

Summer 2021

## The Effectiveness Of Health, Environmental, And Animal Welfare-Focused Video Appeals On Implicit And Explicit 'Wanting' Of Meat And Intentions To Reduce Meat Consumption

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The Effectiveness of Health, Environmental, and Animal Welfare-Focused Video Appeals on Implicit and Explicit 'Wanting' of Meat and Intentions to Reduce Meat Consumption

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A Thesis Presented to the Graduate Faculty of The College of William & Mary in  
Candidacy for the Degree of  
Master of Science

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College of William & Mary  
May 2021



# APPROVAL PAGE

This thesis is submitted in partial fulfillment of  
the requirements for the degree of

Master of Science



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# COMPLIANCE

Research approved by

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Protocol number(s): PHSC-2020-07-22-14415-ajbravo

Date(s) of approval: 08/10/2020

## ABSTRACT

High levels of meat production/consumption negatively impact physical health, environmental sustainability, and animal welfare. As a result, documentaries focused on increasing knowledge of these negative consequences have emerged in popular media. Given this information, the present study examined and compared the effects of these video appeals on intentions to reduce meat consumption and 'wanting' of meat. In the analytic sample, most participants identified as White non-Hispanic ( $n = 237$ ; 58.8%), with a smaller proportion identifying as Asian American or Asian ( $n = 101$ ; 24.9%), as Black or African American ( $n = 54$ ; 13.3%), as Hispanic, Latino, or of Spanish origin (9.4%), as American Indian or Alaska Native ( $n = 6$ ; 1.5%), as Native Hawaiian or other Pacific Islander ( $n = 2$ ; 0.5%), or as identifying with a racial or ethnic identity not listed ( $n = 10$ ; 2.5%). A majority of participants identified as female (61.5%) and the reported mean age of the analytic sample was 18.95 (Median = 19.00; SD = 0.96). Participants completed baseline questionnaires before being randomly assigned to one of four conditions where they watched either a 10 minute video on the negative impact of meat consumption (three experimental conditions with separate appeals; animal welfare, environmental, health) or a control video. Afterwards, intentions to reduce meat consumption and levels of implicit/explicit 'wanting' were assessed. Results indicated that watching any of the three experimental videos led to increased intentions to reduce meat consumption and decreased implicit, but not explicit, 'wanting' of meat compared to the control condition. These effects were mediated by participants' post intervention levels of moral emotions (i.e., shame, guilt, being upset) for those in the animal welfare and environmental conditions, such that being in those conditions led to higher levels of moral emotions, which in turn led to lower implicit/explicit 'wanting' as well as higher intentions to reduce meat intake. Further, moderation and moderated mediation effects were explored. These results suggest video interventions may be an effective and low-cost tool for lowering intentions to consume meat as well as for shifting motivations to consume meat.

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## ACKNOWLEDGEMENTS

I would like to thank the following people/pets for helping me with this research project. Dr. Adrian Bravo, for providing supervision and guidance throughout my two years at William & Mary. Dr. Catherine Forestell for introducing me to this line of research and for their continued support and insight through all steps of this project. Dr. Paul Kieffaber for their thoughtful review of this thesis as well as for teaching me the skills needed to program my experiment. My partner Casey for her unwavering support of my goals and for ensuring that I have a life outside of my work. Charlie Barkmon for bringing me joy after hours of tedious work finishing this project.



## Introduction

High levels of red and processed meat consumption are associated with a variety of negative consequences that are individual and societal (Bonnet et al., 2020; Steinfeld et al., 2006; Wolk, 2017). One possible solution to curb the negative impacts of meat consumption, is to reduce meat intake and collectively shift to a more plant-based and sustainable diet. Having said that, changing people's food preferences is challenging, as food choices are often tied to social norms, cultural traditions, and taste preferences (Fiddes, 2004).

In recent years there has been an emergence of research focused on understanding these challenges in relation to individual and societal meat consumption. As a result of this work, researchers have proposed a set of personal (e.g., knowledge, emotions, values) socio-cultural (e.g., social norms, roles, religion), and external (e.g., access to a variety of foods) factors that influence one's meat eating behavior (Stoll-Kleeman & Schmidt, 2017). Additionally, recent work has identified health, environmental, and animal welfare concerns as the primary motivations for considering vegetarian diets (Hopwood et al., 2020). Based on these motivations and influence factors, researchers have designed a variety of interventions aimed at reducing meat consumption (Harguess et al., 2020), including sending daily text message reminders (Carfora et al., 2017a, 2017b), priming participants with images of animals (Kunst & Hohle, 2016; Tian et al., 2016; Zickfeld et al., 2018), and providing text-only information illustrating the negative consequences of meat consumption (Palomo-Vélez et al., 2018; Scrimgeour, 2012; Verain et al., 2017). Despite the breadth of studies examining this topic, there is limited research examining the effectiveness of media interventions designed to reduce meat consumption.

Digital media has been shown to have a direct effect on food consumption behavior (Lupton & Feldman, 2020). With respect to meat consumption, media such as

blogs and videos have been used to promote meatless diets (Harrington et al., 2019; Véron, 2016). Further, it has been argued that recent documentaries illustrating the negative impacts of meat have been instrumental in increasing awareness of the negative consequences associated with meat consumption, as well as shifting public perception of meatless diets (Harrington et al., 2019). Given the accessibility and popularity of these documentaries, it is worth exploring the effectiveness of their appeals, especially considering video interventions have been found to be more successful at changing health (Shen et al., 2015; Stanczyk et al., 2016; Walthouwer et al., 2015) and environmental (Ahmad et al., 2015; Perrin, 2011) behaviors than text-only interventions. The goal of the present study was to examine the effects of video interventions that provide information about the health, environmental, and animal welfare impacts of meat consumption. Below we review research that has employed interventions to address each of these motivations, as well as individual differences that affect people's willingness to consume meat.

### **Health-Focused Interventions**

Increased consumption of red and processed meat has been linked to several physical maladies, such as obesity (Rouhani et al., 2014), cancer (Chan et al., 2011; Wang et al., 2015) cardiovascular disease (Bechthold et al., 2019), and Type 2 diabetes (Pan et al., 2011). Despite this information, many individuals continue to regularly eat meat partly due to the belief that meat is a nutritionally necessary component of a healthy diet (Pohjolainen et al., 2015). Unsurprisingly, individuals who consume larger quantities of meat are less likely to believe it is unhealthy (de Boer et al., 2017; Neff et al., 2018).

Health-focused interventions have been shown to reduce intentions to eat meat (Carfora et al., 2019; Cordts et al., 2014). Specifically, Carfora and colleagues (2019) found that sending daily text messages illustrating the health benefits of reducing red

and processed meat consumption were effective at increasing positive attitudes towards meat reduction as well as reducing meat consumption. Additionally, of importance to the current study, there is evidence that watching a brief video on the negative health consequences of meat, results in increased intentions to reduce meat consumption (Fehrenback, 2015).

The degree to which health beliefs affect consumers' willingness to reduce their meat intake is affected by several factors. For example, individuals who are more attached to meat (i.e., showing a positive affective connection to meat) are less likely to view meat consumption as a public health concern and less likely to be willing to reduce their meat consumption (Graça, Calheiros et al., 2015; Graça, Oliveira et al., 2015). Further, individuals with higher incomes are more likely to cite health as a primary reason for reducing their meat intake than those with lower incomes (Neff et al., 2018). Additionally, qualitative research suggests trust in dietary guidelines provided by governmental agencies (e.g., U.S. Department of Health and Human Services, U.S. Department of Agriculture) affects decisions to reduce meat consumption (Macdiarmid et al., 2016). While health is a critical aspect of dietary decision-making, decisions to reduce one's meat intake are often affected by values that go beyond nutrition.

### **Environment-Focused interventions**

Research unequivocally shows that the production of livestock contributes to biodiversity erosion, depletion of water resources, degradation of land, and climate change (Godfray et al., 2018; Steinfeld et al., 2006). The livestock sector is estimated to be responsible for 14.5% of global greenhouse gas (GHG) emissions, more than emissions from fueling all of the world's cars, trains, ships, and airplanes combined (Bailey et al., 2014). In addition, it is estimated that global climate change targets will likely not be met unless significant changes to the food system occur (Clark et al., 2020). Despite this looming crisis, most consumers are unaware of the environmental impact of

meat (Hartmann & Siegest, 2017; Sanchez-Sabate & Sabate, 2019), a fact that may be exacerbated by the lack of media coverage on the meat-climate relationship (Almiron & Zoppeddu, 2015).

