivations to reduce food waste (Zhong et al., 2009). However, given that we did not assess whether moral beliefs or moral foundations affect emotions, this implication is speculative and needs to be tested in future research (Cameron, Lindquist, & Gray, 2015).

We also found support for our theorizing that associating food waste with either the care/harm or the purity/disgust foundation can be promising in enhancing intentions to reduce food waste and to plan meals, yet for different reasons and under different conditions. For those who endorse the care/harm moral foundation, our results suggest that the effect of primes that associate food waste with harm on individuals' intention to reduce food waste and engage in meal planning behaviors may be mediated by a strengthened judgement that food waste is morally wrong. For those who endorse the purity/disgust foundation, however, our results suggest that primes associating food waste with disgust directly enhance intentions to reduce food waste and engage in meal planning behaviors. Accordingly, our results suggest that the mechanisms through which primes of the moral foundations affect behavioral intentions operate differently; either through a strengthened moral judgement (care/harm foundation) or directly (purity/disgust foundation). It could be that the disgust intervention is operating subconsciously through moral intuition whereas the harm intervention is more explicitly labelled as morality within western societies. However, although the literature on moral foundations is rich, we did not find any study that indicates distinct or overlapping mechanisms for the two moral foundations and thus future research is needed to further explore the mechanisms of distinct moral foundations.

Independently of how these effects operate, however, it is important to recall that they only occurred when individuals grounded their morality in the respective domain. Such findings are aligned with the literature on moral self-regulation (Zhong et al., 2009) and self-concordance (Unsworth & McNeill, 2017). In practice, however, this implies knowledge of the target audience's morality in order to target specific intervention campaigns, which is often challenging. Of the food waste campaigns that have taken a moral stance, the majority have used the care/harm foundation. For example, in the UK, The Love Food Hate Waste (2022) campaign materials used the slogan "Wasting food feeds climate change", a message that implies food waste harms the environment. Our research suggests that such campaigns will be very powerful – but only for those who endorse that moral foundation. For those who do not endorse that moral foundation, the message will not be effective. On a positive note, we did not find that participants responded negatively when presented with the alternative moral message – the moral condition was never rated lower than the control condition, regardless of the alignment of participants' moral foundation with the message. Therefore, it appears possible for practitioners to include a variety of moral messages in distinct parts of a food waste campaign without concerns that they may upset those with other morals. For example, our results suggest that including a moral appeal against food waste - either based on the moral foundation of care/harm and/or purity/disgust - may be effective in increasing people's intention to reduce food waste. Moreover, when such messages, be it in public campaigns or on product packaging, are linked to specific food management behaviors such as meal planning, practitioners and businesses may be able to promote more sustainable behavior (for the role of businesses in achieving sustainability, see Russell, Padfield, & Bretter, 2023). Future research needs to examine whether participants simply ignore the alternative moral message (i.e., those that do not align with their moral foundation) or whether there are any other longer-lasting effects that might occur. We, therefore, believe that our findings are of value to researchers and practitioners because they demonstrate how

moral appeals can, under the right conditions, help to change behavioral intentions to reduce food waste.

4.3. Limitations

We would like to make the reader aware of at least four limitations of our work. First, we examined self-report measures of food waste and behavioral intentions. Given that such measures have been shown to underestimate actual food waste (Cropley, Sprajcer, & Dawson, 2022; van der Werf, Seabrook, & Gilliland, 2020), our results may be biased. Relatedly, the existence of an intention-action gap (Sheeran, 2002) suggests that behavioral intentions may not necessarily translate into behavior change. Moreover, although our findings are valuable for researchers and practitioners in the field of food waste, scholars have suggested that the effects of one-time interventions are usually short-lived (Stöckli et al., 2018). Therefore, we do not suggest that a single moral prime will lead to long lasting behavior change. However, we view our work as the necessary first step that illuminates the moral side of food waste and encourages future research to test whether actual food waste and behaviors change over time when moral primes are repeatedly administered. Third, we are careful not to suggest causality for our hypothesized mediations in Phase 2. While we measured our mediator (i.e., moral beliefs on food waste) and our dependent variables concurrently, we also did not experimentally manipulate our mediator (see Sajons, 2020). Although our mediation models are based on theory, causality is challenging to establish in such cases and thus we leave it to future research to conduct experiments or interventions with the aim to establish 'true' causality.

Finally, participants may have misinterpreted our messages. By diversifying our messages to include several themes of either the care/harm or the purity/disgust foundation, some of our messages were not explicitly related to food waste (although they were implicitly related given the association with food preparation or disposal). Therefore, participants may have misinterpreted these messages which may have affected our results. Future research may examine our messages and how individuals interpret them in more detail.

4.4. Conclusions

In an attempt to better understand individual food waste behavior, we have shed light on the moral side of food waste in this paper. In our work, the belief that food waste is morally wrong was negatively associated with self-reported food waste even when controlling for multiple value-orientations and demographic factors. In an experiment, we have found that primes associated with either the moral domain of care/harm or purity/disgust may be promising in enhancing individuals' intention to reduce food waste and to engage in meal planning behaviors, although for different reasons. We hope that our work will stimulate fruitful research into how we can leverage moral domains in better understanding and ultimately reducing household food waste.

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Declaration of competing Interest

We have no conflict of interest to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvp.2023.102021.

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