Educational Interventions and Animal Consumption: Results from Lab and Field Studies

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Abstract

Currently, there are many advocacy interventions aimed at reducing animal consumption. We report results from a lab ($N = 267$) and a field experiment ($N = 208$) exploring whether, and to what extent, some of those educational interventions are effective at shifting attitudes and behavior related to animal consumption. In the lab experiment, participants were randomly assigned to read a philosophical ethics paper, watch an animal advocacy video, read an advocacy pamphlet, or watch a control video. In the field experiment, we measured the impact of college classes with animal ethics content versus college classes without animal ethics content. Using a pretest, post-test matched control group design, humane educational interventions generally made people more knowledgeable about animals used as food and reduced justifications and speciesist attitudes supporting animal consumption. None of the interventions in either experiment had a direct, measurable impact on self-reported animal consumption. These results suggest that while some educational interventions can change beliefs and attitudes about animal consumption, those same interventions have small impacts on animal consumption.

Interventions and Animal Consumption: Results from Lab and Field Studies

Do humane educational interventions aimed at reducing animal consumption work? Based on a laboratory and a field study among college undergraduates in the United States, we tested several humane educational interventions. Extending previous work, our results suggest that those educational interventions are effective at changing knowledge, attitudes, and justifications about animal consumption. Those educational interventions increased knowledge about animals used as food, reduced justifications for using animals as food, and lowered attitudes that would support using animals as food. None of the interventions had simple, direct, measurable impacts on self-reported consumption of animals compared to a control condition. Practical and ethical implications for changing behaviors involving animal consumption are discussed.

Interventions and Animal Consumption

Most research concerning animal-consumption behaviors has focused on establishing correlations between psychological or demographic factors and animal-consumption behaviors[1] (for fuller reviews, see A. Feltz and Feltz (in press); (Graca, Godinho, & Truninger, 2019); Ruby (2012)). One can conceptualize these factors into four groups. The first group involves demographic factors like gender. For example, women tend to consume fewer animals than men (Diaz, 2016; S. Feltz & Feltz, 2019a, 2019b; Hayley, Zinkiewicz, & Hardiman, 2015; Rothgerber, 2015). The second group involves cognitive factors. Cognitive factors are mental states with contents that are capable of being true or false. For example, those who know more about the conditions in which animals are raised tend to consume fewer animals than those who know less (S. Feltz & Feltz, 2019b). The third group involves non-cognitive factors. Non-cognitive states can include motivations, emotions, attitudes, rationalizations, and values. For example, those who have stronger rationalizations that eating animals is normal, necessary, natural, and nice tend to consume more animals than those who have weaker rationalizations (Piazza et al., 2015). The final group involves cognitive skills. Cognitive skills are different from cognitive factors since the skills are not capable of being true or false, even if the results of those skills can be (e.g., one could use these skills to acquire true/false beliefs). Rather, cognitive skills involve sets of mental competencies, abilities, or expertise. For example, greater numeracy skills

[1] By animal consumption behaviors, we mean consumption of animal flesh, dairy, or eggs.

(S. Feltz & Feltz, 2019b) and childhood IQ (Gale, Deary, Schoon, & Batty, 2007) have been associated with lower animal consumption behaviors in adulthood.

Intervention research over the past few years has exploded, with several kinds of interventions being tested (for a review, see Harguess, Crespo, and Hong (2020)). Here, we focus on consumer-based interventions rather than other kinds of interventions (e.g., policy based interventions). What is known suggests that in some circumstances, consumer-based interventions can change consumers' knowledge, attitudes, and behaviors concerning animals used as food. To illustrate, some experimental studies suggested that increased perceptions of human-like qualities in animals led to reduced animal consumption behaviors (Kunst & Hohle, 2016; Rothgerber, 2014). Some converging evidence suggests that in instances where animal-meat consumption is made salient, those individuals are less likely to perceive human-like qualities in the animals consumed (Bastian, Loughnan, Haslam, & Radke, 2012; Bilewicz, Imhoff, & Drogosz, 2011). Other work suggests that asking participants to make meat-free pledges can reduce some animal consumption (Grassian, 2020). However, other efforts to change behavior have had meager effects. For example, one study suggests that increasing empathy toward animals has minimal impact on reducing animal consumption (Tiplady, Walsh, & Phillips, 2013).

Relatively less is known about the effects of *humane educational* interventions targeted at reducing animal consumption despite their widespread use by advocates, ethicists, and others. There are many different notions of humane education (Arbour, Signal, & Taylor, 2009; Jacobs, 2016). We understand humane educational interventions to be characterized, at least in part, by attempts to convey information about the conditions of farmed animals. In particular, the focus of our studies is on consumer-based advocacy interventions that attempted to provide information about animals to consumers rather than other means of influencing choice (e.g., by nudging (Brunner, Kurtz, Bryngelsson, & Hedenus, 2018) or framing (Anderson et al., 2020)). Initial evidence suggests that sometimes educational interventions can influence animal consumption behaviors. One study indicated that reading an article from a nutritionist about the desirable effects of eating vegan reduced animal consumption compared to a control group 1 and 4 weeks after reading the article (an effect made even stronger if participants were asked to write down their intentions to reduce animal consumption) (Loy, Wieber, Gollwitzer, & Oettingen, 2016). Another study suggested that reading fictional newspaper articles concerning animal

welfare and meat production increased intentions to reduce animal consumption behaviors (Cordts, Nitzko, & Spiller, 2014). Finally, some studies suggest that generalized ethics education can change animal consumption behaviors. For example, Schwitzgebel, Cokelet, and Singer (2020) asked students to read and discuss a philosophical animal ethics paper. Those who engaged with the ethics text purchased fewer animal products with their university purchasing card than those who did not engage with the text. Similarly designed studies found roughly the same effects in a college sample (Jalil, Tasoff, & Bustamante, 2020) whereas others suggested the potential effects can be short-lived (e.g., disappearing in less than 1 year (Hormes, Rozin, Green, & Fincher, 2013)).[2]

