

# Personality, self-knowledge, and meat reduction intentions

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## Abstract

**Objective:** Meat consumption has a host of serious negative consequences for nonhuman animals, underprivileged humans, and the natural environment. Several interventions have been developed to encourage meat reduction but to relatively limited effect. There is also a range of established predictors of meat consumption, but much less is known about the factors that predict intentions to reduce meat consumption. The goal of this study was to determine the roles of personality and self-knowledge in meat reduction intentions.

**Method:** In this set of three preregistered studies, we tested brief interventions to encourage meat reduction intentions and examined personality predictors of intentions to reduce meat consumption.

**Results:** We found no evidence that brief interventions with or without a self-knowledge component had a meaningful effect on changing meat reduction intentions. However, we found robust evidence for relatively small associations between intending to eat less meat and high Openness to Experience, high Emotionality, and perceiving meat reduction as moral behaviors.

**Conclusion:** Individual differences may be a more influential predictor of meat reduction intentions than brief interventions. Implications for promoting meat reduction are discussed.

## KEYWORDS

intervention, meat, personality, self-knowledge, vegetarian

## 1 | INTRODUCTION

The harmful effects of human meat consumption are well established. Meat consumption is among the most powerful drivers of climate change (Chai et al., 2019; Crippa et al., 2021). Relative to vegetarian diets, meat-based diets are associated with increased food costs (Springmann et al., 2021), water loss (Jalava et al., 2014; Koop & van Leeuwen, 2017), diminished air quality (Bauer et al., 2016; Domingo et al., 2021), and reduced microbial resistance

as well as higher risk for future endemic and pandemic outbreaks (Espinosa et al., 2020; Graham et al., 2019). There are also significant negative health consequences of meat-based diets (Micha et al., 2010; Pan et al., 2012) as well as moral concerns associated with the treatment of animals and humans in animal agriculture (Blattner & Ammann, 2019; Feinberg et al., 2019; Pluhar, 2010). Meat production and consumption are overrepresented in the West and particularly in the United States (Orlich et al., 2019). Thus, finding ways to curb meat consumption

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in the United States could have positive impacts on a range of important societal issues.

Significant attention has recently been paid to understanding the psychological factors that predict meat consumption and the methods that could reduce meat consumption, as we briefly review below. In the current investigation, we build upon this prior research in two ways across three preregistered and well-powered studies. First, we examine a novel approach to meat reduction interventions that leverages self-knowledge to stimulate a desire for change. Specifically, we test whether helping people discover the discrepancy between their current consumption levels and both average and recommended levels motivates them to consume less meat. Second, we extend previous research linking individual differences in personality to meat consumption to examine how personality traits are related to meat reduction goals.

### 1.1 | A self-knowledge approach to meat reduction interventions

Given the increasing recognition of the negative societal consequences of animal agriculture, there has been a surge of studies focused on interventions that reduce meat consumption. Thus far, this literature has yielded somewhat mixed findings. Kwasny et al. (2022) reviewed studies conducted from 2001 to 2019 on the effects of experimental manipulations (e.g., presentation of images of factory farms or information about the environmental impacts of plant-based as opposed to animal-based diets) on attitudes toward meat, intentions to reduce meat consumption, and related variables. Overall, they concluded that such interventions held some promise. However, the authors also described several limitations and gaps in previous research. For instance, a higher percentage of studies were conducted in student samples, and results from studies with this population may not generalize to other samples. Also, the authors noted that several promising behavioral pathways had not yet been investigated and that, overall, there have been relatively few studies directly targeting reductions in intentions to eat less meat, let alone actual behavioral reductions. We further note that studies in this field are generally not preregistered, and most effects have not been directly replicated.

Particularly relevant to the current investigation, Kwasny et al. (2022) concluded that consumption intention, the main dependent variable in the current study, is a primary mediator of the relationship between interventions and actual meat reduction. This is consistent with findings in the environmental literature (Bamberg & Möser, 2007). Thus, knowing how to promote the intention to reduce meat consumption provides important insights into this behavior.

We tested whether a novel self-knowledge intervention approach could reduce meat consumption intentions. In a self-knowledge intervention approach, people first provide information about where they stand on a variable under scrutiny (here meat consumption), then estimate some normative standard, and then are told the actual standard. This shows where they actually stand relative to that standard. For instance, people may report how much meat they eat, then are asked to rate how much meat consumption they think experts recommend for good health, then are told how the actual expert recommendation compares to their level of consumption. The idea is that a negative discrepancy between their perception of their position relative to some standard and/or their actual position could motivate change. For instance, if people think they eat about as much meat as would be recommended for good health but are then told they actually eat twice as much meat as is recommended by health experts, they may be more motivated to reduce their meat consumption. Thus, a key assumption underlying this approach is that one factor associated with the maintenance of a maladaptive or socially undesirable behavior is that people may be too optimistic with regard to where they stand relative to some standard on that behavior or a related trait.

This approach has shown some success in reducing substance abuse. Research in this area suggested that many people who drink more than average have skewed perceptions of how much other people drink. When they believe their drinking frequency or amount is within normal limits but are told that they actually drink much more than is typical, the desire to reduce drinking is reliably enhanced (Berkowitz, 2005). Similarly, research on morality-related behavior and characteristics shows that individuals have a general tendency to inflate their morality (Tappin & McKay, 2017), ascribe moral characteristics to themselves rather than to others (Van Lange & Sedikides, 1998) and assume that they will more likely engage in moral behaviors than others (Allison et al., 1989; Epley & Dunning, 2000; Klein & Epley, 2016). Arguably, such systematic overestimation will reduce the perception that one needs to further improve on these characteristics, that is, to become more moral. Indeed, Thielmann and De Vries (2021) recently applied a self-knowledge approach to the problem of positive personality change. These authors found that participants who were told that their level of Honesty–Humility was lower than they thought relative to others were more motivated to increase it. Interestingly, this positive effect of increasing self-knowledge was particularly pronounced for Honesty–Humility, the HEXACO trait with the strongest link to morality (Zettler et al., 2020). This suggests that self-knowledge represents a potentially powerful mechanism of desire to change, particularly regarding morally tinged traits. These findings raise questions about whether such a

dynamic might generalize to other classes of moral behaviors, such as meat reduction.

In this investigation, we hypothesized that a negative discrepancy between people's actual level of meat consumption and recommended standards or population averages would create cognitive dissonance and motivate intentions to reduce meat consumption. Thus, the first goal of this set of studies was to test whether making people aware of how their level of meat consumption compares to that of others or of standards recommended by major health or environmental organizations would increase their desire to consume less meat. Importantly, most Americans eat far more than the recommended amounts of meat (McGuire, 2011; Neff et al., 2018), and thus we reasoned that, to the degree that self-knowledge is an important factor, it would generally motivate people who learned about these recommendations to eat less.