Research indicates that intentions to reduce meat consumption are often determined by rational motives (i.e., cost-benefit analysis of behavior) that are based on moral considerations (i.e., pro-environmental beliefs, concern for animal welfare) (Carfora et al., 2020). Therefore, increasing awareness of the environmental impact of meat through environmentally focused interventions may be a crucial step toward reducing meat consumption through activating moral motives and emotions (i.e., guilt, shame, being upset). In support of this notion, Graham and Abrahamse (2017) showed that participants reported significantly lower intentions to eat meat after being exposed to information illustrating meat's detrimental effects on the environment. Important to note, information-only appeals are not always effective. For example, environmental information on menus was not by itself successful in promoting the ordering of meatless options (Campbell-Arvai et al., 2014). Rather, interventions that incorporate an emotional appeal along with information have been shown to be more successful (Harguess et al., 2020; Stoll-Kleeman & Schmidt, 2017). One approach to increasing awareness about environmental issues through emotional appeals has been via documentary style films. Specifically, researchers found films that highlighted environmental concerns raised intentions to engage in environmentally friendly behaviors (Hofman & Hughes, 2017; Nolan, 2010; Vratsanou et al., 2019). It is worth noting that to date, only one preliminary study has examined the effect of documentary style films on meat-related outcomes (Pabian et al., 2020). In this study, watching a ninety minute documentary on the environmental impact of meat (*Cowspiracy*) resulted in increased intentions to reduce meat consumption (Pabian et al., 2020).

It is likely that people differ in how receptive they are to environmentally-focused appeals. Specifically, past research indicates those higher in environmental concern are more willing to reduce their meat consumption (Cheah et al., 2020). Additionally, women are more likely to perceive meat reduction as beneficial to the environment (Siegest et al., 2015) and more willing to limit their meat consumption for environmental reasons than men (De Groeve & Bleys, 2017). Moral concerns are also a key predictor of the effectiveness of meat reduction interventions utilizing animal welfare appeals.

### **Animal Welfare-Focused Interventions**

Animals in factory farms are often confined to crowded unsanitary cages without access to fresh air or grass (Mallon, 2005). Due to these tight quarters, disease transmission is common and many animals suffer from illnesses throughout the duration of their brief lives (Stathopoulos, 2010). Interestingly, most people disapprove of factory farming and the harming of animals but still routinely eat meat. Research has coined this phenomenon the “meat-paradox” (Loughnan et al., 2010) and researchers have utilized cognitive dissonance theory (Festinger, 1957) to understand it (Bastian & Loughman, 2017; Loughman et al., 2010; Rothgerber, 2020).

Cognitive dissonance arises when individuals experience emotional discomfort as a result of their actions contradicting their values or beliefs (Festinger, 1957). It follows then that meat-eaters should experience cognitive dissonance when presented with the animal origins of their food. To reduce this cognitive dissonance, individuals may either choose to change their meat-eating behavior or justify their behavior by utilizing a variety of strategies outlined by Rothgerber (2020). One potential mechanism that may explain why some individuals choose to reduce their meat intake while others do not is the strength of moral emotions (i.e., guilt, shame, being upset) experienced when presented with the negative impact of their meat consumption.

Experiencing moral emotions leads to increased moralization of eating meat, thus leading to increased intentions to reduce meat consumption (Feinberg et al., 2019). With this in mind, it makes sense that meat-reduction interventions that highlight animal suffering directly have been shown to be effective. For example, Paloma and colleagues (2018) found showing images depicting animals in inhumane and disgusting conditions led to less favorable ratings of meat images. Therefore, it may be that documentaries illustrating the suffering of animals in factory farms would lead to an increase in cognitive dissonance and experience of moral emotions, thus leading to changes in meat-related intentions.

Additionally, past research has identified trait variables that may help explain one's willingness to eat meat despite awareness of animal suffering. For example, those higher in social dominance orientation (i.e., a general desire for social hierarchy) and speciesism (i.e., the belief that humans are superior to non-human animals) are more likely to consume higher levels of meat (Caviola et al., 2019; Dhont & Hodson, 2014). Conversely, those higher in animal empathy are seemingly less able to morally disengage when eating meat, leading to reduced meat consumption (Camilleri et al., 2020).

Limited research suggests that animal welfare appeals may be more effective at reducing intentions to eat meat when compared to environmental or health appeals. Specifically, participants who read fake newspaper articles reported higher intentions to reduce meat consumption when their article focused on animal welfare problems, compared to health and environmentally focused articles (Cordts et al. 2014). Similarly, participants who read persuasive essays focused on animal welfare, rated meat images lower than individuals did in environmental, health, and control conditions (Palomo-Vélez et al., 2018).

### **Present Study**

There is limited experimental research comparing the effects of health, environmental, and animal welfare-focused video documentaries on consumers' responses to meat. As a result, the present study aimed to compare the effects of brief (~10 minute) health, environmental, and animal welfare-focused video appeals on intentions to reduce meat consumption. Additionally, given that intention-change interventions only lead to a small or medium change in behavior (Webb & Sheeran, 2006), we believe there is utility in assessing additional outcomes of meat-reduction interventions that may account for a portion of the intention-behavior gap. Considering that people typically want and like the foods they choose to eat, we focused on these two distinct components of food reward as dependent variables in the present study. 'Liking' is usually understood as the actual pleasure or hedonic impact that comes from a reward (Berridge & Kringelbach, 2008). Whereas 'wanting' is most often operationalized as the motivation for the reward (Berridge & Kringelbach, 2008). 'Wanting' can occur subconsciously or consciously. For example, implicit 'wanting' refers to incentive salience, which can depend on one's current physiological state as well as learned associations to relevant cues (Tindell et al., 2009). In contrast, explicit 'wanting' refers to the conscious desire to consume a particular food (Finlayson et al., 2007).

Based on past literature, we developed four a priori hypotheses and conducted two exploratory analyses, which are outlined below. First, we expected the health, environmental, and animal welfare groups to report higher willingness to reduce their meat consumption compared to the control group. Second, we predicted that the health, environmental, and animal welfare groups would show lower levels of implicit and explicit 'wanting' of meat than the control group. We did not expect to find a difference in groups on explicit 'liking' of meat as it is unlikely that our brief manipulation would affect the perceived hedonic impact of eating meat, whereas explicit 'wanting' is more likely to be influenced by changes in implicit 'wanting' (Stevenson et al., 2017). Third, we

expected that the animal welfare group would show the greatest change in intentions as well as implicit and explicit 'wanting' due to the emotion provoking content of the video. Fourth, we hypothesized that moral emotions (i.e., guilt, shame, being upset) would mediate the association between condition and intentions to reduce meat intake and implicit/explicit 'wanting' of meat (see Figure 1) when comparing the environmental, animal welfare and control conditions, such that those in the environmental and animal welfare conditions would show higher levels of moral emotions which in turn would predict higher intentions to reduce meat intake/lower implicit and explicit 'wanting' of meat.

Additionally, we conducted two exploratory analyses to investigate possible moderation and moderated mediation effects. First, we explored whether trait variables associated with increased meat consumption (i.e., meat attachment, social dominance orientation, ecological views, speciesism, and empathy) moderated the effect of condition on intentions to reduce meat intake and implicit 'wanting' of meat. For these analyses, we expected social dominance orientation, speciesism, and empathy would only moderate the relationship when comparing the animal welfare and control conditions. In addition, we believed that ecological views would only moderate the relationship when comparing the environmental and control conditions. Second, after completing our mediation analyses, we explored whether the relative indirect effect between condition and intentions to reduce meat consumption and implicit/explicit 'wanting' via moral emotions was moderated by meat attachment when comparing the environmental and animal welfare conditions with the control condition (Figure 2). Additionally, we explored whether the relative indirect effect between condition and intentions to reduce meat consumption and implicit/explicit 'wanting' via moral emotions was moderated by social dominance orientation when comparing the animal welfare and control conditions. We predicted as levels of meat attachment and social dominance



orientation increased, students in the relevant experimental condition would be less likely to experience moral emotions, which in turn would lead to lower intentions to reduce meat consumption and higher implicit/explicit 'wanting.'

## Methods

### Participants

University students (N=476) were recruited from the Psychology Department participant pool at a mid-size southeastern university in the United States. Seventy one participants were excluded for the following reasons: 1) 41 respondents indicated that they did not consume meat when asked to identify their current eating habits (i.e., vegan, lacto-vegetarian, lacto-ovo vegetarian, pesco-vegetarian); 2) 25 participants did not complete the food reward task portion of the study; 3) 3 participants were excluded for being exposed to multiple video conditions through taking the survey multiple times; and 4) 2 participants refused to provide consent. Therefore, the final analytic sample consisted of 405 participants. In the analytic sample, most participants identified as White non-Hispanic ( $n = 237$ ; 58.8%), with a smaller proportion identifying as Asian American or Asian ( $n = 101$ ; 24.9%), as Black or African American ( $n = 54$ ; 13.3%), as Hispanic, Latino, or of Spanish origin (9.4%), as American Indian or Alaska Native ( $n = 6$ ; 1.5%), as Native Hawaiian or other Pacific Islander ( $n = 2$ ; 0.5%), or as identifying with a racial or ethnic identity not listed ( $n = 10$ ; 2.5%). A majority of participants identified as female (61.5%) and the reported mean age of the analytic sample was 18.95 (Median = 19.00; SD = 0.96). The experiment took approximately 30 minutes to complete and participants received research credit for their participation. This study was approved by the participating university's IRB PHSC-2020-07-22-14415.