We aimed to build on this research and measure the causal impact of humane educational interventions concerning what people think and feel about animals used as food and whether the interventions influence animal consumption behaviors in two main ways. First, we employed a variety of humane education interventions (Experiment 1). Second, we measured a host of attitudes, beliefs, and behaviors that could change as a function of being exposed humane educational interventions (Experiments 1 and 2). Experiment 1 was a lab-based experiment designed to measure the impact a pamphlet, a video, and philosophical animal ethics papers had on animal consumption. Previous research suggests that providing these kinds of educational interventions can have an impact on what people know about animals used as food (e.g., a brief infographic), and on attitudes about or justifications for using animals as food (S. Feltz & Feltz, 2019b). Experiment 2 was a field experiment designed to measure the impact of college classes on knowledge, justifications, attitudes, and animal consumption with animal ethics content compared to students in classes without animal ethics content. In both studies, we had the following hypotheses based on the research reviewed above (hypotheses were pre-registered at https://osf.io/s5b8p/)

H1. Humane education interventions would increase knowledge of animals used as food compared to a control condition.

H2. Humane education interventions would decrease justifications for the consumption of animals compared to a control condition.

[2] For other related work, see Brunner et al. (2018); de Boer, Schoesler, and Boersema (2013); Sanchez-Sabate, Badilla-Briones, and Sabate (2019); Sanchez-Sabate and Sabate (2019).

H3. Humane education interventions would decrease overall animal consumption behaviors compared to a control condition.

To foreshadow, our studies generally found evidence consistent with *H1* and *H2*, but failed to find evidence that supported *H3*.

Experiment 1

Experiment 1 was a lab-based experiment where students at a large state university were exposed to different humane education interventions. We selected interventions that are used in some advocacy research. These interventions were an advocacy pamphlet, an advocacy video, and two philosophical ethical papers that argue against consuming animals (among other treatment of animals). We recognized that having this breadth of interventions would make direct comparisons of humane educational interventions against each other difficult because there were substantial differences in the content and medium for the interventions. For these reasons, our main set of analyses involved the comparisons between each of the humane educational interventions and a control condition. The control condition consisted of participants watching a video about how to make coffee. We did not have a priori predictions about how well the humane educational interventions would perform against each other (e.g., pamphlets v. ethics papers), so we did not test potential differences between humane educational interventions.

Participants

Two hundred and sixty-seven participants were recruited from an undergraduate subjects' pool at a large state university. The sampling plan included 50 participants in each group for a total sample size of 250. This sample size allows for detecting moderately sized effects (assuming *power* = .8, *alpha* = .05, $N = 100$ (intervention $N = 50$, control $N = 50$), within-between interaction sensitivity $f = .25$). Four participants were excluded for reporting an age less than 18. The mean age was 18.86, $SD = 1.49$. One hundred and eighty-five were female (75%).

Materials

Experiment 1 was pre-registered https://osf.io/s5b8p/. Data for all studies are available on the pre-registration site. After obtaining consent, participants filled out pretest questionnaires, were randomly assigned to one of the five conditions, and then filled out a post-test questionnaire. Participants were then contacted one week from the end of the Experiment to fill out a follow-up questionnaire online. The one-week follow-up questionnaire included all of the following dependent variables. The pretest questionnaire included all of the following dependent

variables except the Berlin Numeracy Test, the Ten Item Personality Inventory, and demographic information. The post-test questionnaire included all of the following dependent variables except the food frequency questions.

Knowledge of Animals as Food (KAFS). The KAFS is a brief instrument consisting of 9 true or false statements to measure objectively what people know about animals used as food (e.g., "Federal laws protect how poultry are slaughtered") (S. Feltz & Feltz, 2019b).

4Ns. The 4Ns is a measure of people's justifications for consuming animals that center on whether consuming animals is necessary, nice, natural, and normal (Piazza et al., 2015). The 4Ns consists of 16 Likert-scale items (e.g., "It is normal to eat meat") rated on a 7-point scale (1 = completely disagree, 7 = completely agree).

Speciesism Scale. The Speciesism scale measures how much one prefers the interests of humans over the equivalent interests of non-human creatures (Piazza et al., 2015). The Speciesism Scale consists of 5 Likert-scale items (e.g., "We should always elevate human interests over the interests of animals") rated on a 7-point scale (1 = strongly disagree, 7 = strongly agree).

Twenty-four-hour food frequency questionnaire. Participants were asked to indicate how frequently they consumed some animal products over the previous 24 hours. Participants were given the following instructions: "In the past day, how many times did you consume the following food and drinks?" Participants could respond from 0 times to 5 or more times for the following items: Dairy, chicken, turkey, fish, pork, eggs, beef, bacon, sausages, processed meats, hamburgers, or any animal meat (any kind). Responses were coded from 0-5, and we used the sum of items in analyses. The complete instrument is available on the pre-registration site.