## 1.2 | Individual differences in meat reduction

There is a growing body of research on the individual predictors of meat reduction. Several factors associated with lower meat consumption have been identified, including higher socioeconomic status (Frehner et al., 2021; Hulshof et al., 1991), female gender (Rosenfeld, 2020), liberal political attitudes (Veser et al., 2015), and specific dietary motives (Graça et al., 2015; Hopwood et al., 2020, 2021). Moreover, personality traits are a particularly interesting set of variables to consider in this context for two reasons. First, there is now considerable evidence that personality traits are both relatively stable across time and situations but also subject to change (Bleidorn et al., 2022), particularly during certain developmental periods and with the help of interventions (Stieger et al., 2021). Second, personality represents a broad and relatively comprehensive account of individual differences in psychological attributes and thus connects many different psychological and behavioral variables together (Roberts et al., 2007; Soto, 2019; Zettler et al., 2020). Given its broad importance for a wide range of behaviors and life outcomes and a mix of durability and malleability, personality is a potentially powerful target for leveraging changes at the individual level that could produce benefits for society (Bleidorn et al., 2019).

Previous research suggests robust connections between personality traits and a vegetarian diet (Forestell & Nezelek, 2018; Holler et al., 2021; Pfeiler & Egloff, 2018; Tan et al., 2021). Reist (2022) recently meta-analyzed this literature and found the most robust effect to be that people who are higher in Openness to Experience are more likely to be vegetarian. A slightly different question has to do with the personality traits associated with meat reduction goals. Thus far, little is known about the personality traits associated with the desire to eat less meat.

This information could be helpful for encouraging meat reduction. For instance, identifying individuals who have the personality traits that are associated with meat reduction goals could increase the power of meat reduction interventions by allocating resources to individuals who are most likely to respond to an intervention (e.g., see Matz et al., 2017).

The second goal of the current set of studies was to determine which personality traits are related to meat reduction goals. We used the HEXACO model of personality to pursue this question (Ashton & Lee, 2007). This model comprises six traits: Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness to Experience. Previous meta-analyses suggest that Honesty-Humility—which captures the tendency to be fair and genuine in dealing with others—tends to have robust associations with prosocial (Thielmann et al., 2020) and proenvironmental (Soutter et al., 2020) behavior.

In addition to HEXACO personality traits, we also focused on individual differences in moral character, or the general tendency to believe in the importance of being moral, to be motivated toward morality, and to see oneself as a moral person (Furr et al., 2022). Although related to general traits such as Honesty-Humility (Furr et al., 2022), the moral character goes beyond this trait and encompasses several other moral dispositions, such as compassion, fairness, and purity, that may be useful predictors of the desire to reduce meat consumption. Finally, we examined self-efficacy (Schwarzer & Jerusalem, 1995) based on the expectation that people who are high in self-efficacy and thus believe they can accomplish their goals may be more likely to have goals that could be challenging (Locke & Latham, 2002; Luszczynska et al., 2011; Moeller & Stahlmann, 2019).

## 1.3 | Current research

This package of three studies had two goals: (a) to test a self-knowledge intervention approach designed to increase meat reduction motives, and (b) to determine the individual differences that are related to the desire to consume less meat. However, each of the three studies we conducted built upon one another, and findings from our first and second studies informed hypotheses and design decisions in our second and third studies, respectively. Because our goals and methods shifted slightly as we proceeded through each study, we will describe the specific goals and results from each study one at a time.

## 2 | STUDY 1

Preregistration and study materials for Study 1 can be found at [https://osf.io/zu6ay/?view\\_only=e96441f0f1d543238be9](https://osf.io/zu6ay/?view_only=e96441f0f1d543238be9)

52bd4bf0493b. Our initial goal was focused on the question of whether a self-knowledge intervention could increase meat reduction motives. We randomized participants to one of five self-knowledge interventions. In each intervention, people first reported on their personality and behavior, then were told where they stood relative to averages or standards, and then were asked whether they wanted to change that behavior, as well as other moral behaviors.

Three of the five interventions focused on meat reduction. In these three interventions, we compared people's self-reported meat consumption to (a) that of the average US American (Kuck & Schnitkey, 2021), (b) health recommendations by the US Department of Health and Human Services (2019), and (c) recommendations from the environmental science literature (Parlasca & Qaim, 2022).

We also had two control interventions. The first had to do with general morality. In this condition, we compared people's scores on the Moral Character Questionnaire to the average score in the population from the inventory's original validation study (Furr et al., 2022). This condition allowed us to anchor any findings from specific meat intervention conditions to a more general morality intervention. It is conceivable that the meat interventions

would be more powerful because they focus on a more specific behavior (Freund & Hennecke, 2015). However, it is also conceivable that they would be less powerful because of the possibility that direct appeals to change dietary behavior can actually decrease the desire to change (Rothgerber, 2020) or because people do not necessarily consider meat reduction moral behaviors. The second control condition had to do with charity donations. We compared the amount people reported giving to charity to the average amount given by Americans. This again allowed us to anchor results from the meat-focused interventions, this time by comparing them to a specific behavior that is likely to be more universally recognized as prosocial.

We preregistered two hypotheses together with exploratory research questions. First, across all conditions, we expected that a greater difference between the individual's self-reported level and the comparison value would be associated with higher change goals on the behavior/trait that was manipulated. Second, we expected that a greater difference between the individual's self-reported level and the comparison value (i.e., more positively biased self-perception) would be associated with higher meat reduction change goals across all conditions. In addition, we



FIGURE 1 Correlations between moral behaviors and moral intentions in Study 1. Cells depict Pearson correlations and 99% confidence intervals. Significant correlations ( $p < 0.01$ ) are marked with asterisks. HHS, US Department of Health and Human Services.



explored whether different conditions were more effective for increasing meat reduction change goals as well as the correlations between participants' personality traits and meat reduction change goals.

## 2.1 | Method

We recruited 1013 adult omnivore participants from the United States. This sample size provides the power of  $1-\beta=0.80$  to detect correlations in the full sample of  $r>0.10$  and within conditions of  $r>0.24$  in a two-tailed test with  $\alpha=0.01$ . On average, participants were 38.75 years old ( $SD=13.67$  years, range=18–93 years). The gender distribution was balanced (50.74% male, 47.58% female, 1.48% non-conforming/other). Most participants were White (81.84%). The rest self-defined as Asian (8.69%), Black (7.90%), Hispanic (6.81%), American Indian or Alaska Native (0.89%), or Native Hawaiian or Pacific Islander (0.10%). We recruited participants through Prolific and paid them \$7.50 per hour. The survey took about 10 min to complete, so we paid about \$1.25 per participant. We excluded participants who provided incomplete ( $n=181$ ) or implausible/offensive data<sup>1</sup> ( $n=56$ ).