### Study Design

Participants completed baseline questionnaires and were randomly allocated to one of four groups: animal welfare ( $n = 97$ ), environmental ( $n = 103$ ), health ( $n = 97$ ),

control ( $n = 108$ ). Participants in the three experimental conditions then watched a brief (~10 minute) video from the documentary film *H.O.P.E. What You Eat Matters* that focused on either the animal welfare, environmental, or health consequences of meat consumption. Participants in the control condition watched a brief (~10 minute) video excerpt from the documentary film *Voices of Debt - The Student Loan Crisis: Don't Major in Debt* where no reference to meat consumption was made. Upon watching the video, participants then responded to a questionnaire assessing their affective state before completing a modified version of the Leeds Food Preference Questionnaire (LFPQ; Finlayson et al., 2007) to assess food reward preferences. Lastly, participants answered questionnaires assessing intentions to reduce meat consumption as well as completed several manipulation checks.

## **Measures**

### ***Experimental Tasks***

***Food Images.*** Food images were taken from the food pics database (Blechert et al., 2014). The images were chosen based on palatability data from a large sample of American and European adults (Blechert et al., 2014). The meat images consisted of the following foods: roasted chicken (ID# 546), hot dog (ID# 547), roast beef (ID# 552), hamburger (ID# 45), grilled pork (ID# 328), and steak (ID# 721). The non-meat images were comprised of the following foods: avocado (ID# 835), fried egg (ID# 560), cheese (ID# 70), cashews (ID# 110), french fries (ID# 22), and spaghetti (ID# 547). Each picture was shown on a white background and all photos were resized to 350 x 263. All images were presented in cooked or prepared form.

***Implicit 'Wanting.'*** Implicit 'wanting' and preferences for meat was assessed using an adapted version of the LFPQ (Finlayson et al., 2007) created in PsyToolkit (Stoet, 2010, 2017) that consisted of the 6 meat images and 6 non-meat images listed above for a total of 12 images. The task paired a meat image with a non-meat image and

participants were asked to respond to the prompt “Which food do you most want to eat now?” as quickly as possible. There were 36 trials comparing meat to non-meat options, which were presented in a randomized order. Stimuli remained on the screen for 5000 ms or until the participant made their choice and each trial was separated by an intertrial interval of 500 ms. To improve reliability, participants completed four test trials (that did not contribute to the test outcomes) before completing the 36 task trials.

**Explicit ‘Liking’ & ‘Wanting.’** Explicit ‘liking’ and ‘wanting’ were assessed using the same adapted version of the LFPQ that was used to measure implicit ‘wanting.’ The order of the tasks (i.e., explicit vs. implicit) were randomized in PsyToolkit. Participants were asked to rate each of the 12 single food images according to “How pleasant it would be to taste some of this food right now?” (Explicit ‘liking’) and “How much do you want some of this food right now?” (Explicit ‘wanting’). Responses were on a scale ranging from 1 (*Not at all*) to 7 (*Extremely*). Average explicit ‘liking’ and ‘wanting’ scores were calculated for each participant. To improve reliability, participants completed four test trials (that did not contribute to the test outcomes) prior to viewing the 12 task images.

### **Questionnaires**

For all measures (unless specified), composite scores were created by averaging items and reverse-coding items when appropriate such that higher scores indicate higher levels of the construct.

**Willingness to Reduce Meat Consumption.** Participants were asked to respond to four statements on a 5-point Likert scale (1 = *Disagree Strongly*, 5 = *Agree Strongly*). The four statements were as follows: “I am willing to eat meat less often per week,” I am willing to eat smaller quantities of meat per meal,” I am willing to adopt a more vegetarian diet,” and “I am planning to reduce my meat intake in the near future” (Grove et al., 2016). Additionally, participants were asked to “Indicate to what extent you plan to

engage in the following behaviors in the following months” for two items on a sliding scale (0 = *not at all*, 100 = *A lot*): “Switch to a plant-based diet (vegetarian or vegan),” and “Pick a day of the week to not eat meat (e.g., Meatless Mondays).” Each statement was treated as a separate dependent variable.

**Moral Emotions.** Moral emotions were assessed using the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) before and after the experimental manipulation (i.e., watching the video). Specifically, we were interested in assessing the moral emotions of guilt, shame, and being upset. Respondents were asked to indicate to what extent they felt the emotion at the present moment on a scale from 1 (*very slightly or not at all*) to 5 (*extremely*). Participant scores on guilt, shame, and being upset were summed and then divided by three to create a “moral emotions” total score (Internal reliability  $\alpha = .88$ ).

**Meat Attachment.** Meat attachment was assessed using the Meat Attachment Questionnaire (MAQ; Graca et al., 2015) which assesses one’s positive affective connection to meat and consists of 16 items. Measured on a 5-point response scale (1 = *Strongly Disagree*, 5 = *Strongly Agree*), participants were asked “Please indicate to what extent you agree or disagree with the following statements.” Example items include, “to eat meat is one of the good pleasures in life” and “Meat is irreplaceable in my diet” (Internal reliability  $\alpha = .92$ ).

**Social Dominance Orientation.** Social dominance orientation was assessed using the Social Dominance Orientation Scale (Pratto et al., 1994) and generally measures one’s support for social hierarchy. Participants responded to the 14 items measured on a 7-point Likert scale (1 = *Very Negative*, 7 = *Very Positive*). Example items include, “Inferior groups should stay in their place” and “To get ahead in life, it is sometimes necessary to step on other groups” (Internal reliability  $\alpha = .91$ ).

**Environmental Concern.** Participants' attitudes towards the environment were assessed using the New Ecological Paradigm Scale (NEP; Dunlap et al., 2000) which consists of 15 items measured on a 5-point Likert scale (1 = *Strongly Disagree*, 5 = *Strongly Agree*). Example items include, "Humans are severely abusing the environment" and "The so-called 'ecological crisis' facing humankind has been greatly exaggerated" (reverse coded) (Internal reliability  $\alpha = .82$ ).

**Speciesism.** Speciesism was assessed using the Speciesism Scale (Caviola et al., 2019) which consists of 6 items measured on a 7-point Likert scale (1 = *Strongly Disagree*, 7 = *Strongly Agree*). Example items include, "Morally, animals always count for less than humans" and "It is morally acceptable to trade animals like possessions" (Internal reliability  $\alpha = .80$ ).

**Empathy.** Empathy was assessed using the Toronto Empathy Questionnaire (Spreng et al., 2009) which consists of 16 items measured on a 5-point Likert Scale (1 = *Never*, 5 = *Always*). Example items include, "I have tender, concerned feelings for people less fortunate for me" and "I get a strong urge to help when I see someone who is upset" (Internal reliability  $\alpha = .84$ ).

### **Data Analysis Plan**

Before running our primary analyses, the assumption of normality was determined to be satisfied as the outcome variables exhibited skew and kurtosis less than  $|2|$  and  $|2|$  respectively (Garson, 2012). Additionally, we conducted manipulation checks to ensure our intervention had the desired impact on participants as well as to confirm that random assignment worked as expected. Upon completion of the manipulation checks, three four group one-way between groups ANOVAs were conducted with explicit 'liking,' explicit 'wanting,' and implicit 'wanting' as the dependent variables, measuring the differences between the four conditions (animal welfare, environmental, health, control). Forty-three responses (2.9%) from the LFPQ were

excluded, as the response time was under the commonly used cutoff of 200 ms (Whelan, 2008). An additional seventy-six responses (5.2%) were excluded, as participants did not answer in the 5000 ms time provided. To calculate implicit 'wanting' of meat, the frequency of meat and non-meat selections, and the reaction time of each trial is combined with a frequency-weighted algorithm (see Oustric et al., 2020 for a comprehensive review of the LFPQ). Additionally, separate ANOVAs were conducted with the intention to reduce meat questions as the dependent variables. In the case of a significant omnibus F test, pairwise comparisons were explored using Bonferroni tests. Mediation analyses (Model 4 in PROCESS) were conducted using the PROCESS 3.4 macro for SPSS (Hayes, 2017) to determine whether post-intervention levels of moral emotions (i.e., guilt, shame, being upset) mediated the association between condition and intentions to reduce meat intake and implicit/explicit 'wanting' of meat for those in the animal welfare and environmental conditions compared to the control condition.

Afterwards, exploratory moderation analyses were conducted (Model 1 in PROCESS) to determine whether the associations between condition and intentions to reduce meat intake and implicit 'wanting' of meat were moderated by trait (e.g., social dominance orientation) level variables. Lastly, due to the results of our mediation analyses we conducted exploratory first stage moderated mediation analyses (Model 7 in PROCESS) to determine whether trait variables (i.e., meat attachment, social dominance orientation) moderated the indirect effect of condition on willingness to reduce meat consumption as well as on implicit/explicit 'wanting' via moral emotions. Specifically, we predicted that meat attachment would moderate the relative indirect effect when comparing the control condition to both the animal welfare and environmental conditions and that social dominance orientation would moderate the relative indirect effect when comparing the control condition to the animal welfare condition. For all moderation/mediation/moderated mediation analyses, we followed the

steps outlined by Hayes (2017) for using a multicategorical antecedent variable in these analyses. Importantly, because we utilized a multicategorical antecedent variable, all effects are relative and reflect comparisons between conditions.