Berlin Numeracy Test (Cokely, Galesic, Schulz, Ghazal, & Garcia-Retamero, 2012). Numeracy refers to one's ability to use and understand statistical information in context. To measure numeracy, we used the 7-item version of the Berlin Numeracy (e.g., "Imagine we are throwing a five-sided die 50 times. On average, out of these 50 throws how many times would this five-sided die show an odd number (1, 3 or 5)?"). Total number of correct answers were used in analyses.

Ten-Item Personality Inventory (Gosling, Rentfrow, & Swann, 2003). The Ten-Item Personality Inventory is a 10-item measure of the Big Five Model of personality traits. Each trait

is calculated as a function of how well participants think two pairs of adjectives describe them (e.g. “Extraverted, enthusiastic”) on a 7-point scale (1 = strongy disagree, 7 = strongly agree).

Participants were randomly assigned to only one of five conditions that represent 4 different humane educational interventions and a control condition.

Control condition ($N = 51$). Participants in the control condition watched a short video about coffee called “Two Minute Coffee.” The video length was 140 seconds and discussed a way to make coffee. https://www.youtube.com/watch?v=-aQsUeJbiKc

Video condition ($N = 51$). Participants in the video condition watched a short educational video about the conditions of factory farmed animals called “What Is Factory Farming? Us and the Planet.” The video was 145 seconds long and covered issues concerning treatment of factory farmed animals and the impacts of factory farming on the environment and human health. https://www.youtube.com/watch?v=7I0v3LhKhQg

Pamphlet condition ($N = 49$). Participants were instructed to read an educational pamphlet about the conditions of factory farmed animals called “Compassionate Choices: If You Care about Animals, Please Consider not Eating Them.” The pamphlet was sixteen A5 sized pages discussing various aspects of factory farming, including the effects on the animals and human health. The pamphlet also included tips for reducing animal consumption including alternatives to animal products. https://veganoutreach.org/wp-content/uploads/2020/01/CC.pdf

Engel ethics paper condition ($N = 50$). Participants read a philosophical ethics paper by the ethicist Mylan Engel (2002) that discussed the ethics of consuming animals for food. The focus of the paper was to argue that most people are already morally committed not to eat animals. The paper clarifies those moral beliefs and draws implications for consuming animals.

Rachels ethics paper condition ($N = 46$). Participants read a philosophical ethics paper by James Rachels (2017) that discussed the ethics of consuming animals for food. The focus of the paper was to elucidate a basic argument concerning animals that causing unnecessary pain is wrong and animals in factory farms experience unnecessary pain.

Results and Discussion

Analyses were conducted in R (Team, 2018). Planned analyses proceeded in two stages. The first stage was to calculate pretest correlations among the dependent variables. The second stage was to determine if any of the dependent variables changed as a function of being in one of the experimental conditions compared to the control condition. Our primary goal was to estimate

the influence of interventions on meat-eaters' knowledge, attitudes, justifications, and behaviors compared to a control condition. So, for all analyses besides the correlational analyses, those who reported being vegetarian or vegan were excluded ($N = 16$).

Pretest correlations: The pretest correlations are reported in Table 1. The 24-hour food frequency measure exhibited strong internal reliability (Cronbach's alpha = .86). Because we were interested in overall animal-consumption behavior and for ease of analyses, we calculated a composite score of the items in the 24-hour food frequency questionnaire (sum of items).

Changes in Knowledge, Justifications, Attitudes, and Behavior by Condition: A series of mixed-measures ANOVAs were conducted in two general groups. We conducted one set of ANOVAs for those who completed the pre-test and post-test. We conducted another set of ANOVAs for those who had responses in pre-test, post-test, and 1-week follow-up. We only had hypotheses about effects of interventions versus the control condition. We did not have any hypotheses about how different interventions would perform compared to each other. Between-subjects interactions in the pre-test, post-test scores for each intervention were compared against the control condition (see Table 2 for means, standard deviations, and statistical analyses.

KAFS: Overall, there was a reliable interaction of condition from pre-test to post-test F (4, 242) = 5.33, $p < .01$, $\eta_p^2 = .08$ and a reliable interaction of condition from pre-test, post-test, and one-week follow-up F (8, 388) = 3.36, $p < .01$, $\eta_p^2 = .06$. There was a significant change from the pre-test and the post-test scores in each of the 5 conditions. The difference persisted to the one-week follow-up measure. Critical for our purposes was whether knowledge changed as a function of being in the control or one of the intervention groups. Each of the interventions had a significant, moderately sized influence on knowledge compared to the control condition, except for those who were assigned to the video condition. At the one-week follow-up, all of the intervention conditions significantly increased knowledge compared to the control condition.

4Ns. Overall, there was a reliable interaction of condition from pre-test to post-test F (4, 242) = 4.96, $p < .01$, $\eta_p^2 = .08$ and a trend for a reliable interaction of condition from pre-test, post-test, and one-week follow-up F (8, 388) = 1.75, $p = .09$, $\eta_p^2 = .01$. There was a significant change from pretest to post-test scores for those in each of the 5 conditions. Compared to the control condition, those who were in one of the interventions had significantly, moderately sized *increase* in scores on the 4Ns from the pretest to post-test except for those were assigned to the

video condition. At the one week follow-up, participants in all of the humane education conditions reported *lowered* 4Ns scores compared to the control except for the video condition.