Participants were randomized evenly to the five intervention conditions. They first filled out demographic variables and three survey instruments, the general morality scale of the Moral Character Questionnaire (Furr et al., 2022; 6 items,  $\omega_t=0.85$ ), the Brief HEXACO Inventory (De Vries, 2013; 4 items per trait, average  $\omega_t=0.59$  [ $0.51\leq\omega_t\leq0.74$ ]), and the General Self-Efficacy Scale (Schwarzer & Jerusalem, 1995; 10 items,  $\omega_t=0.93$ ). Participants were then asked to estimate their typical amount of meat consumption per week, with examples to help them derive accurate estimates as well as the amount of time and money they have spent volunteering or donating to charity, respectively, in the past few years. They were then randomized to one of the five conditions. Within each condition, participants were asked to estimate where they fall, relative to others, in terms of average morality as well as their amount of meat consumption or amount donated to charity. They were then immediately told where they actually fall so that they could compare their estimated level to their actual level based on their previous responses. They were then asked how much they would like to be more moral, eat less meat, donate more money to charity, or spend more time volunteering for charity. Finally, participants were asked to rate how moral they perceived the following behaviors to be: telling the truth, giving to charity, obeying the law, eating meat, being loyal, and volunteering for charity.

Following our preregistration, we used  $p<0.01$  as our cutoff for statistical significance for confirmatory hypotheses (1 and 2) and  $p<0.01$  with Holm's correction as our cutoff for exploratory tests. For any variables (including difference

scores) with skew  $>|2.5|$ , we preregistered that we would conduct analyses both before and after normalizing the distribution using log transformation (Curran et al., 1996). This rule did not apply to any variables examined in Study 1, so we conducted analyses using the raw data.

## 2.2 | Results

Full results and data are available at ([https://osf.io/yvkrm/?view\\_only=0464d53e13ee482e9ce8627afef9b3c6](https://osf.io/yvkrm/?view_only=0464d53e13ee482e9ce8627afef9b3c6)). In terms of our primary hypotheses, the evidence was mixed and largely null. Correlations between meat reduction intentions and the difference between comparison/recommended and individual levels of consumption within each of the five conditions are depicted in Figure 1. Contrary to expectations, people who were less moral than the average American tended to be less interested in becoming more moral or volunteering for or donating more to charity. Similarly, people who donated less than average were less interested in being more moral or spending more time volunteering. The one significant positive effect that we found suggested that people who eat more meat than is recommended by the US Department of Health and Human Services wanted to eat less meat. All other effects were small and not significant. Overall, these results do not suggest that the self-knowledge interventions were effective in encouraging a desire to behave more morally in general or to reduce meat consumption in particular.

A between-subjects ANOVA with the condition as the independent variable and meat reduction change goals as the dependent variable had a significant overall effect ( $F_{[4, 1008]}=4.88$ ,  $p<0.001$ ,  $\eta^2=0.02$ ). This effect was driven by participants who were told that the US Department of Health and Human Services recommends eating no more than 1.63 pounds per week and who reported that they wanted to eat less meat ( $M=6.17$ , 99% CI [5.89, 6.45]) than participants in the other conditions (Grand  $M=5.88$ ). This provided some suggestion that the intervention focused on comparison with health recommendations may be more efficacious than either the intervention focusing on environmental recommendations or normative averages. There were no other differences between conditions.

Across conditions, we found that, on a 1–9 scale, participants generally wanted to be more moral ( $M=6.24$ ,  $SD=1.36$ ), donate more to charity ( $M=6.13$ ,  $SD=1.38$ ), and volunteer more for charity ( $M=6.15$ ,  $SD=1.37$ ), whereas intentions to reduce meat were actually somewhat lower ( $M=5.88$ ,  $SD=1.52$ ). This provided an initial indication that participants regarded meat reduction as less clearly a desirable, and perhaps moral, behavior than the other variables (Cohen's  $d$ 's ranged from 0.17 to 0.25). This was tested directly by asking how moral participants

thought different behaviors were. On a 7-point scale (from morally irrelevant to very moral), scores were lowest for eating less meat ( $M = 3.09$ ,  $SD = 1.72$ ). Scores for other behaviors, such as telling the truth, giving time or money to charity, obeying the law, and being moral, ranged from 4.91 to 6.09 (all  $d$ 's  $> 1$ ). Notably, people who saw meat reduction as moral behaviors were more strongly motivated to reduce meat consumption ( $r = 0.17$ , 99% CI [0.09, 0.25]).

As a further exploratory aim, we correlated individual difference variables with meat reduction motives (Figure 2). Global morality was related to higher intentions to be more moral and to give more time and money to charity, but not meat reduction. Honesty–Humility and Openness to Experience were both related to the intention to eat less meat and give more time and money to charity. Emotionality was associated with all four intentions as well. People with higher levels of Extraversion and Agreeableness reported a desire to spend more time volunteering. These significant effects were relatively small (i.e.,  $r = 0.11$ – $0.17$ ). Finally, generalized self-efficacy was unrelated to the four intentions.

### 2.3 | Summary

Overall, Study 1 did not provide evidence that self-knowledge interventions are effective for increasing a desire to behave morally in general or to reduce meat consumption in particular. To the extent that the approach was useful, it seemed most helpful to focus on health motives. This is consistent with previous research suggesting that people randomly sampled from a population of omnivores are more likely to want to reduce meat consumption for health rather than ethical (e.g., environment or animal rights) reasons (Kwasny et al., 2021). However, two other findings were noteworthy. First, people did not generally seem to think of meat consumption as moral behaviors and generally did not wish to reduce their meat consumption and this distinguished meat consumption from the other variables we examined as controls. However, seeing meat reduction as moral was positively correlated with meat reduction intentions ( $r = 0.16$ ).

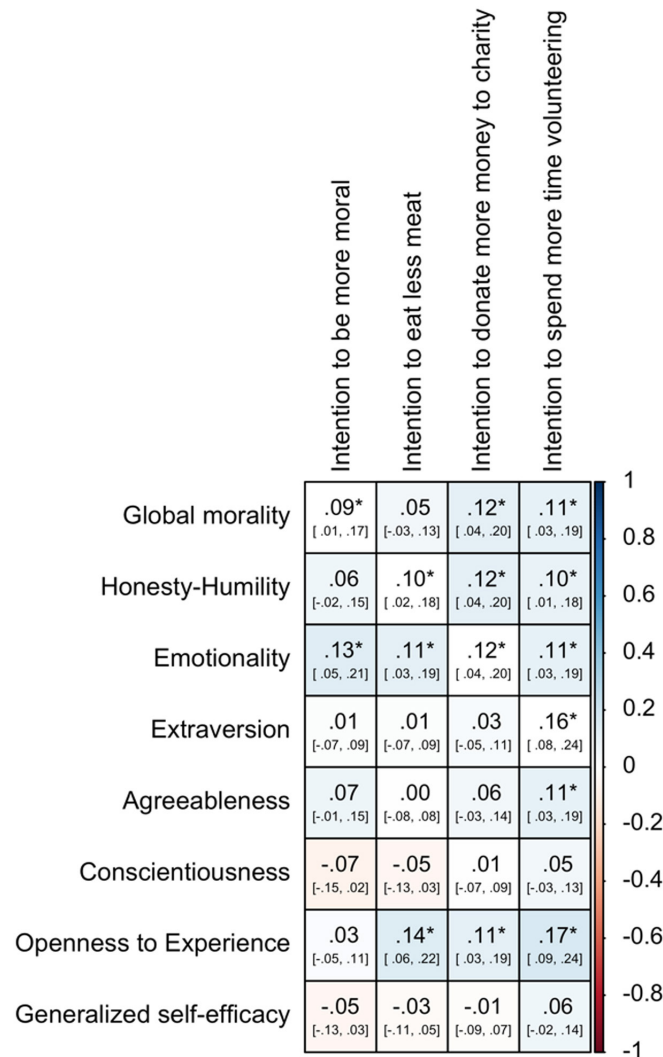
Second, personality traits, and in particular global morality, Openness to Experience, Honesty–Humility, and Emotionality, emerged as modest but reliable predictors of desires to behave in a more moral fashion, with the latter three significantly predicting desires to eat less meat. Correlations between meat reduction intentions and Honesty–Humility (partial  $r = 0.10$ ), Openness to Experience (partial  $r = 0.14$ ), and Emotionality (partial  $r = 0.10$ ) remained significant controlling for the perception that meat reduction is moral. This suggests that these traits predict meat reduction intentions above and beyond their effect on viewing meat reduction as moral behaviors.