## Results

### Manipulation Checks

To ensure the video manipulations accomplished their intended purpose, we conducted several manipulation checks. First, a one-way between-subjects ANOVA was conducted to compare the effects of condition on agreement with the statement “Choosing to eat meat has negative consequences on my health.” The omnibus test showed a significant effect of video watched on agreement with the statement “Choosing to eat meat has negative consequences on my health,”  $F(3,398) = 10.46, p < .001$ . Post hoc comparisons indicated that the mean score for the health condition was higher than those in the animal welfare, environmental, and control conditions.

Additionally, analyses revealed a significant effect of video watched on agreement with the statement “Choosing to eat meat has negative consequences on the environment,”  $F(3,399) = 9.54, p < .001$ . Once again, post hoc comparisons indicated that the mean score for the environmental condition was higher than those in the health and control conditions. Further, analyses revealed a significant effect of video watched on agreement with the statement “Choosing to eat meat has negative consequences on animal welfare,”  $F(3,399) = 15.61, p < .001$ . Post hoc comparisons indicated that the mean score for the animal welfare condition was higher than those in the health and control conditions.

In addition, analyses indicated there was a significant effect of video watched on closing one’s eyes or looking away from the screen due to the video’s content,  $F(3,400) = 15.11, p < .001$ . Post hoc comparisons revealed individuals in the animal welfare condition were more likely to close their eyes or look away from the screen than those in

the other three conditions, providing evidence for the animal welfare video being the most emotive. Lastly, there were no differences among the four conditions in gender, age, socioeconomic status, or average level of hunger.

### **ANOVA Analyses**

Bivariate correlations and descriptive statistics of all study variables are shown in Table 1. All study variables were significantly correlated with the exception of empathy and willingness to switch to a plant-based diet. Descriptive statistics of study variables across experimental conditions as well as the results of our primary ANOVA analyses are shown in Table 2.

#### ***Reduce Meat Intake***

As expected, analyses revealed a significant effect of condition on intentions to reduce meat intake in the near future,  $F(3,399) = 8.90, p < .001, \eta_p^2 = .063$ . Post hoc comparisons indicated that participants in the environmental, animal welfare, and health conditions were more willing to reduce their meat intake compared to those in the control condition. Notably, the animal welfare, environmental, and health conditions did not significantly differ from each other.

#### ***Eat Smaller Quantities***

Additionally, a significant effect was found for the effect of condition on willingness to eat smaller quantities of meat per meal,  $F(3,399) = 4.92, p < .01, \eta_p^2 = .036$ . Post hoc comparisons indicated that those in the environmental condition were more willing to eat smaller quantities of meat compared to the control condition. The animal welfare and health conditions did not significantly differ compared to the control condition. Further, the animal welfare, environmental, and health conditions did not significantly differ from each other.

#### ***Eat Meat Less Often***



Analyses revealed a significant effect of condition on willingness to eat smaller quantities of meat per meal was,  $F(3,399) = 3.53, p < .05, \eta_p^2 = .026$ . Post hoc comparisons indicated that those in the environmental condition were more willing to eat smaller quantities of meat compared to the control condition. The animal welfare and health conditions did not significantly differ compared to the control condition. Further, the animal welfare, environmental, and health conditions did not significantly differ from each other.

### ***Meatless Day of the Week***

Analyses revealed a significant effect of condition on intentions to pick a day of the week to not eat meat,  $F(3,398) = 8.63, p < .001, \eta_p^2 = .061$ . Post hoc comparisons indicated that those in the environmental condition were more willing to pick a day of the week to not eat meat compared to those in the control and health conditions. The environmental condition did not significantly differ in comparison to the animal welfare condition. Further, the animal welfare, health, and control conditions did not significantly differ from each other.

### ***Switch to Plant-Based Diet/Adopt a Vegetarian Diet***

The omnibus test revealed a significant effect of condition on intentions to switch to a plant-based diet (vegetarian or vegan),  $F(3,398) = 2.68, p < .05, \eta_p^2 = .020$ . However, post hoc comparisons using a Bonferroni test indicated no significant differences between conditions. Further, a non-significant effect of condition on willingness to adopt a vegetarian diet was observed  $F(3,399) = 1.10, p = .350, \eta_p^2 = .008$ .

### ***Implicit 'Wanting'***

As expected, analyses showed there was a significant effect of condition on implicit 'wanting' of meat,  $F(3,401) = 7.41, p < .001, \eta_p^2 = .053$ . Post hoc comparisons indicated that the mean scores for the three experimental conditions (i.e., animal welfare, environmental, health) were lower (indicating less implicit 'wanting') compared

to the control condition. Although the animal welfare condition did show the lowest level of implicit 'wanting,' the group means did not significantly differ from the others as expected (see Table 2).

### ***Explicit 'Liking' and 'Wanting'***

Contrary to our hypothesis, analyses revealed there was not a significant effect of condition on explicit 'wanting' of meat,  $F(3,401) = 1.99$ ,  $p = .115$ ,  $\eta_p^2 = .015$ .

Additionally, the omnibus test revealed a non-significant effect of condition on explicit 'liking' of meat,  $F(3,401) = 2.31$ ,  $p = .076$ ,  $\eta_p^2 = .017$ .

### **Mediation Analyses**

Experiencing moral emotions mediated the relationship between condition and willingness to reduce meat intake when comparing the animal welfare and control conditions (see Table 3). Specifically, being in the animal welfare condition was associated with higher levels of moral emotions ( $\beta = 1.01$ , 95% CI [.77, 1.26]), which in turn was associated with higher willingness to reduce meat intake.

Additionally, experiencing moral emotions mediated the relationship between condition and willingness to reduce meat intake when comparing the environmental and control conditions (see Table 3), such that being in the environmental condition was associated with higher levels of moral emotions ( $\beta = .66$ , 95% CI [.42, .90]), which in turn was associated with higher willingness to reduce meat intake. It is important to highlight that a significant direct effect from condition to intentions to reduce meat intake was still found even after controlling for effects of moral emotions.

With regard to implicit/explicit 'wanting' as the outcomes, mediation analyses revealed experiencing moral emotions mediated the relationship between condition and implicit/explicit 'wanting' of meat when comparing the animal welfare and control conditions (see Table 3). Specifically, being in the animal welfare condition was associated with higher levels of moral emotions ( $\beta = 1.01$ , 95% CI [.77, 1.26]), which in

turn was associated with lower implicit/explicit 'wanting' of meat. Importantly, a significant direct effect from condition to implicit 'wanting' of meat was still found after controlling for effects of moral emotions. In contrast, the direct effect from condition to explicit 'wanting' was not significant.

Similarly, moral emotions mediated the relationship between condition and implicit/explicit 'wanting' of meat when comparing the environmental and control conditions (see Table 3) such that those in the environmental condition were more likely to experience moral emotions ( $\beta = .68$ , 95% CI [.44, .92]), which in turn was associated with lower implicit/explicit 'wanting' of meat. A significant direct effect from condition to implicit 'wanting' of meat was still found after controlling for effects of moral emotions. Conversely, the direct effect from condition to explicit 'wanting' was not significant.

### **Exploratory Moderation Analyses**

Moderation analyses showed that meat attachment moderated the relationship between condition and intention to reduce meat intake when comparing the environmental and control conditions (see Table 4). Specifically, those in the environmental condition were more likely to reduce their meat consumption at average and high levels of meat attachment compared to those at average or high levels within the control group. There was no difference between willingness to reduce meat consumption between the environmental and control conditions at low levels of meat attachment. None of the other variables entered in as moderators (i.e., ecological views, social dominance orientation, empathy, speciesism) were found to be statistically significant when comparing any of the experimental conditions to the control condition (analyses available upon request).

### **Exploratory Moderated Mediation Analyses**

We found a significant interaction between meat attachment and condition when comparing the animal welfare and control conditions (see Table 5). Specifically, the

relationship between condition and moral emotions strengthened at lower levels of meat attachment, indicating that while those in the animal welfare condition were more likely to experience moral emotions at all levels of meat attachment, the disparity between the two conditions was most pronounced at lower levels of meat attachment. Additionally, the first stage moderated mediation model indicated a significant moderated mediation effect (Index =  $-.14$ , 95% CI [ $-.27$ ,  $-.02$ ]) based on a PROCESS-provided index of moderated mediation (Hayes, 2015). These findings indicate a significant moderated mediation effect, such that the relative indirect effects from condition to willingness to reduce meat intake via moral emotions were stronger for those in the animal welfare condition compared to those in the control condition at all levels of meat attachment. With that being said, it is noteworthy to mention that the relative indirect effects (animal welfare vs control) were significantly weaker as levels of meat attachment increased (see Table 5), indicating being high in meat attachment lessened the likelihood of experiencing moral emotions as a result of being in the animal welfare condition, which in turn led to less willingness to reduce future meat intake. Interestingly, the moderation mediation model comparing the environmental condition to the control condition did not yield a significant moderated mediation effect (Index =  $.06$ , 95% CI [ $-.06$ ,  $.17$ ]).