Speciesism. Overall, there was a reliable interaction of condition from pre-test to post-test F (4, 242) = 6, $p < .01$, $\eta_p^2 = .09$ and a reliable interaction of condition from pre-test, post-test, and one-week follow-up F (8, 388) = 3.36, $p < .01$, $\eta_p^2 = .05$. Those in the control condition had significantly higher Speciesism attitudes, whereas those in the intervention conditions had significantly lower Speciesism attitudes from pretest to post-test, except for those assigned to the video condition. Each of the humane educational interventions was significantly different from the control condition, except for those who were assigned to the video condition. At the one-week follow-up, those assigned to the Rachels paper and pamphlet conditions had significantly lower Speciesism scores than those in the control condition. There was no measurable difference between the control condition and the Engels paper and video conditions compared to the control condition at the one week follow-up.

24 Hour Animal Consumption. There was not a reliable overall interaction of condition for pre-test to one week scores F (4, 194) = 2.04, $p = .09$, $\eta_p^2 = .01$. There were no detectable differences in animal consumption in the pre-test and one-week follow-up for any of the conditions, and none of the humane educational interventions were reliably different from the control condition with respect to reported animal consumption. [3]

The results of Experiment 1 suggested that, overall, humane educational interventions can make some people more knowledgeable about animals used as food. Those humane educational interventions also tended to lower 4N and Speciesist justifications and attitudes. Humane educational interventions did not have a measurable impact on animal consumption behaviors.

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[3] While there were no changes as a function of humane educational interventions, an exploratory analyses suggested that attitudes/justifications interacted with knowledge to reduce overall animal consumption behaviors independent of humane educational intervention. To illustrate, we calculated differences scores for the pretest and posttest scores for Speciesism, KAFs, 4Ns and animal consumption. The Speciesism by KAFS interaction trended toward significance*:* $B = 0.2$, $t = 1.78$, $p = .076$. However, the 4Ns by KAFS interactions was not statistically significant*:* $B = 0.45$, $t = 1.17$, $p = 0.25$.

Experiment 2

Experiment 2 was a classroom-based field experiment. One goal of Experiment 2 was to determine if being in a philosophy class with animal ethics content influenced animal-related attitudes, justifications, knowledge, and consumption compared to a control group. Another goal was to replicate the findings of Experiment 1 in a more naturalistic setting.

Participants

Two hundred and eight participants were recruited from four U.S. universities. Six participants were excluded for reporting an age under 18, and 8 were excluded for reporting implausibly high animal consumption behaviors.[4] Our sampling was constrained by the availability of philosophy classes with animal ethics content and the willingness of instructors to participate. Ninety-two participants were recruited from classes with animal ethics course content, and 101 were recruited from classes without animal ethics content for a total sample size of 193. Sixty-one percent were female (N = 118) and the mean age was 19.61, SD = 2.86.

Materials

Participants received all the same materials participants in Experiment 1 received in a pretest, post-test design. Participants in the experimental condition were in classes with animal ethics content. Participants in the control condition were in classes without animal ethics content. The average elapsed time between pretest and post-test was 81 days for the experimental condition (*range* = 33-105 days) and 59 days for the control condition (*range* = 42-79 days).[5]

Experimental Condition. The experimental condition consisted of university classes with animal ethics components. There were four different university locations where data were gathered.

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[4] Analyzing the distribution of responses to the 24-hour food frequency questions, the data had sizable positive skew (*skewness* = 2.55). A visual and analytical inspection of the data suggested that this was almost entirely driven by outliers on the upper end. Removing outliers that were more than 2 standard deviations from the mean (≥ 22, equivalent to eating meat 22 times the previous day, or about 7 types of meat for each of breakfast, lunch, and dinner) substantially reduced skew (*skewness* = 0.8). We conducted all analyses with those outliers excluded. The same patterns of results were obtained with those responses included in the analyses.

[5] The difference in elapsed time was due to accommodating instructors' use of class time.

Location 1 (*N* = 6)**.** The animal ethics content of this class lasted one week (2 1 hour and 15 minute class sessions). The students read Singer's (1989) *All Animals are Equal* article on one day. On the second day, students read Levy's (2003) *What (if Anything) is Wrong with Bestiality.* The course also required weekly reflection writings on the course materials.

Location 2. (*N* = 3). The animal ethics content of this course lasted for one week. Students read Hettinger's (1989) *The responsible use of animals in biomedical research* and Cohen's (1986) *The case for the use of animals in biomedical research*. Students were required to answer written questions about each paper.

Location 3 (N = 27). Students read Singer's (1989) *All Animals are Equal* and Steinbock's (1978) *Speciesism and the Idea of Equality.* The class spent 1 week on animal ethics with each paper being discussed in their own 1 hour and 15 minute class. There were writing assignments for these papers that were completed in class in addition to lectures and discussions about the papers.