These results informed the hypotheses and design changes for Study 2.

## 3 | STUDY 2

Results from Study 1 suggested that self-knowledge interventions alone may not be enough to produce changes in attitudes and may even be counterproductive in some cases. However, it is possible that our interventions were not powerful enough to elicit the desired effect. Thus, one goal for our second study was to increase the power of our interventions.

We did this in six ways. First, we reasoned that participants may not have desired to reduce their meat consumption regardless of condition because they generally did not consider meat consumption a moral behavior. We thus provided more information about why plant-based diets promote environmental sustainability in the condition focused on comparing current consumption rates to environmental standards. We did this to ensure that participants, particularly in the condition that focuses on a moral reason to reduce meat consumption (i.e., to protect the environment), were aware that doing so would reflect moral behavior in the sense that it would involve self-sacrifice for the greater good. We also added a question about whether participants believe that environmentally sustainable behavior is moral. This allowed us to test whether participants would rate environmentally sustainable behavior as more moral than meat reduction, which would suggest that people do not tend to make the connection between meat consumption and sustainability and thus do not tend to see meat reduction as a moral behavior. Second, in the condition in which participants' consumption was compared with health recommendations, we emphasized specific health benefits and noted that plant-based diets can provide adequate vitamins and proteins. Third, across all meat consumption conditions, we framed potential changes in meat consumption in terms of an increase in plant-based diets rather than a decrease in meat-based diets, given previous evidence that positively framed messages may be more effective (Kwasny et al., 2021). We also emphasized that plant-based alternatives often taste good, are cost-effective, and are easy to prepare to avoid potential obstacles to meat reduction goals. Fourth, in the general morality condition, we added more detailed feedback about how we compared people's scores to a normative sample and offered finer distinctions in the feedback about where people stood relative to this sample. Fifth, we emphasized to a greater extent in the consent process that this study did not use deception and asked participants to confirm that they did not believe they were deceived at the end of



**FIGURE 2** Correlations between individual differences in personality and desires to increase moral behaviors across all participants in Study 1. Cells depict Pearson correlations and 99% confidence intervals. Significant correlations ( $p < 0.01$ ) are marked with asterisks.

the study. This was done to ensure that participants believed the information about where they stood relative to comparison groups or recommendations across the conditions. Finally, given that previous research suggested that meat reduction interventions may be more powerful to the extent that they (a) appeal to emotions, (b) emphasize that meat consumption is easy to change, and (c) emphasize that there can be immediate consequences to change in addition to long-term benefits (Kwasny et al., 2021), our feedback to participants incorporated all these elements across all five conditions.

Each of these steps, stated in our preregistration at [https://osf.io/3g76t/?view\\_only=ddff022817bc488ab2e4564c3b7edde3](https://osf.io/3g76t/?view_only=ddff022817bc488ab2e4564c3b7edde3), was designed to make the interventions more specific, believable, and potentially powerful than in Study 1. We tested the same preregistered hypotheses as in Study 1, which focused on testing the efficacy and

specificity of the interventions and replicating findings regarding individual differences correlates of moral, meat reduction, and charity intentions.

### 3.1 | Method

We recruited 924 adult omnivore participants from the United States who had not participated in Study 1. This sample size provides power of  $1 - \beta = 0.80$  to detect correlations in the full sample of  $r > 0.11$  and within conditions of  $r > 0.24$  in a two-tailed test with  $\alpha = 0.01$ . On average, participants were 39.99 years old ( $SD = 13.66$  years, Range = 18–85 years). The gender distribution was balanced (50.22% male, 48.70% female, 0.97% nonconforming/other). Most participants were White (79.98%). The rest self-defined as Black (9.31%), Asian (8.33%), Hispanic

(7.90%), or American Indian or Alaska Native (1.73%). We recruited participants through Prolific and paid them \$7.50 per hour. The survey took about 10 min to complete, so we paid about \$1.25 per participant. We excluded participants who provided incomplete ( $n=70$ ) or implausible/offensive data<sup>2</sup> ( $n=22$ ). The procedure was exactly the same as in Study 1, although the content of parts of the survey changed slightly, as described above. Measure reliabilities were as follows: Moral Character Questionnaire (Furr et al., 2022;  $\omega_t=0.84$ ), Brief HEXACO Inventory (De Vries, 2013; average  $\omega_t=0.58$  [ $0.47 \leq \omega_t \leq 0.70$ ]), General Self-Efficacy Scale (Schwarzer & Jerusalem, 1995;  $\omega_t=0.92$ ).

### 3.2 | Results

Full results and data are available on our project's OSF page. Overall, the changes we implemented in Study 2 did not increase the efficacy of the self-knowledge interventions to increase behavior change intentions. Figure 3 shows correlations with 99% confidence intervals between meat reduction intentions and the difference between comparison/recommended and individual levels

of consumption within each of the five conditions. The correlation pattern from Study 1 largely replicated, with some minor differences in the magnitude of effects. The only noteworthy difference was that the previously positive effect of deviation between participant level and the US Department of Health and Human Services recommendations on intentions to eat less meat did not replicate. Again, these results suggest that self-knowledge interventions are not effective in encouraging a desire to behave more morally in general or to reduce meat consumption in particular. A between-subjects ANOVA with condition as the independent variable and meat reduction change goals as the dependent variable was not significant ( $F_{[4, 919]}=1.55, p=0.19, \eta^2=0.01$ ), indicating that no intervention was more or less effective than the others.