Additionally, analyses revealed a significant interaction between social dominance orientation and condition when comparing the animal welfare and control conditions (see Table 6). Specifically, the relationship between condition and moral emotions strengthened at lower levels of social dominance orientation, suggesting that while those in the animal welfare condition were more likely to experience moral emotions at all levels of social dominance orientation, the relative conditional effects were largest at lower levels of social dominance orientation. Further, the first stage moderated mediation model indicated a significant moderated mediation effect (Index =  $-.10$ , 95% CI [ $-.21$ ,  $-.01$ ]), meaning a significant moderated mediation effect was

observed, such that the relative indirect effects from condition to willingness to reduce meat intake via moral emotions were stronger for those in the animal welfare condition compared to those in the control condition at all levels of social dominance orientation. Importantly, this means that those who were higher in social dominance orientation were less likely to experience moral emotions as a result of being in the animal welfare condition which in turn suggests they were less likely to be willing to reduce their meat intake.

Following these analyses, we ran the same models with implicit/explicit 'wanting' as the outcome variables. In doing so, we found a unique significant interaction between meat attachment and condition when comparing the animal welfare and control conditions (see Table 7). Analyses of the first stage moderated mediation model indicated a significant moderated mediation effect for both implicit (Index = .07, 95% CI [.01, .14]) and explicit (Index = .05, 95% CI [.01, .12]) 'wanting.' Specifically, the relative indirect effects (animal welfare vs. control) were significantly weaker as levels of meat attachment increased. These findings indicate a significant moderated mediation effect, such that the relative indirect effects from condition to implicit/explicit 'wanting' of meat via moral emotions were stronger for those in the animal welfare condition compared to those in the control condition at all levels of meat attachment. Similarly, to the intentions findings, those higher in meat attachment were less likely to experience moral emotions as a result of being in the animal welfare condition and therefore showed higher levels of implicit/explicit 'wanting.' Once again, the moderation mediation model exploring the effect of meat attachment when comparing the environmental and control conditions did not yield a significant moderated mediation effect (Implicit index = -.03, 95% CI [-.09, .03]; Explicit index = -.02, 95% CI [-.07, .02]).

Additionally, analyses revealed a significant interaction between social dominance orientation and condition when comparing the animal welfare and control

conditions (see Table 8). Further, the first stage moderated mediation model indicated a significant moderated mediation effect for both implicit (Index = .05, 95% CI [.00, .11]) and explicit (Index = .04, 95% CI [.00, .09]) 'wanting.' Specifically, the relative indirect effects from condition to implicit/explicit 'wanting' of meat via moral emotions were stronger for those in the animal welfare condition compared to those in the control condition at all levels of social dominance orientation. Importantly, the relative conditional indirect effects were stronger at lower levels of social dominance orientation, revealing that those who were higher in social dominance orientation were less likely to experience moral emotions as a result of being in the animal welfare condition which in turn resulted in higher implicit/explicit 'wanting' of meat.

### Discussion

Research has shown that the excessive consumption of red and processed meat has negative consequences on one's health (Wolk, 2017). Further, meat production negatively affects the environment (Steinfeld et al., 2006) as well as leads to the inhumane treatment of animals (Mallon, 2005). In recent years, documentaries aimed at enhancing consumer knowledge of the negative consequences of meat production/consumption such as *Cowspiracy*, *What the Heath*, *Forks over Knives*, and *H.O.P.E. What You Eat Matters* have amassed millions of views on popular streaming sites such as YouTube and Netflix. Interestingly, there has been limited research examining the effectiveness of these documentaries (Pabian et al., 2020). As a result, the present study examined (and compared) the effects of health, environmental, and animal welfare video appeals on meat-related outcomes.

As hypothesized, watching any of the three experimental (i.e., animal welfare, environmental, health) documentary videos led to an increase in intentions to reduce future meat intake. However, only those who viewed the environmental video were more likely to be willing to eat smaller quantities of meat, eat meat less often, and pick a day

of the week to not eat meat. Further, there was no significant difference found between conditions on willingness to adopt a more vegetarian or vegan diet or switch to a plant based diet. Notably, the phrasing of the questions appeared to impact people's willingness to decrease their meat consumption. Particularly, the questions highlighting the choice to eat some meat but not as much (e.g., eat smaller quantities, eat meat less often, pick a day of the week to not eat meat) were responded to more favorably by those in the environmental condition. This may be due to the environmental appeal being more focused on *limiting* one's meat intake rather than *eliminating* meat altogether. However, future research is needed to examine this further.

In addition to assessing intentions to reduce meat consumption, we added to the literature by exploring the effect of our video manipulations on food reward preferences (i.e., 'wanting' and 'liking'). As hypothesized those in the three experimental conditions reported lower implicit 'wanting' compared to the control group. Further, the animal welfare group reported the lowest level of implicit 'wanting,' though the mean score did not significantly differ compared to the environmental or health conditions. Conversely, the video manipulation did not seem to directly affect participants' explicit 'wanting' or 'liking.' Therefore, our results suggest that while individuals still consciously wanted to eat meat and endorsed the taste of meat, subconsciously they were affected by the content of the videos they watched. This provides further evidence that aspects of food reward are distinct and can be uniquely targeted. Additionally, it provides preliminary evidence that explicit motivations (i.e., explicit 'wanting') regarding meat consumption may not always be in alignment with implicit motivations (i.e., implicit 'wanting').

Next, we examined post video intervention levels of moral emotions as a mediator to better understand *how* the video intervention impacted intentions to reduce meat intake and implicit/explicit 'wanting' of meat. In doing so, we found that moral emotions mediated the relationship between condition and willingness to reduce meat

intake and implicit/explicit 'wanting', such that those in the animal welfare and environmental conditions experienced higher levels of moral emotions and thus reported a greater willingness to reduce their meat intake and scored lower on implicit/explicit 'wanting.' These results are in alignment with past research indicating that increases in moral emotions leads to increased intentions to reduce meat consumption (Feinberg et al., 2019).

Additionally, we explored potential moderators to identify individual differences that interact with the effectiveness of these interventions. In the environmental condition, our moderation analyses revealed meat attachment as a moderator of the relationship between exposure to the video and intentions to reduce meat intake. Specifically, individuals in the environmental condition who reported average or high levels of meat attachment were more willing to reduce their meat intake when compared to those in the control group. There is conflicting research on meat attachment and willingness to engage in meat reduction practices. Specifically, Circus & Robison (2019) found that individuals high in meat attachment were more willing to consume alternative protein sources (i.e., lab grown meat, insects, plant-based substitutes) than those scoring lower in meat attachment, while Graça and colleagues (2016) observed that meat attachment was negatively associated with willingness to consume meat substitutes. Interestingly, the primary motivation for meat reduction among high meat attachment participants in Circus & Ribison's (2019) sample was environmental concerns. Therefore, it's possible that although meat attachment usually negatively predicts meat reduction behaviors, the relationship flips for those motivated by environmental concerns. This may be a result of low meat attachment individuals feeling like they do not need to change their meat consumption to help the environment because their meat intake is already relatively low. Whereas, those higher in meat attachment are confronted with the relatively larger impact of their eating behavior and thus are more willing to reduce their meat intake. It



is important to note that none of the other trait level variables (e.g., empathy, social dominance orientation, environmental concerns, etc.) were found to moderate the associations between condition and willingness to reduce meat intake or implicit 'wanting,' despite being significantly correlated with all of the meat-related outcomes (see Table 1). These results suggest that these individual differences predicted meat-related outcomes independently of our manipulation.

Lastly, due to the results of our prior analyses we conducted first stage moderated mediation analyses. Analyses revealed that when comparing the animal welfare and control conditions, the relative conditional indirect effect of condition on willingness to reduce meat intake as well as on implicit/explicit 'wanting' was significantly stronger for those reporting low levels of meat attachment compared to participants with average or high levels. Similarly, when comparing the animal welfare and control conditions, the relative conditional indirect effect of condition on willingness to reduce meat intake as well as on implicit/explicit 'wanting' was significantly stronger at lower levels of social dominance orientation. These findings suggest that participants lower in social dominance orientation/meat attachment were more likely to experience heightened moral emotions as a result of being in the animal welfare condition, which in turn led to a higher willingness to reduce their meat intake and lower implicit/explicit 'wanting' of meat compared to those reporting average or high levels of social dominance orientation/meat attachment. By identifying these moderated mediation effects, we were able to provide further context into which trait level variables may impact the effectiveness of interventions similar to our own.

### ***Strengths and Limitations***

The present study is one of the first to experimentally assess (and compare) the effects of health, environmental, and animal welfare-focused video appeals on intentions to reduce meat intake and motivations to consume meat. In doing so, we extended the

findings of Pabian et al. (2020) by demonstrating that each of the three (i.e., health, environmental, animal welfare) video appeals were effective at reducing intentions to reduce meat intake and lowering implicit 'wanting' of meat. Additionally, whereas Pabian et al. (2020) had participants watch a ninety minute film, we utilized shorter video clips (i.e., ~10 minutes), providing evidence that future interventions may not need to have participants watch the entire film to obtain the desired changes in meat-related outcomes. Additionally, we believe that given the role of documentary films as a popular and accessible medium to raise awareness of the negative impacts of meat production/consumption, our study possesses strong ecological validity. Lastly, as a result of using sections from the same documentary, we are confident that the observed effects were unaffected by factors such as video quality or style.