Location 4 (*N* = 56). Students read Singer's (1989) *All Animals are Equal* along with Engel's (2000) *The Immorality of Eating Meat*. The animal ethics section of the course lasted for 1 week and each paper was discussed in a class consisting of 1 hour and 15 minutes. Students had to respond to a set of questions on the readings before the discussions took place. While not formally about animal ethics, students also spent a week concerning "animal minds" and read Andrews (2016) *Animal Cognition*, Siebert (2016) *What does a Parrot Know about PTSD,* and de Wall (2016) *What I Learned from Tickling Apes.*

Control Condition: The control condition consisted of students who were not enrolled in a class with an animal ethics component. Participants in the control condition came from Location 3 (*N* = 59) and Location 4 (*N* = 44).

Because of a coding error in the creation of the surveys, the Speciesism Scale data were not usable in Experiment 2.

Results and Discussion

Planned analyses proceeded in two stages. First, we calculated pretest correlations among dependent variables. Second, we performed a series of mixed measures ANOVAs with pretest and posttest scores as within-subjects factors and intervention condition and control as a between-subjects factor.

There were no consistent and substantial differences with respect to the measured variables between testing locations, so we combined all results for ease of analyses and increased power.[6] Planned analyses used the same process used in Experiment 1. For all of the analyses beside the pretest correlations, we only included those who self-reported being meat-eaters (Non-meat eaters $N = 11$).[7]

Pretest correlations. Pretest correlations are reported in Table 1. Largely, the results of the previous study were replicated.

Knowledge: Overall, there was a significant overall difference with respect to knowledge between the pretest ($M = 7.27$, $SD = 1.38$) and post-test ($M = 7.8$, $SD = 1.2$), F (1, 181) = 18.52, $p < .01$, $\eta_p^2 = .09$, indicating that over time people became more knowledgeable about animals used as food. Using the pre-test, post-test scores as a within-subjects factor and the condition as between subjects factor indicated that was no reliable change in knowledge between the humane education (pretest $M = 7.59$, $SD = 1.37$, post-test $M = 8.08$, $SD = 1.13$) and control condition (pretest $M = 7.18$, $SD = 1.37$, post-test $M = 7.55$, $SD = 1.21$), F (1, 180) = 0.32, $p = .57$, $\eta_p^2 = .002$, indicating that the change in knowledge was not a function of being in a philosophy class with animal ethics content.

4Ns: There was an overall decrease in the 4Ns between the pretest ($M = 4.4$, $SD = 1.06$) and post-test ($M = 4.06$, $SD = 1.07$), F (1, 181) = 7.11, $p = < .01$, $\eta_p^2 = .05$. However, this effect was likely driven by an interaction with being in the humane education condition (pretest $M = 4.05$, $SD = 1.01$, post-test $M = 3.69$, $SD = 0.99$) and the control condition (pretest $M = 4.41$, $SD = 1.09$, post-test $M = 4.24$, $SD = 1.06$), F (1, 180) = 9.41, $p = < .01$, $\eta_p^2 = .05$. Those in the control condition did not have reliably different scores on the 4Ns from pre-test to post-test (F (1, 180) = 0.01, $p = .93$) whereas those in the experimental condition did have reliably different 4Ns scores from pretest to posttest (F (1, 180) = 15.78, $p < .01$).

24 Hour Animal Consumption*:* There was good internal consistency of the 12 items used to measure animal consumption (Cronbach's alpha pretest = .69, post-test = .83). So, for

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[6] We conducted a linear mixed model analysis that allowed including testing location as a random factor. Including the random factor did not substantially influence the overall results. So, we report the results from the less complex mixed-measures ANOVA.

[7] Excluding the non-meat eaters did not substantially alter any patterns observed in the data.

simplicity and ease of analyses, a total animal-consumption score was calculated for the pretest and post-test. There was no overall reliable change in animal-consumption behavior measured by the 24-hour scale between the pretest (M = 7.54, SD = 4.55) and the post-test (M = 8.13, SD = 6.24): F (1, 181) = 1.49, p = .23, η_p^2 = .01. The interaction between the experimental (pretest M = 7.92, SD = 4.66, post-test M = 7.83, SD = 6.04) and control condition (pretest M = 7.21, SD = 4.44, post-test M = 8.04, SD = 6.43) was also not statistically significant F (1, 180) = 1.8, p = .18, η_p^2 = .01.[8]

General Discussion

Overall, our data suggest that humane educational interventions are effective in increasing knowledge about animals used as food. [9] Humane education is also effective at weakening beliefs or attitudes that could justify animal consumption. However, none of the humane educational interventions translated directly to reductions in self-reported animal consumption behavior in either of the two studies. [10]

These data contribute to understanding some of the challenges associated with changing animal consumption behaviors, especially in one-off or short (e.g., 1 week) interventions. First, our results are consistent with what is known about the intention-behavior gap (Loy et al., 2016;

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[8] Based on the results of Study 1, we tested whether KAFS and 4Ns interacted to reduce animal consumption in the entire sample regardless of humane education intervention. The interaction of KAFS and 4Ns significantly reduced consumption B = .1, t = 3.38, p < .01.

[9] There are two important qualifications for the effect of humane education on KAFS scores. First, in both studies, people scored higher on the KAFS in the post-test than in the pre-test, suggesting that a testing effect may play a role in these scores. Second, there was no reliable difference with KAFS scores between the control and experimental condition in Study 2. These results are consistent with potential testing effects with the KAFS observed in previous studies (S. Feltz & Feltz, 2019b).