As in Study 1, participants were generally less interested in eating less meat ( $M=5.64, SD=1.88$  on a 1–9 scale) than increasing their general morality or donating to/volunteering for charity more (range of means: 6.04–6.38;  $d$ 's ranged from 0.24 to 0.43). Similarly, they again saw meat eating as essentially unrelated to morality ( $M=3.17, SD=1.75$  on a 7-point scale), whereas they saw telling the truth, donating to charity, obeying the law, being more loyal, and engaging in environmentally sustainable



FIGURE 3 Correlations between moral behaviors and moral intentions in Study 2. Cells depict Pearson correlations and 99% confidence intervals. Significant correlations ( $p < 0.01$ ) are marked with asterisks. HHS, US Department of Health and Human Services.



behavior as moral (range of means: 4.96–6.06; all  $d$ 's > 1). It is particularly interesting that environmentally sustainable behavior was regarded as moral ( $M = 5.23$ ,  $SD = 1.59$ ), whereas eating less meat was not ( $d = 1.23$ ). However, people who saw eating less meat as moral were again more strongly motivated to reduce meat consumption ( $r = 0.21$ ).

Finally, we again examined individual differences correlates of intentions to be more moral, eat less meat, and give more time or money to charity (Figure 4). Results replicated relatively well. Global morality was again significantly related to higher intentions to be more moral and to give more time and money to charity. Honesty-Humility and Openness to Experience were both related to the intention to give more time and money to charity, and Openness (but not Honesty-Humility) was again related to the intention to eat less meat. Finally, Emotionality was associated with the intention to eat less meat and to donate more to charity. Although these correlations were relatively small ( $\sim 0.10$ ), replication across two studies suggests that they are robust. Moreover, correlations of Openness to Experience (partial  $r = 0.16$ ) and Extraversion ( $0.09$ ) with meat reduction intentions continued to be significant after controlling for the degree to which participants saw meat reduction as moral behaviors.

### 3.3 | Summary

Across two studies, we found that self-knowledge interventions had a very limited effect on intentions to be more moral, reduce meat consumption, or give more money or time to charitable causes. Based on these results, we concluded that this is not a fruitful avenue for encouraging moral behaviors, particularly given that changing intentions is only one step toward producing actual and durable behavior change. A second finding that replicated across studies was that people generally do not want to reduce their meat consumption. This appears to be related to the fact that they generally did not see meat consumption as a morally relevant behavior, even though they did tend to see environmentally sustainable behavior as moral. The third finding that replicated across studies is that people who are more open to experience and emotions are more likely to want to reduce their meat consumption and that Honesty-Humility and global morality were related to intentions to increase other moral behaviors.

## 4 | STUDY 3

The failure of the self-knowledge interventions to change meat reduction intentions was surprising, given

previous research that suggests that brief interventions such as those featured in this study can affect intentions for meat reduction (Kwasny et al., 2021) and increase moral characteristics (Thielmann & De Vries, 2021). This led us to wonder whether a self-knowledge approach may actually be counterproductive, at least for some people. It seemed possible that telling people that they were below a certain standard or norm may not be motivating but instead could be deflating or slighting. Thus, one goal of the third study was to again examine the effect of brief interventions on intentions to change using the exact same design but without a self-knowledge component. Computing population averages do not make sense in the absence of a self-knowledge component because a population average does not reflect an aspiration for moral behaviors. We therefore removed the condition in which we compared respondents' personal level of meat consumption to the average level of meat consumption in the US population from Study 3. Thus, participants were randomized to one of four conditions in which they were simply given reasons why they might want to be more moral, eat less meat for health reasons, eat less meat for environmental reasons, or give more to charity.

Perhaps less surprising is that participants do not generally see meat consumption as a morally relevant behavior. However, it seemed possible that this was in part because we asked whether eating meat was immoral rather than whether eating *less* meat was moral. Thus, in Study 3, we changed this question to ask whether participants perceived eating less meat as moral. We also asked about the perceived morality of potentially immoral actions (cutting in line and avoiding taxes), to establish a lower bound for ratings of meat reduction. Each of these changes and the full survey content can be seen in our preregistration at [https://osf.io/4etn6/?view\\_only=4c00dfa4457643f38fdd5b982dc6f9ff](https://osf.io/4etn6/?view_only=4c00dfa4457643f38fdd5b982dc6f9ff).

Our hypotheses were different than in Studies 1 and 2. Given the pattern of findings in the first two studies, our primary interest was in replicating individual differences correlates of meat reduction motives. Thus, our first hypothesis was that meat reduction goals would be associated with higher scores on general morality, Honesty-Humility, Emotionality, and Openness to Experience, and seeing meat reduction as moral. We also sought to explore whether the four interventions would affect change goals, whether any of the interventions would be more or less effective in increasing meat reduction intentions, and whether the interventions without a self-knowledge component would produce different effects than the parallel interventions with a self-knowledge component from Studies 1 and 2.

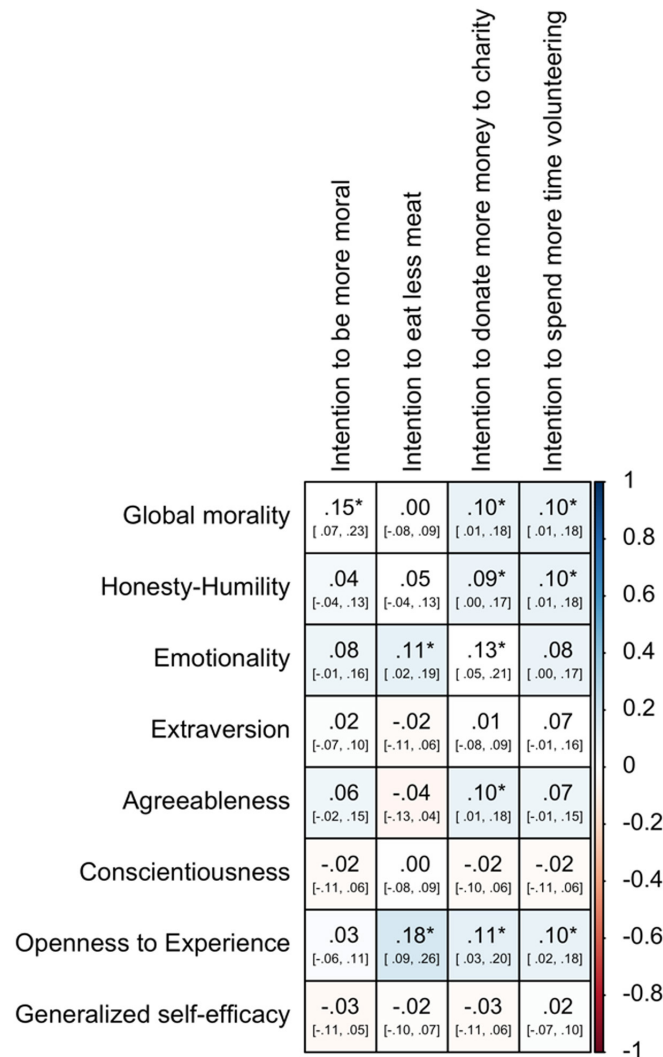


FIGURE 4 Correlations between individual differences in personality and desires to increase moral behaviors across all participants in Study 2. Cells depict Pearson correlations and 99% confidence intervals. Significant correlations ( $p < 0.01$ ) are marked with asterisks.