Nonetheless, this study has several limitations that should be considered. First, the intervention was administered online and as a result we were unable to ensure that all of the participants complied with instructions (e.g., paying close attention to the video). Having said that, we did implement manipulation checks and it appears that the desired effects were observed. Second, we did not take steps to ensure our sample was representative; therefore, our generalizability to other populations outside of university students from the United States is limited. As a result, future research is needed to examine the effectiveness of this intervention among community members of varying ages. Another limitation is that the present study only utilized one documentary film. Although, doing so allowed for greater control, our results cannot be generalized to other documentaries aimed at increasing knowledge of the consequences of meat consumption. Future research is needed to replicate our findings with other video content.

### ***Conclusions***

Despite these limitations, our results provide evidence that watching a brief documentary film on the negative impact of meat consumption leads to increased intentions to reduce meat consumption and decreased implicit 'wanting' of meat regardless of the appeal (i.e., environmental, animal welfare, health). With that being said, the environmental appeal appeared to predict greater willingness to limit consumption when the prompt was focused on *limiting* rather than *eliminating* meat. Further, by identifying moderators and mediators of these effects we were able to better understand *how* and *with whom* these documentary style films may be the most effective. Given the accessibility and popularity of documentary films aimed at enhancing awareness of the negative impacts of meat consumption/production, this research suggests that use of these films may be a low cost approach to increasing intentions to reduce meat consumption as well as shifting motivations to consume meat.

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Table 1  
*Bivariate correlations among study variables in analytic sample.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	M	SD
1. Implicit 'Wanting'	--																-6.18	24.31
2. Explicit 'Wanting'	<b>.66</b>	---															3.50	1.65
3. Explicit 'Liking'	<b>.63</b>	<b>.93</b>	---														3.69	1.60
4. Reduce intake	<b>-.53</b>	<b>-.44</b>	<b>-.44</b>	---													5.17	2.28
5. Eat Less Often	<b>-.47</b>	<b>-.44</b>	<b>-.42</b>	<b>.79</b>	---												5.54	2.21
6. Eat Smaller Quantities	<b>-.47</b>	<b>-.43</b>	<b>-.41</b>	<b>.78</b>	<b>.89</b>	---											5.72	2.17
7. Adopt Vegetarian Diet	<b>-.48</b>	<b>-.46</b>	<b>-.45</b>	<b>.76</b>	<b>.77</b>	<b>.75</b>	---										5.19	2.26
8. Switch to Plant-Based	<b>-.45</b>	<b>-.39</b>	<b>-.39</b>	<b>.57</b>	<b>.45</b>	<b>.44</b>	<b>.57</b>	---									26.94	28.59
9. Meatless Day of Week	<b>-.39</b>	<b>-.34</b>	<b>-.34</b>	<b>.66</b>	<b>.57</b>	<b>.58</b>	<b>.55</b>	<b>.54</b>	---								46.68	36.74
10. Meat Attachment	<b>-.60</b>	<b>.53</b>	<b>.51</b>	<b>-.63</b>	<b>-.61</b>	<b>-.60</b>	<b>-.66</b>	<b>-.61</b>	<b>-.50</b>	---							3.56	0.81
11. T2 Moral Emotions	<b>-.25</b>	<b>-.17</b>	<b>-.18</b>	<b>.42</b>	<b>.37</b>	<b>.38</b>	<b>.33</b>	<b>.24</b>	<b>.41</b>	<b>-.24</b>	---						2.49	1.18
12. Ecological Views	<b>-.24</b>	<b>-.21</b>	<b>-.20</b>	<b>.35</b>	<b>.38</b>	<b>.39</b>	<b>.36</b>	<b>.26</b>	<b>.30</b>	<b>-.42</b>	<b>.24</b>	---					3.77	0.55
13. Social Dominance	<b>-.26</b>	<b>.18</b>	<b>-.15</b>	<b>-.34</b>	<b>-.33</b>	<b>-.34</b>	<b>-.32</b>	<b>-.21</b>	<b>-.31</b>	<b>.36</b>	<b>-.24</b>	<b>-.52</b>	---				2.19	0.94
14. Speciesism	<b>.31</b>	<b>.24</b>	<b>.24</b>	<b>-.37</b>	<b>-.33</b>	<b>-.35</b>	<b>.33</b>	<b>-.31</b>	<b>-.34</b>	<b>.42</b>	<b>-.25</b>	<b>-.59</b>	<b>.44</b>	--			2.87	1.13
15. Empathy	<b>-.22</b>	<b>-.17</b>	<b>-.17</b>	<b>.25</b>	<b>.24</b>	<b>.28</b>	<b>.19</b>	<b>.08</b>	<b>.21</b>	<b>-.16</b>	<b>.23</b>	<b>.33</b>	<b>-.39</b>	<b>-.34</b>	--		4.03	0.44
16. Gender	<b>-.27</b>	<b>-.26</b>	<b>-.24</b>	<b>.18</b>	<b>.25</b>	<b>.27</b>	<b>.23</b>	<b>.16</b>	<b>.21</b>	<b>-.27</b>	<b>.11*</b>	<b>.17</b>	<b>-.16</b>	<b>-.24</b>	<b>.19</b>	--	0.63	0.48

*Note.* Significant correlations ( $p < .01$ ) are bolded for emphasis. \* Reflects significance at the  $p < .05$  level. Gender was coded 0 = male, 1 = female. T2 moral emotions refers to participants' moral emotions after the intervention. T1 moral emotions were not included as they were not utilized in primary analyses. A negative score on implicit 'wanting' indicates a preference for non-meat images over meat images, while a positive score indicates a preference for meat images over non-meat images.

Table 2  
Descriptive statistics for each condition and results of ANOVAs

Variable	Animal Welfare		Environmental		Health		Control		F
	M	SD	M	SD	M	SD	M	SD	
Explicit 'Wanting'	3.30	1.75	3.48	1.56	3.38	1.65	3.82	1.61	1.99
Explicit 'Liking'	3.47	1.74	3.70	1.50	3.55	1.56	4.01	1.57	2.31
Implicit 'Wanting'	-10.37	26.38	-9.78	22.25	-8.37	24.21	2.97	22.18	7.41**
Variable	M	SD	M	SD	M	SD	M	SD	F
Reduce Meat Intake	5.18	2.42	5.86	1.91	5.38	2.20	4.32	2.30	8.90**
Vegetarian Diet	5.12	2.42	5.44	2.05	5.31	2.24	4.91	2.33	1.10
Eat Smaller Quantities	5.74	2.31	6.31	1.69	5.67	2.14	5.18	2.36	4.92**
Eat Meat Less Often	5.66	2.30	6.00	1.87	5.49	2.26	5.03	2.34	3.53*
Variable	M	SD	M	SD	M	SD	M	SD	F
Switch to Plant-Based Diet	28.14	31.20	29.86	27.04	29.93	29.38	20.36	26.03	2.68*
Meatless Day of the Week <sup>b</sup>	47.70	39.76	60.06	31.14	44.08	35.21	35.07	36.48	8.67**

*Note.* \*\* $p < .01$ , \* $p < .05$ . A negative score on implicit 'wanting' indicates a preference for non-meat images over meat images, while a positive score indicates a preference for meat images over non-meat images.

Table 3

*Summary of relative total, relative indirect, and relative direct effects of mediation models*

Predictor Variables:	$\beta$	95% CI
Relative Direct Effects		
Animal > Reduce Meat Intake	-0.10	-0.37, 0.16
Relative Indirect Effects		
Animal > Moral Emotions > Reduce Meat Intake	<b>.48</b>	<b>0.32, 0.65</b>
Relative Total Effect		
Relative Direct + Relative Indirect	<b>.38</b>	<b>0.11, 0.64</b>
Predictor Variables:	$\beta$	95% CI
Relative Direct Effects		
Environment > Reduce Meat Intake	<b>.36</b>	<b>0.12, 0.61</b>
Relative Indirect Effects		
Environment > Moral Emotions > Reduce Meat Intake	<b>.31</b>	<b>0.19, 0.45</b>
Relative Total Effect		
Relative Direct + Relative Indirect	<b>.68</b>	<b>0.41, 0.94</b>
Predictor Variables:	$\beta$	95% CI
Relative Direct Effects		
Health > Reduce Meat Intake	<b>.54</b>	<b>0.30, 0.79</b>
Relative Indirect Effect		
Health > Moral Emotions > Reduce Meat Intake	-0.07	-0.18, 0.03
Relative Total Effect		
Relative Direct + Relative Indirect	<b>.47</b>	<b>0.20, 0.74</b>
Predictor Variables	$\beta$	95% CI
Relative Direct Effects		
Animal > Implicit 'Wanting'	<b>-0.31</b>	<b>-0.59, -0.03</b>
Relative Indirect Effects		
Animal > Moral Emotions > Implicit 'Wanting'	<b>-0.23</b>	<b>-0.37, -0.12</b>
Relative Total Effect		
Relative Direct + Relative Indirect	<b>-0.55</b>	<b>-0.82, -0.28</b>
Predictor Variables	$\beta$	95% CI
Relative Direct Effects		
Environmental > Implicit 'Wanting'	<b>-0.36</b>	<b>-0.63, -0.10</b>
Relative Indirect Effects		
Environmental > Moral Emotions > Implicit 'Wanting'	<b>-0.16</b>	<b>-0.26, -0.08</b>
Relative Total Effect		
Relative Direct + Relative Indirect	<b>-0.52</b>	<b>-0.79, -0.26</b>
Predictor Variables	$\beta$	95% CI
Relative Direct Effects		
Health > Implicit 'Wanting'	<b>-0.49</b>	<b>-0.76, -0.23</b>
Relative Indirect Effects		
Health > Moral Emotions > Implicit 'Wanting'	.04	-0.01, 0.09
Relative Total Effect		
Relative Direct + Relative Indirect	<b>-0.46</b>	<b>-0.73, -0.19</b>
Predictor Variables	$\beta$	95% CI
Relative Direct Effects		
Animal > Explicit 'Wanting'	-0.13	-0.43, 0.16