[10] One potential exception concerns the Rachels condition in Experiment 1. In that condition, there was a trend toward a significant reduction in animal consumption compared to the control condition. This result is consistent with other research suggesting that using the Rachels paper can reduce behaviors indicative of consuming animals (Schwitzgebel, 2019).

Webb & Sherran, 2006). The intention-behavior gap is the general phenomenon where one may express an intention to perform and action yet fail to perform that action. While our studies did not measure intentions not to consume animals, two common components for intentions include having relevant beliefs and desires (Davidson, 1980). In our studies, the overall tendency was for people to gain knowledge about animals used as food while weakening justifications and attitudes that would support consuming animals. However, we did not detect a change in animal consumption.

The intention-behavior gap can provide insights into why there were no detectable changes in animal consumption behaviors while there were changes in knowledge, justifications, and attitudes. In action theory, there is often a distinction between proximal and distal intentions to perform an action. Proximal intentions are intentions to act straight away, whereas distal intentions are intentions to act at some point in the relatively distant future. For example, one can have an intention to watch television right now or one could have an intention to watch TV tomorrow. The former is a proximal and the later a distal intention. While our data do not allow us to determine why there is this failure to translate the beliefs/attitudes to actions, the above distinctions allow for some reasonable potential explanations. First, our studies do not involve proximal intentions (not) to eat meat. Rather, the time points where animal consumption behaviors were measured were distal (e.g., more than 1 week from intervention). As such, the intentions that are formed (if they are formed) would be distal intentions (not) to consume animals—or at least proximal intentions that are sustained over time. Distal intentions (or extended proximal intentions) are subject to many sources of interference that would result in the intention not being executed. These sources of interference can be revising, eliminating, or forgetting the intention. One could also suffer from weakness of will.

Additionally, one important element in all intentions is a *settledness* to act (Mele, 1992, 1995). That is, to have an intention to act, one needs not only to believe that one can perform the action (with other relevant background beliefs) along with a desire to act, but one must also be settled on acting. The settledness is one element that distinguishes intentions from other motivational states like desires. Settledness is important for our studies because even though there are changes in beliefs, justifications, and attitudes, we do not know if any of the participants settled on not eating animals (see, for related work, see Kloeckner and Ofstad (2017)). Changes in beliefs and attitudes do not entail being settled on a course of action. If

people were not settled in their decision not to consume animals, then those people did not have an intention in the first place. So, there may not have been an intention-behavior gap but rather a belief/desire-intention gap. Our data are silent on whether (a) people form intentions not to consume animals, and (b) if intentions are formed, what interferes with the execution of that intention.

There are additional reasons to think that changing animal consumption is likely to be difficult in one-off or short humane educational interventions. For instance, animal consumption may be trait-like (A. Feltz et al., ms). One way to characterize traits is that they are stable, enduring (but *not* never changing) tendencies that occur in different situations. Traits need not determine behaviors, but the traits should increase the probability that one thinks or behaves in trait consistent ways across situations (see Haslam, Smillie, and Song (2017)). Inter-related behavioral tendencies to consume animals can thereby be characterized as a *trait*. Because traits are stable, they can be difficult to change (but they can be changed). These changes are especially difficult in contexts where people lack the desire to change or do not think that change is possible (Hennecke, Bleidorn, Denissen, & Wood, 2014). Many people do not desire to change their animal consumption behaviors (e.g., they do not find the behavior problematic and perhaps forms part of their core identity (Sobal, 2005)) and many others do not even know if it is possible to change their behaviors in a healthy way (e.g., they may have the false belief that non-animal diets entail protein deficiencies). Hence, our studies provide empirical support for the general idea that changing eating behaviors, especially if they are traits and there is a lack of motivation to do so, will be difficult with one-off or short humane educational interventions.

Apart from the intention-behavior gap and difficulties in changing traits in the absence of a desire to change, our data suggest that there is an interesting trajectory associated with justifications and attitudes about meat-eating. Just by being introduced to and probed about the topic of animals used as food, people initially reported having *stronger* attitudes and justifications (e.g., 4Ns) for their animal-consumption behaviors. These results support the idea that, at least in the short-term, some meat-eaters are resistant, protective, or otherwise reactive when encountering information concerning the treatment of animals used as food. This pattern of results is consistent with the cognitive dissonance hypotheses concerning eating meat (Rothgerber, 2014) (see also the boomerang effect (Anderson et al., 2020; Byrne & Hart, 2016; Kloeckner & Ofstad, 2017)). According to Rothgerber, at least some meat eaters understand

some of the problematic aspects of their meat eating. So, to help address the gap between their meat eating and their acknowledgment of its problematic aspects, people adopt attitudes and justifications that give even *stronger* justifications for their behaviors. In our data, participants initially expressed stronger 4N justifications. However, over time (> 1 week) those in the experimental conditions had overall weaker justifications about consuming animals than those in the control. Given these data, those who employ humane education interventions could expect fairly strong initial resistance to the educational interventions. But, over time, that resistance is likely to weaken. For some people and over time, the attitudes justifying animal consumption would be overall weaker than before being exposed to humane educational intervention.