## 4.1 | Method

We recruited 713 adult omnivore participants from the United States who had not participated in Studies 1 or 2. This sample size provides power of  $1 - \beta = 0.80$  to detect correlations in the full sample of  $r > 0.12$  and within conditions of  $r > 0.25$  in a two-tailed test with  $\alpha = 0.01$ . On average, participants were 38.84 years old ( $SD = 12.90$  years, range = 18–76 years). The gender distribution was balanced (50.63% male, 47.97% female, 1.40% nonconforming/other). Most participants were White (80.65%). The rest self-defined as Black (9.12%), Asian (7.57%), Hispanic (6.59%), American Indian or Alaska Native (1.12%), or Native Hawaiian or Pacific Islander (0.28%). We recruited participants through Prolific and paid them \$7.50 per hour. The survey took about 10 min to complete, so we paid about \$1.25 per participant. We excluded participants who provided incomplete ( $n = 95$ ) or implausible/offensive<sup>3</sup> ( $n = 18$ ) data.

The procedure was exactly the same in Studies 1 and 2, although the content of parts of the survey changed slightly, as described above. The most significant changes were that the interventions did not include a self-knowledge component and that participants were randomized evenly to four rather than five intervention conditions. Reliabilities for study measures were as follows: Moral Character Questionnaire (Furr et al., 2022;  $\omega_t = 0.84$ ), Brief HEXACO Inventory (De Vries, 2013; average  $\omega_t = 0.57$  [ $0.47 \leq \omega_t \leq 0.72$ ]), General Self-Efficacy Scale (Schwarzer & Jerusalem, 1995;  $\omega_t = 0.92$ ). Participants were then asked to estimate their typical amount of meat consumption per week, with examples to help them derive accurate estimates, as well as the amount of time and money they have spent volunteering or donating to charity, respectively, in the past few years. They were then randomized to one of the four conditions, in which they were given reasons why they

should consider changing their behavior (using the same language as in Study 2—see preregistration) and were then asked how much they would like to be more moral, eat less meat, donate more money to charity, or spend more time volunteering for charity. Participants were then asked to rate how moral they perceived the following behaviors to be: telling the truth, giving to charity, obeying the law, eating less meat, being loyal, volunteering for charity, engaging in environmentally sustainable behavior, shifting around income to pay fewer taxes, and cutting in line. Finally, they confirmed that they understood that they were not deceived during the study. Following our preregistration, we again used  $p < 0.01$  as our cutoff for statistical significance for confirmatory hypotheses (1 and 2) and  $p < 0.01$  with Holm's correction as our cutoff for exploratory tests. No variables were significantly skewed.

## 4.2 | Results

Full results and data are available on our project's OSF page. Results of individual differences correlates of intentions are shown in Figure 5. As in Studies 1 and 2, people who were higher in Openness to Experience and Emotionality reported being more motivated to eat less meat. No other individual differences variables correlated with this intention. People who reported being more moral and who had higher scores on Honesty-Humility also wanted to increase their morality and spend more time and money on charity, replicating findings from Studies 1 and 2. Moreover, people who saw eating less meat as more moral again had stronger meat reduction intentions ( $r = 0.40$ ), but correlations between meat reduction intentions and Openness to Experience and Emotionality again persisted when controlling for the extent to which participants saw meat reduction as moral ( $r = 0.10$  and  $0.16$ , respectively).

Intentions to eat less meat were similarly unaffected by the interventions as in our previous studies ( $F_{[3, 708]} = 2.47$ ,  $p = 0.06$ ,  $\eta_p^2 = 0.01$ ). These effects all fell within the 99% confidence intervals of the effects from Studies 1 and 2. This finding corroborates our conclusion that brief interventions, with or without a self-knowledge component, are unable to change intentions to reduce meat consumption or increase other moral behaviors.

As in the first two studies, people were generally less motivated to eat less meat on a 9-point scale ( $M = 5.48$ ,  $SD = 1.93$ ) than they were to be more moral or give more time or money to charity (range means  $5.94$ – $6.31$ ;  $d$ 's ranged from  $=0.36$  to  $0.49$ ). Likewise, participants continued not to see meat consumption as a particularly morally relevant behavior on a 7-point scale ( $M = 4.12$ ,  $SD = 1.04$ ),

whereas they did see cutting in line ( $M = 2.61$ ,  $SD = 1.02$ ) and evading taxes ( $M = 2.95$ ,  $SD = 1.40$ ) as immoral and telling the truth, giving or donating to charity, obeying the law, being loyal, and behaving sustainably as moral (range of means:  $5.57$ – $6.41$ ; all  $d$ 's  $> 1$ ).

## 4.3 | Summary

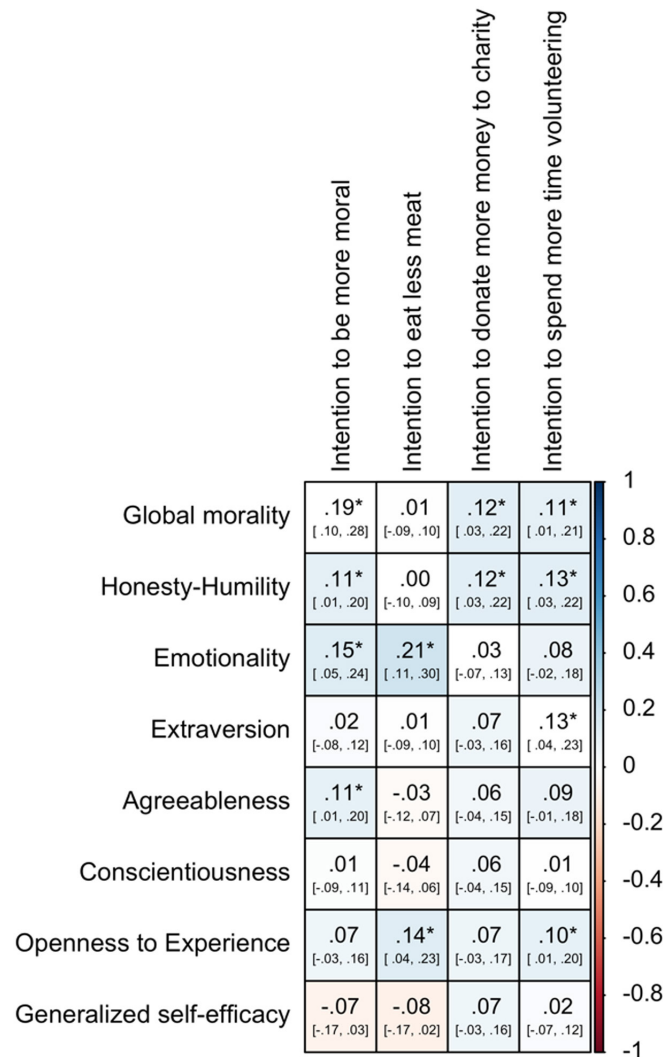
The results from Study 3 replicated our findings that brief interventions are not effective for changing meat reduction motivations or other intentions to increase moral behaviors. They also replicated relatively small but specific correlations between meat reduction intentions and the traits Openness to Experience and Emotionality. Finally, results again showed that people do not generally see meat reduction as moral behaviors, but those who do are more likely to want to reduce their meat consumption.