Relative Indirect Effects		
Animal > Moral Emotions > Explicit 'Wanting'	<b>-.18</b>	<b>-0.32, -0.06</b>
Relative Total Effect		
Relative Direct + Relative Indirect	<b>-.31</b>	<b>-0.59, -0.04</b>
Predictor Variables	$\beta$	95% CI
Relative Direct Effects		
Environment > Explicit 'Wanting'	<b>-.09</b>	<b>-0.36, 0.19</b>
Relative Indirect Effects		
Environment > Moral Emotions > Explicit 'Wanting'	<b>-.12</b>	<b>-0.22, -0.04</b>
Relative Total Effect		
Relative Direct + Relative Indirect	<b>-.21</b>	<b>-0.48, 0.06</b>
Predictor Variables	$\beta$	95% CI
Relative Direct Effects		
Health > Explicit 'Wanting'	<b>-.29</b>	<b>-0.56, -0.02</b>
Relative Indirect Effects		
Health > Moral Emotions > Explicit 'Wanting'	.02	-0.01, 0.07
Relative Total Effect		
Relative Direct + Relative Indirect	-.27	-0.54, 0.01

*Note.* Significant effects are in bold typeface for emphasis and were determined by a 95% percentile bootstrap confidence interval (based on 10,000 bootstrap samples) that does not contain zero.

Table 4  
*Summary of effects of moderator on intention to reduce meat intake*

Predictor Variables:	Outcome Variable: Intention to Reduce Meat	
	$\beta$	99% CI
Animal Welfare Condition	<b>.29</b>	<b>0.09, 0.50</b>
Meat Attachment	<b>-.71</b>	<b>-0.85, -0.56</b>
Condition X Meat Attachment	-.12	-0.34, 0.09
Effect of Condition at low (1 SD below mean) Meat Attachment	<b>.42</b>	<b>0.11, 0.74</b>
Effect of Condition at average Meat Attachment	<b>.29</b>	<b>0.08, 0.49</b>
Effect of Condition at high (1 SD above mean) Meat Attachment	.16	-0.13, 0.46
Predictor Variables:	$\beta$	99% CI
Environmental Condition	<b>.53</b>	<b>0.32, 0.73</b>
Meat Attachment	<b>-.71</b>	<b>-0.85, -0.56</b>
Condition X Meat Attachment	<b>.33</b>	<b>0.13, 0.53</b>
Effect of Condition at low (1 SD below mean) Meat Attachment	.19	-0.10, 0.49
Effect of Condition at average Meat Attachment	<b>.55</b>	<b>0.35, 0.75</b>
Effect of Condition at high (1 SD above mean) Meat Attachment	<b>.88</b>	<b>0.59, 1.17</b>
Predictor Variables:	$\beta$	99% CI
Health Condition	<b>.27</b>	<b>0.06, 0.48</b>
Meat Attachment	<b>-.71</b>	<b>-0.85, -0.56</b>
Condition X Meat Attachment	.10	-0.10, 0.31
Effect of Condition at low (1 SD below mean) Guilt	.16	-0.13, 0.46
Effect of Condition at average Guilt	<b>.28</b>	<b>0.07, 0.48</b>
Effect of CABs at high (1 SD above mean) DTC-depression	<b>.38</b>	<b>0.08, 0.68</b>

*Note.* Significant effects are in bold typeface for emphasis and were determined by a 95% percentile bootstrap confidence interval (based on 10,000 bootstrap samples) that does not contain zero.



Table 5. Summary of effects of condition to willingness to reduce meat intake via moral emotions by levels of meat attachment.

Predictor Variables:	Outcome: Moral Emotions	
	$\beta$	95% CI
Condition (Animal)	<b>1.00</b>	<b>0.76, 1.23</b>
Meat Attachment	<b>-.22</b>	<b>-0.41, -0.86</b>
Condition (Animal) x Moral Emotions	<b>-.30</b>	<b>-0.54, -0.05</b>
Effect of Condition (Animal) at Low (-1 SD) Attachment	<b>1.29</b>	<b>0.94, 1.65</b>
Effect of Condition (Animal) at Average Attachment	<b>.98</b>	<b>0.74, 1.21</b>
Effect of Condition (Animal) at High (1 SD) Attachment	<b>.68</b>	<b>0.35, 1.01</b>
Condition (Environment)	<b>.62</b>	<b>0.39, 0.85</b>
Condition (Environment) x Moral Emotions	.12	-0.18, 0.28
Effect of Condition (Environment) at Low (-1 SD) Attachment	<b>.50</b>	<b>0.16, 0.83</b>
Effect of Condition (Environment) at Average Attachment	<b>.63</b>	<b>0.40, 0.86</b>
Effect of Condition (Environment) at High (1 SD) Attachment	<b>.74</b>	<b>0.41, 1.08</b>
	Outcome: Reduce Meat Intake	
Relative Conditional Indirect Effects (Animal)	$\beta$	95% CI
Meat Attachment Level: Low (-1 SD)	<b>.62</b>	<b>0.41, 0.86</b>
Meat Attachment Level: Average	<b>.46</b>	<b>0.32, 0.63</b>
Meat Attachment Level: High (1 SD)	<b>.32</b>	<b>0.15, 0.51</b>
Relative Conditional Indirect Effects (Environment)	$\beta$	95% CI
Meat Attachment Level: Low (-1 SD)	<b>.24</b>	<b>0.07, 0.42</b>
Meat Attachment Level: Average	<b>.30</b>	<b>0.17, 0.44</b>
Meat Attachment Level: High (1 SD)	<b>.35</b>	<b>0.18, 0.55</b>

Note. Significant effects are in bold typeface for emphasis and were determined by a 95% percentile bootstrap confidence interval (based on 10,000 bootstrap samples) that does not contain zero.

Table 6. Summary of effects of condition to willingness to reduce meat intake via moral emotions by levels of social dominance orientation.

Predictor Variables:	Outcome: Moral Emotions	
	$\beta$	95% CI
Condition (Animal)	<b>1.01</b>	<b>0.78, 1.25</b>
Social Dominance Orientation (SDO)	<b>-.14</b>	<b>-0.28, -0.00</b>
Condition (Animal) x SDO	<b>-.22</b>	<b>-0.43, -0.01</b>
Effect of Condition (Animal) at Low (-1 SD) SDO	<b>1.23</b>	<b>0.91, 1.56</b>
Effect of Condition (Animal) at Average SDO	<b>1.01</b>	<b>0.78, 1.25</b>
Effect of Condition (Animal) at High (1 SD) SDO	<b>.79</b>	<b>0.49, 1.10</b>
Relative Conditional Indirect Effects (Animal)	Outcome: Reduce Meat Intake	
	$\beta$	95% CI
SDO Level: Low (-1 SD)	<b>.59</b>	<b>0.38, 0.82</b>
SDO Level: Average	<b>.48</b>	<b>0.33, 0.66</b>
SDO Level: High (1 SD)	<b>.38</b>	<b>0.22, 0.55</b>

Note. Significant effects are in bold typeface for emphasis and were determined by a 95% percentile bootstrap confidence interval (based on 10,000 bootstrap samples) that does not contain zero.

Table 7. Summary of effects of condition to implicit 'wanting' of meat via moral emotions by levels of meat attachment.