There are several limitations of the current set of studies. First, our samples were composed of only university undergraduates. While in many instances this limitation is not very important, in our studies the limitation could be illuminating. It stands to reason that college students (mostly freshmen and sophomores in our studies) encounter a host of new information while they are at college. They interact with new people, are exposed to new ideas, and for the first time are living and eating on their own. Early college years are a time of rapid development for many students. This rapid development may be one reason why people, even in the control conditions, learn something about animals used as food. To help to control for this, comparisons to non-undergraduate students should be made. That comparison would be important to better understand the direct effects of humane educational interventions on animal-consumption behaviors, knowledge, and attitudes (e.g., general learning in college may dampen the unique effects of humane education on animal-consumption behavior).

Our studies are also limited by the interventions we used. While the materials we used are used in some animal-advocacy and humane education, they were substantially different from one another. These differences made those intervention-specific comparisons difficult to make. That having been said, there is the potential that the specific content of the humane educational interventions could be important for their effectiveness (e.g., the invitational approach of Regan's article versus the cartoonish nature of the video we used). The potential differences between the interventions are too numerous to meaningfully review here. Future research should explore the extent to which visual and written interventions impact behavior along with the content of those interventions (e.g., graphic images versus benign images; spoken word v. written word).

Our work also points toward future directions for researchers. If the goal of researchers and advocates is behavioral change, then our data suggest that brief, one-time humane educational interventions might not result in change in long-term behavioral change even if they can change knowledge, attitudes, and justifications. As a result, researchers and advocates looking to evoke behavioral change should perhaps seek out interventions with contents that simultaneously influence these mental states *and* encourage a settledness to act. Encouraging the settledness to act may require repeated, and perhaps combinations of, interventions. Our results suggest that much is left to be done to provide the right kind of humane education and the frequency of those interventions to foster changes in animal consumption. By focusing on these kinds of potential interactions, humane education is likely not only to be more effective, but also holds the promise of providing evidence to help make individuals better, more authentic decision makers.

Table 1: Pretest correlations, means, and standard deviations from Experiment 1 (upper value) and Experiment 2 (lower value).

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. 24 Hour	1												
2. KAFS	-.19**	1											
	-.19**												
3. 4Ns	.15*	-.49**	1										
	.18*	-.45**											
4. BNT	-.15*	.03	.02	1									
	.11	.03	.03										
5. Speciesism	.16**	-.17**	.3**	.06	1								
	--	--	--	--	--								
6. Sex	-.2**	.16*	-.14*	-.16**	-.28**	1							
	.08	.16*	-.22**	.02	--								
7. Age	.06	-.1	.08	.05	.03	-.23**	1						
	.01	-.04	.03	-.11	--	-.02							
8. Politics	.12	-.33**	.4**	-.13*	.26**	.05	-.03	1					
	.09	-.4**	-.51**	-.12	--	-.01	.07						
9. Extraversion	.06	-.04	.04	-.17*	-.05	.16**	.21**	.14*	1				
	.11	.05	.08	-.2**	--	.07	-.08	.06					
10. Agreeableness	-.09	.03	-.08	.08	-.11	.12	.04	-.06	-.17**	1			
	-.07	.03	-.12	-.1	--	-.01	.03	-.07	.04				
11. Conscientiousness	-.07	-.08	.01	-.05	-.13*	.1	0	.08	.12	.07	1		
	0	-.1	.13	-.12	--	-.07	.07	.16*	.1	.11			
12. Emotional Stability	.07	-.03	.03	.02	.08	-.22**	-.01	.03	.18**	.11	.1	1	
	.13	-.14*	.21**	.15**	--	.02	0	.22**	.04	.1	.01		

13. Openness to	-.07	.07	-.12	-.03	-.14*	.08	.08	-.16**	.23**	.07	.16**	.13*	1
Experience	-.1	.14*	-.2**	-.06	--	-.05	-.01	-.06	.21**	.28**	.03	.13	
Mean	9.34	7.33	4.17	2.62	14.25		18.84	4.02	4.2	4.94	5.59	4.37	5.05
	7.24	7.46	4.01	2.8	--		19.61	3.92	3.88	4.63	5.43	4.01	5.06
SD	6.99	1.4	1.02	1.62	3.99		1.47	1.56	1.63	1.01	0.93	1.25	0.99
	4.63	1.39	1.17	1.87	--		2.86	1.60	1.53	1.08	1.04	1.35	1.02

Table 2: Mixed-measures ANOVAs with Pretest, Post-test, 1 Week Follow Up from Experiment 1. The means represent the pretest, posttest, and 1 week follow up values. The "within" section (left side) of the table represents the pre-test or pretest-posttest-1 week ANOVAs. The "control x condition" values (right side of table) represent the analyses of each condition compared to the control condition.