## 5 | DISCUSSION

We had two main goals in this investigation. The first was to test the effectiveness of brief self-knowledge interventions for increasing intentions to reduce meat consumption. The second was to examine personality traits as predictors of those intentions. Overall, we found that intentions were generally not impacted by interventions with or without a self-knowledge component. However, we found that perceiving meat reduction as moral and being higher in Openness to Experience and Emotionality were reliable predictors of meat reduction intentions.

### 5.1 | Meat reduction interventions

Several studies have indicated that very brief interventions, similar to the ones employed here, can impact attitudes about meat consumption measured concurrently (Berndsen & Van Der Pligt, 2005; Graham & Abrahamse, 2017; Kunst & Hohle, 2016; Palomo-Vélez et al., 2018; Piazza et al., 2018; Sparkman & Walton, 2017; Tybur et al., 2016), whereas others have produced null effects (Dowsett et al., 2018). Other research has suggested that self-knowledge can enhance desires to increase moral characteristics and thus, encourage a desirable change in morality-related personality traits (Thielmann & De Vries, 2021). Based on this literature, we expected brief self-knowledge interventions focusing on comparing people's perceptions of their standing on moral (i.e., general morality, meat reduction, or



**FIGURE 5** Correlations between individual differences in personality and desires to increase moral behaviors across all participants in Study 3. Cells depict Pearson correlations and 99% confidence intervals. Significant correlations ( $p < 0.01$ ) are marked with asterisks.

charitable) behaviors to their actual standing in relation to averages or proscriptive norms would impact intentions. However, across two studies, we found almost no evidence for this effect. Nor did we find that a brief educational intervention without a self-knowledge component impacted intentions to behave in a way that is more moral in Study 3. This finding rules out the possibility that the self-knowledge aspect of the interventions had a negative or nullifying effect. It does not, however, rule out that self-knowledge approaches can enhance the effects of certain kinds of interventions. Given that previous positive effects testing this kind of mechanism have shown promise for enhancing personality change goals (Thielmann & De Vries, 2021) and alcohol reduction motives (Berkowitz, 2005), one possibility is that self-knowledge interventions will tend to be most effective when the targeted behavior has clearer potential positive benefits for the self. This stands in contrast to the current

study, in which potential benefits of meat reduction (as well as increased moral behaviors and charitable giving) tend to have benefits primarily for others.

There are other possible explanations for these null findings. The most obvious is that the interventions were very brief and thus very weak. However, the request to change intentions without demonstrating or even committing to a change in behavior was also very mild. This intention to change is only one small step toward actual, meaningful behavior change, and thus it should be easier to encourage people to express an intention than to get people to actually change their behavior. Moreover, the interventions in our studies were very similar in brevity and intensity to those reported in previous work. That being said, Tan et al. (2023) recently found that showing participants negative or positive images of farmed animals daily for 2 weeks impacted intentions, suggesting that one way to increase the power of intervention designs like the ones



tested here might be to repeat them. There may be other ways to increase the impact of such messages, such as making the appeals more detailed, emotionally resonant, or personalized.

A related possibility is that the sample was not necessarily motivated to change. It could be that interventions like the one employed here can be effective for individuals who are already somewhat motivated to reduce meat consumption, which does not describe most people in our sample.

A third possibility is that there was something specific about our design, such as our format, the language of our interventions, or outcome measures or sample, that constrained study effects. However, studies that have found significant effects on meat reduction intentions as a function of brief interventions have varied tremendously in terms of design characteristics. Moreover, we varied intervention content across studies to try to maximize the potential to find an effect. Nevertheless, more work is needed with different kinds of designs to determine how to maximize the potential effectiveness of meat reduction and other moral behavior interventions.

Finally, it is possible that at least some of the effects reported in the literature are false positives. The studies in which positive effects have been reported were not preregistered and there have been very few direct replications. As such, it is possible that there are negative findings in the file drawer, which would stress the importance of disseminating negative effects such as those observed in the current studies.

## 5.2 | Personality and meat reduction intentions

In contrast to findings related to the interventions, we found robust support for the relevance of individual differences in personality for intentions to reduce meat consumption. Indeed, the most consistent finding in our studies was that people who are more open to experience, emotional, and who see meat eating as immoral are most interested in reducing their meat consumption. These effects, like many in personality psychology, were relatively small but robust (Funder & Ozer, 2019). Thus, these individual difference variables are relatively weak predictors for individual people but have potentially significant relevance when applied across large groups of people.

One conclusion from these results is that some people are more likely to perceive meat consumption through a moral lens and that this perception impacts the likelihood of their intention to change it. On the one hand, it stands to reason that people generally want to be more moral, if

possible, given that it is a socially desirable trait. The interesting pattern in our study was that, unlike other behaviors with similar kinds of effects on the well-being of the planet or society, meat consumption was not generally considered moral by participants in this sample. Thus, variation in the extent to which people see meat consumption as moral could be an important driver of meat reduction motives. On the other hand, recent evidence suggests that being more moral is not necessarily a strong motivation for most people relative to more self-serving goals (Sun & Goodwin, 2020; Thielmann & De Vries, 2021). However, studies found personal benefits of prosocial behavior, at least in some cases (Hui, 2022; Hui et al., 2020). For instance, Sun et al. (2022) found that people who are seen by others as moral tend to have higher levels of well-being, and Hofmann et al. (2014) found an association between the frequency of moral acts and happiness. This suggests that one way to encourage moral behaviors would be to point out those personal benefits. Our attempt to do that in Studies 2 and 3 did not seem to have an effect, but it is possible that our efforts were too subtle. Overall, future work should examine whether helping people see meat reduction as moral and see the potential positive benefits of moral behaviors for others *and* themselves would increase their intentions to reduce meat consumption.

Openness to Experience is the personality trait most consistently connected to a vegetarian diet (Reist, 2022), and thus it is reasonable that it was related to meat reduction motives in this investigation of omnivores. If one were to bet on which people will eventually reduce their meat consumption, this trait would perhaps provide the strongest basis for such a bet. Open people are less likely to be constrained by the habits that are typical in society, more likely to try new things, and more likely to be politically liberal and thus compelled by social justice or environmental arguments (Connelly et al., 2014; Schwaba, 2019). It is therefore not surprising that they are also more likely to be vegetarians or to think about reducing their meat consumption.

It is less obvious why Emotionality would have significantly predicted meat reduction intentions in this study. It could be that our interventions evoked guilt in people high in emotionality. It may also be that people who have more negative emotions just generally think they should change in some way to be better. While the emotionality effect did not replicate across general morality or charitable giving intentions in the way it did for meat reduction intention, it was positive in all three studies, lending some support to this interpretation. It is also possible that this effect was driven by aspects of Emotionality that are particularly emphasized in the HEXACO model (Ashton & Lee, 2007), such as sentimentality and empathic concern, and that this effect would not replicate in a Big Five conceptualization of

Neuroticism. Future work should further explore the association of different negative emotions to meat reduction intentions and behaviors.