Outcome: Moral Emotions		
Predictor Variables:	$\beta$	95% CI
Condition (Animal)	<b>1.00</b>	<b>0.77, 1.23</b>
Meat Attachment	<b>-.22</b>	<b>-0.39, -0.06</b>
Condition (Animal) x Moral Emotions	<b>-.29</b>	<b>-0.53, -0.05</b>
Effect of Condition (Animal) at Low (-1 SD) Attachment	<b>1.29</b>	<b>0.94, 1.65</b>
Effect of Condition (Animal) at Average Attachment	<b>1.00</b>	<b>0.77, 1.23</b>
Effect of Condition (Animal) at High (1 SD) Attachment	<b>.71</b>	<b>0.39, 1.03</b>
Condition (Environment)	<b>.63</b>	<b>0.40, 0.86</b>
Condition (Environment) x Moral Emotions	.12	-0.11, 0.35
Effect of Condition (Environment) at Low (-1 SD) Attachment	<b>.51</b>	<b>0.18, 0.85</b>
Effect of Condition (Environment) at Average Attachment	<b>.63</b>	<b>0.40, 0.86</b>
Effect of Condition (Environment) at High (1 SD) Attachment	<b>.75</b>	<b>0.43, 1.07</b>
Outcome: Implicit 'Wanting'		
Relative Conditional Indirect Effects (Animal)	$\beta$	95% CI
Meat Attachment Level: Low (-1 SD)	<b>-.30</b>	<b>-0.48, -0.16</b>
Meat Attachment Level: Average	<b>-.23</b>	<b>-0.35, -0.12</b>
Meat Attachment Level: High (1 SD)	<b>-.16</b>	<b>-0.28, -0.07</b>
Relative Conditional Indirect Effects (Environment)	$\beta$	95% CI
Meat Attachment Level: Low (-1 SD)	<b>-.12</b>	<b>-0.23, -0.03</b>
Meat Attachment Level: Average	<b>-.15</b>	<b>-0.24, -0.07</b>
Meat Attachment Level: High (1 SD)	<b>-.18</b>	<b>-0.30, -0.08</b>
Outcome: Explicit 'Wanting'		
Relative Conditional Indirect Effects (Animal)	$\beta$	95% CI
Meat Attachment Level: Low (-1 SD)	<b>-.23</b>	<b>-0.41, -0.07</b>
Meat Attachment Level: Average	<b>-.18</b>	<b>-0.30, -0.06</b>
Meat Attachment Level: High (1 SD)	<b>-.12</b>	<b>-0.23, -0.04</b>
Relative Conditional Indirect Effects (Environment)	$\beta$	95% CI
Meat Attachment Level: Low (-1 SD)	<b>-.09</b>	<b>-0.20, -0.02</b>
Meat Attachment Level: Average	<b>-.11</b>	<b>-0.20, -0.03</b>
Meat Attachment Level: High (1 SD)	<b>-.13</b>	<b>-0.24, -0.04</b>

Note. Significant effects are in bold typeface for emphasis and were determined by a 95% percentile bootstrap confidence interval (based on 10,000 bootstrap samples) that does not contain zero.

Table 8. Summary of effects of condition to implicit 'wanting' of meat via moral emotions by levels of social dominance orientation.

Outcome: Moral Emotions		
Predictor Variables:	$\beta$	95% CI
Condition (Animal)	<b>1.01</b>	<b>0.78, 1.25</b>
Social Dominance Orientation (SDO)	<b>-0.15</b>	<b>-0.29, -0.01</b>
Condition (Animal) x SDO	<b>-0.22</b>	<b>-0.43, -0.01</b>
Effect of Condition (Animal) at Low (-1 SD) SDO	<b>1.23</b>	<b>0.91, 1.56</b>
Effect of Condition (Animal) at Average SDO	<b>1.01</b>	<b>0.78, 1.25</b>
Effect of Condition (Animal) at High (1 SD) SDO	<b>.80</b>	<b>0.49, 1.10</b>
Outcome: Implicit 'Wanting'		
Relative Conditional Indirect Effects (Animal)	$\beta$	95% CI
SDO Level: Low (-1 SD)	<b>-0.29</b>	<b>-0.44, -0.15</b>
SDO Level: Average	<b>-0.24</b>	<b>-0.36, -0.13</b>
SDO Level: High (1 SD)	<b>-0.19</b>	<b>-0.30, -0.09</b>
Outcome: Explicit 'Wanting'		
Relative Conditional Indirect Effects (Animal)	$\beta$	95% CI
SDO Level: Low (-1 SD)	<b>-0.22</b>	<b>-0.38, -0.07</b>
SDO Level: Average	<b>-0.18</b>	<b>-0.31, -0.06</b>
SDO Level: High (1 SD)	<b>-0.14</b>	<b>-0.26, -0.05</b>

*Note.* Significant effects are in bold typeface for emphasis and were determined by a 95% percentile bootstrap confidence interval (based on 10,000 bootstrap samples) that does not contain zero.

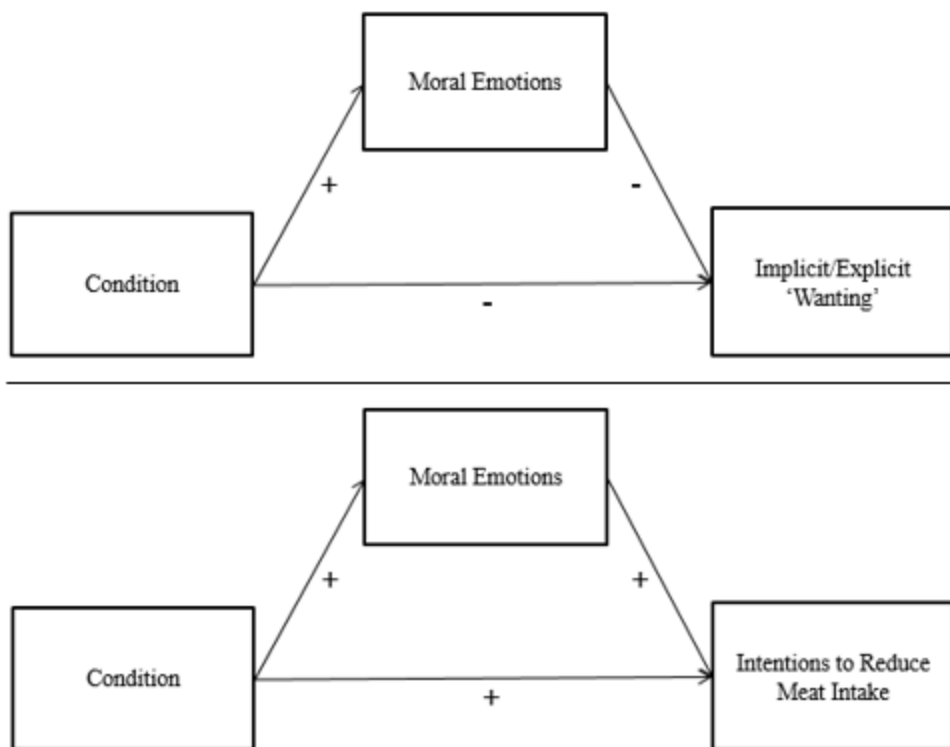


Figure 1. Conceptual model of meditation models.

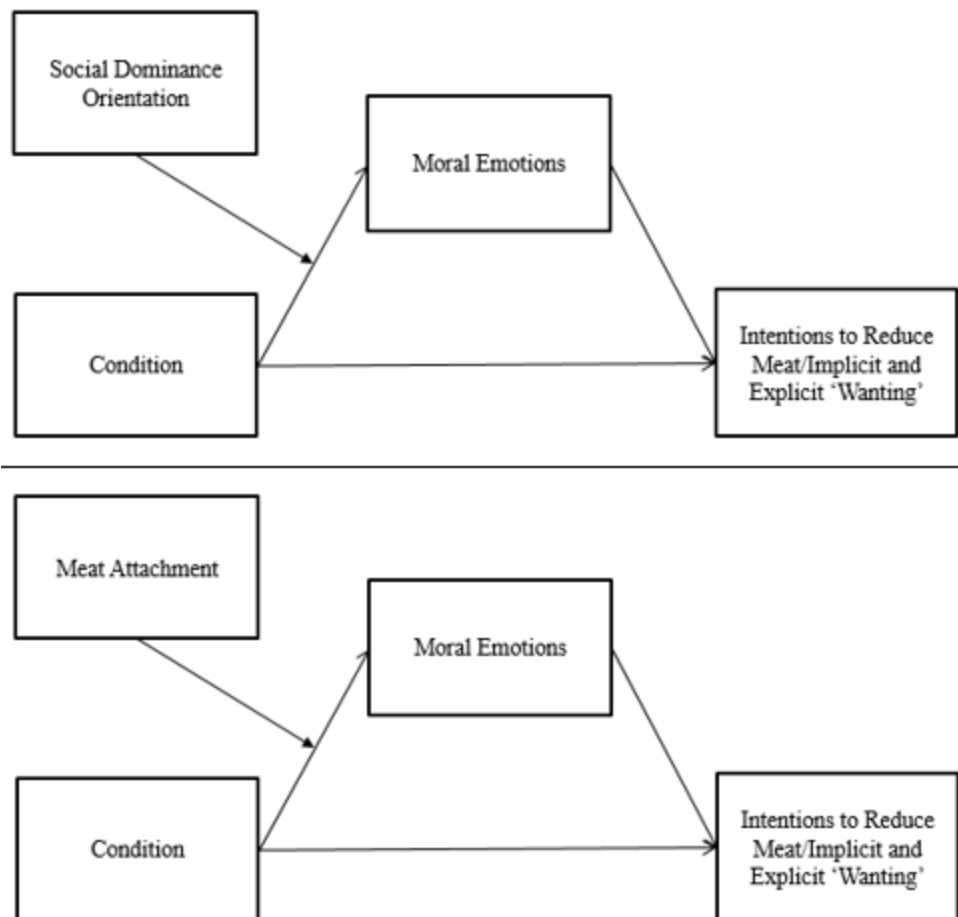


Figure 2. Conceptual model of exploratory moderated-mediation models.