KAFS Pretest, Post-test										
Intervention	**Pre *M, SD***	**Post *M, SD***		***N***	**Within *F***	**Within *p***	**Within η_p^2**	**Control v. Intervention *F***	**Control v. Intervention *p***	**Control v. Intervention η_p^2**
Control	7.33, 1.42	7.57, 1.32		51	8.22	< .01	.14			
Engel	7.28, 1.62	8.26, 1.16		50	21.59	< .01	.31	10.99	< .01	.1
Video	7.45, 1.17	7.98, 1.16		51	6.83	.01	.12	1.81	.18	.02
Pamphlet	7.18, 1.24	8.45, 0.77		49	52.63	< .01	.52	29.28	< .01	.23
Rachels	7.09, 1.47	8.04, 1.13		46	24.95	< .01	.36	6.29	< .01	.12
KAFs One Week										
Intervention	**Pre *M, SD***	**Post *M, SD***	**One Week *M, SD***	***N***	**Within *F***	**Within *p***	**Within η_p^2**	**Control v. Intervention *F***	**Control v. Intervention *p***	**Control v. Intervention η_p^2**
Control	7.24, 1.5	7.48, 1.38	7.71, 1.15	42	6.19	< .01	.24			
Engel	7.12, 1.64	8.35, 1.12	8.13, 1.17	40	12.32	< .01	.39	6.98	< .01	.08
Video	7.41, 1.15	8.07, 0.95	7.86, 0.96	44	7.95	< .01	.27	3.04	.05	.04
Pamphlet	7.08, 1.28	8.42, 0.79	7.97, 1.69	38	25.46	< .01	.59	9.38	< .01	.11
Rachels	7.23, 1.44	8.14, 1.14	8.31, 1.18	35	13.84	< .01	.46	6.34	< .01	.08
4ns Pretest, Post-test										
Intervention	**Pre *M, SD***	**Post *M, SD***		***N***	**Within *F***	**Within *p***	**Within η_p^2**	**Control v. Intervention *F***	**Control v. Intervention *p***	**Control v. Intervention η_p^2**

Control	4.32, 1.03	5.03, 1.03	51	131.75	< .01	.73			
Engel	4.16, 0.92	4.48, 0.88	50	11.78	< .01	.19	12.78	< .01	.11
Video	4.35, 0.87	4.91, 0.95	51	39.37	< .01	.44	1.83	.18	.02
Pamphlet	4.33, 0.08	4.57, 0.89	49	8.27	< .01	.15	2.0.3	< .01	.17
Rachels	4.28, 1.01	4.62, 1.03	46	9.6	< .01	.18	8.83	< .01	.09

4Ns One Week

Intervention	**Pre *M, SD***	**Post *M, SD***	**One Week *M, SD***	***N***	**Within *F***	**Within *p***	**Within η_p^2**	**Control v. Intervention *F***	**Control v. Intervention *p***	**Control v. Intervention η_p^2**
Control	4.32, 1.05	5.04, 1.04	4.1	42	126.81	< .01	.76			
Engel	4.19, 0.92	4.57, 0.86	3.76, 1.04	40	31.23	< .01	.45	4.09	.02	.05
Video	4.38, 0.86	4.92, 0.96	4.04, 0.94	44	36.47	< .01	.46	1.15	.32	.01
Pamphlet	4.34, 0.87	4.58, 0.96	3.8, 1.27	38	16.33	< .01	.31	5.62	< .01	.07
Rachels	4.19, 0.95	4.56, 0.97	3.83, 0.99	35	28.01	< .01	.45	4.9	< .01	.06

Speciesism Pretest, Post-test

Intervention	**Pre *M, SD***	**Post *M, SD***	**One Week *M, SD***	***N***	**Within *F***	**Within *p***	**Within η_p^2**	**Control v. Intervention *F***	**Control v. Intervention *p***	**Control v. Intervention η_p^2**
Control	14.41, 4.39	14.9, 4.46		51	4.29	.04	.08			
Engel	14.68, 3.62	13.78, 3.76		50	4.29	.04	.08	7.98	< .01	.08
Video	14.08, 3.49	14.24, 3.61		51	0.36	.55	.01	0.89	.35	.01
Pamphlet	14.98, 4.16	13.73, 4.83		49	15.91	< .01	.25	19.83	< .01	.17
Rachels	14.48, 3.66	13.13, 4.67		46	9.43	< .01	.17	14.34	< .01	.13

Speciesism One Week

Intervention	Pre *M, SD*	Post *M, SD*	One Week *M, SD*	*N*	Within *F*	Within *p*	Within η_p^2	Control v .Intervention *F*	Control v. Intervention *p*	Control v. Intervention η_p^2
Control	14.21, 4.64	14.55, 4.69	14.67, 4.74	42	1.37	.26	.03			
Engel	14.5, 3.77	13.7, 4.06	14.1, 4.49	40	1.21	.3	.03	2.08	.13	.03
Video	14.2, 3.49	14.18, 3.68	15.18, 4.13	44	6.54	< .01	.13	2.17	.12	.03
Pamphlet	14.71, 4,29	13.39, 5.03	14.05, 4.2	38	3.86	.03	.1	4.86	.01	.06
Rachels	13.94, 3.43	12.17, 4.48	13.51, 4.47	35	6.27	< .01	.16	6.92	.01	.08

24 Animal Consumption Hour One Week

Intervention	Pre *M, SD*	Post *M, SD*	One Week *M, SD*	*N*	Within *F*	Within *p*	Within η_p^2	Control v. Intervention *F*	Control v. Intervention *p*	Control v. Intervention η_p^2
Control	8.88, 5.87		9.38, 7.27	42	.21	.65	.01			
Engel	9.48, 7.45		11.23, 8.84	40	2.02	.16	.05	0.58	.45	.01
Video	9.2, 7.54		10.34, 8.35	44	2.29	.14	.05	0.23	.63	< .01
Pamphlet	9.61, 6.06		11.63, 8.18	38	3.89	.06	.1	1.02	.32	.01
Rachels	10.74, 8.91		8.91, 8.47	35	3.3	.08	.09	2.37	.13	.03

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