These effects raise the question, why do omnivores with such personality traits, who would like to reduce their meat consumption, not do it? We conducted post hoc tests of the interaction between trait levels and interventions to see whether the interventions would be more effective for people who are high in Openness to Experience and Emotionality and, by inference, are more interested in reducing their meat consumption and found no convincing evidence that these traits make the interventions more potent (see OSF page). Thus, it is unclear how to translate these effects into applied solutions to reducing meat consumption. We discuss three possible directions in the next section.

Of the traits we assessed, Honesty-Humility seemed among the most likely to relate to meat reduction intentions, given that it is a trait with clear moral content (Ashton & Lee, 2007) and has been shown to predict prosocial behavior (Thielmann et al., 2020). It was consistently, although modestly, related to charitable giving intentions in our three studies, but it was not related to intentions to be more moral or to eat less meat. It seems plausible that Honesty-Humility is not related to meat reduction intentions because people do not typically see meat reduction as moral, but the fact that Honesty-Humility was not related to intentions to be less moral either seems to rule this interpretation out. Future work should explore the role of this trait in understanding meat consumption intentions and behaviors.

### 5.3 | Implications

A general take-home message of this study is that individual differences may be a more reliable indicator of meat reduction intentions than brief self-knowledge or educational interventions. This finding has several potential applied implications. First, if the goal is to reduce meat consumption in some specific group of people, it may be more fruitful to find people who are already predisposed to meat reduction and give them the tools, knowledge, and motivation to do that. The traits identified as predictors of openness to meat reduction (Openness to Experience, Emotionality, and perceiving meat reduction as moral) may help with the identification of such people.

Second, interventions may need to be more intense, longer lasting, and multimodal (including various factors such as knowledge, motivation, structural factors, means, etc.) to be effective. We are skeptical, based on the current findings, that very brief and low-intensity

interventions will be all that powerful for changing intentions, let alone producing enduring behavior change. Indeed, Tan et al. (2023) showed that even when intentions changed as a function of their two-week intervention, this did not translate to actual meat reduction.

Third, it may be possible to increase motivation to reduce meat consumption by changing the basic traits that predict it. Based on the results of this study, a first step might be increasing people's Openness to Experience and Emotionality. There is evidence that traits can change, especially with intervention among motivated people (Stieger et al., 2021). However, normally people do not want to be more open, and very few people want to be more emotional (Hudson et al., 2020; Thielmann & De Vries, 2021). Cultural changes may increase the awareness that meat consumption is a critical factor in environmental sustainability (Bryant & Sanctorem, 2021) and, thus, the perception of meat reduction as a prosocial act. It may also be possible to use educational or other methods to encourage this connection.

As noted before, these findings must be considered in the context of the magnitude of associations between personality traits and meat reduction intentions (i.e., correlations were generally below 0.20). Although these effects can be considered small in the sense that knowing one person's personality would not be particularly informative about their likely interest in meat reduction, they are larger than those found for studies that relate personality traits to behavioral markers of prosocial or moral behaviors (Stahlmann et al., 2023) and are in roughly the same range as those found for lab-based measures (Thielmann et al., 2020). At a broader group or population level, in turn, these effects are informative and may be practically useful for encouraging meat reduction.

### 5.4 | Limitations and future directions

This study sampled individuals from the United States because we sought to focus on a society in which meat consumption is particularly high and in which meat reduction could thus potentially have the most positive benefits. However, future work should sample individuals from other cultures to test various aspects of our findings. Moreover, this was a convenience sample of adult survey workers, and results may not generalize to the United States in general or to particular sub-cultures within the United States.

We focused on concurrent intentions to get a foothold on potential meat reduction mechanisms. The null effects of the interventions and weak effects of individual differences show that there is considerable work to do for

psychologists to affect meat reduction in practice. Future research should employ designs that are more powerful and examine their impacts on intentions as well as actual and sustained behavioral reduction.

Finally, there are many specific ways in which our design could potentially be improved. For instance, it is possible that key features of our interventions that would have produced reliable effects were missing. There may be other individual difference variables that would better predict meat reduction intentions. Our use of single items to measure intentions could have limited reliability and thus the power to find significant effects. Future research with better designs would be helpful for replicating and extending the current results.

## 5.5 | Conclusion

In this work, we tested whether a self-knowledge approach could increase meat reduction intentions. In these interventions, people were asked how much meat they eat, then asked how they think that their meat consumption compares with normative (average amount US Americans eat) or proscriptive (expert recommendations based on health or environmental sustainability) standards, and then told where they actually fall in relation to those standards. Our prediction was that people who were told that they are further from the standards than they thought would be more motivated to reduce their meat consumption. We found no evidence for this effect. However, we also found no evidence that this approach increased motivations to be more moral in general or to be more charitable, ruling out the possibility that this null effect was specific to meat reduction goals. Moreover, there was no evidence that a simple educational approach without a self-knowledge component was effective, suggesting that self-knowledge interventions are not particularly ineffective or counterproductive, either. Overall, despite some evidence in the existing literature suggesting otherwise, we conclude that very brief interventions to increase moral intentions (let alone behavior) are unlikely to be particularly effective. In contrast, we found reliable evidence that individual differences in personality and moral concerns are related to intentions to reduce meat consumption. In particular, omnivores who are more open to experience, more emotional, and who see meat reduction as moral behaviors were more likely to report intending to reduce meat consumption across all three samples. This raises questions about why such people have not reduced their meat consumption as well as interesting possibilities about how they could be encouraged to do so.

## AUTHOR CONTRIBUTIONS

All authors conceptualized the study together. AS analyzed the data, and CH wrote the first draft. All authors edited the paper.


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## ETHICS STATEMENT

All participants were consented prior to participation. This study was exempt from university review according to the standards of the University of Zurich Faculty of Philosophy Ethics Commission.

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## ENDNOTES

- <sup>1</sup> We excluded  $n=27$  participants who stated that they eat more meat, donate more money, or volunteer more hours than the average plus 5 SDs of the remaining sample. We also excluded  $n=22$  participants who stated that they do not eat meat or that they eat “negative” amounts per week. Finally, we excluded  $n=7$  participants who used offensive language in open-ended answers or expressed their unwillingness to participate.
- <sup>2</sup> We excluded  $n=18$  participants who stated that they eat more meat, donate more money, or volunteer more hours than the average plus 5 SDs of the remaining sample. We also excluded  $n=4$  participants who used offensive language in open responses or expressed unwillingness to participate in open responses.
- <sup>3</sup> We excluded  $n=12$  participants who stated that they eat more meat, donate more money, or volunteer more hours than the average plus 5 SDs of the remaining sample. We also excluded  $n=6$  participants who used offensive language or expressed unwillingness to participate in open responses.

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