

Promoting a Reduction in Meat Consumption: An Initial Study on the Efficacy of a
Commitment Strategy

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ABSTRACT

The current study employed an ABA design with a control group to assess the effectiveness of a commitment strategy in reducing meat consumption among university students ($n=70$). Participants who were randomly assigned to the commitment condition did not consume significantly less meat than participants in the control group, $t(48)=.74$, $p=.47$. 79% ($n=19$) of participants in the control group decreased their meat consumption from baseline to treatment phase, compared with 96% ($n=27$) of participants in the treatment group. Additionally, when both groups were collapsed, all participants reduced meat consumption from baseline to treatment phase $t(51)=8.6$, $p<.001$. Participants' scores on the Motivation Towards the Environment Scale, a measure of self-determined motivation towards environmental behavior, were not significant predictors of meat consumption behavior before or during the intervention, $t(67)= -.26$, $p=.80$, $t(51)=.53$, $p=.60$. Implications and directions for future research are discussed within the paper.

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1. Introduction

Humans today are faced with a whole host of environmental problems that can be directly traced to human behavior. These problems threaten not only our health, but the health of other animal and plants species whose survival depends on a healthy planet capable of sustaining life. The impact of human behavior on the environment is unquestionable. However, though human behaviors may have negative consequences for the planet, not all behaviors are detrimental to the environment. Various behaviors contribute to protecting, preserving and restoring the environment. Such behaviors are referred to as environmentally responsible behaviors (ERBs), alternatively “environmentally sustainable behaviors,” “responsible environmental behaviors,” and “pro-environmental behaviors.” In this paper, ERBs refer to practices intended to conserve natural resources. Promoting individuals’ engagement in ERBs has been the subject of research in the field of psychology since the early 1970’s.

A number of interventions have targeted ERBs. Osbaldiston (2004) conducted a meta-analysis of 62 studies, including 133 effect sizes, to examine the behaviors targeted, the type of interventions employed, and potential mediators of successful interventions. The experiments reviewed contained a variety of interventions that manipulated antecedents, consequences, or both. However, the targeted ERBs fell within a limited range of categories. In fact, they were largely concentrated in two areas: recycling and energy conservation (Osbaldiston, 2004). These behaviors are certainly important, but are unlikely to be identified as the most beneficial to the environment.

Lehman & Geller (2004) note, for example, interventions aimed at reducing the use of materials at the source can have more impact than recycling, which occurs at the end of the usage chain. Recycling, energy conservation, and littering behaviors are often targeted for convenience of observing and of measuring, rather than for having the greatest potential benefit to the natural environment (Lehman & Geller 2004; Osbaldiston, 2004). These behaviors have proven easy to observe and measure quantitatively.

The mismatch between the behaviors studied and the behaviors that would be most significant in altering the course of environmental damage may be because, as Hayes says, behavioral scientists have always looked for “nails our hammers could hit”

(cited in Geller, 1990). That is, behavioral community psychologists choose behaviors that are easy to observe and measure, amenable to change, and suitable for available intervention strategies. Gardner and Stern (1996) echo this sentiment that the intervention-focused research has studied behaviors that are more convenient than important when it comes to ERBs.

Although the ERBs already addressed are important, it would be informative to study other behaviors, especially individual ERBs whose impact may be more far-reaching. A particular behavior that has been the subject of very few interventions conducted from an ERB perspective is that of reducing meat consumption. In one exception, Staats, Harland, and Wilke (2004) included this behavior as one of several measured in a longitudinal study of Dutch citizens who participated in “EcoTeams” with friends and neighbors as an intervention to promote ERBs. The researchers found that participants reported significant decreases in their rates of meat consumption after joining the teams.

1.1 Environmental Impact of Meat Consumption

The environmental impact of raising livestock for meat consumption is significant and contributes to a number of threatening environmental issues (Jowitt, 2008; Steinfeld, Gerber, Wassenaar, Castel, Rosales, & de Haan, 2006) According to researchers for the Food and Agriculture Organization (FAO) of the United Nations, meat production contributes to a number of environmental problems, including climate change, water and air pollution, land degradation, and loss of biodiversity (Steinfeld et al., 2006)

Climate change and air pollution

Estimates place the contribution of livestock production at anywhere from 18% to 51% of total greenhouse gas emissions (Goodland & Anhang, 2009; Steinfeld et al., 2006). The FAO’s lifecycle analysis reveals that livestock production accounts for 9% of anthropogenic carbon emissions, mostly through the deforestation of land for livestock or feed production, but also via the use of fossil fuels to create fertilizers for feed production as well as to produce and transport processed and refrigerated animal products (Steinfeld et al., 2006). Furthermore, livestock accounts for 37% of anthropogenic methane, which has 23 times the global warming potential of carbon dioxide. Finally, livestock

production is responsible for 64% of anthropogenic ammonia emission, a major player in acid rain and ecosystem acidification (Steinfeld et al., 2006).

Water Pollution and Water-related Threats

Water is becoming a stressed resource, and yet 8% of potable water used for livestock, with the majority of this water used to irrigate animal feed in arid areas (Steinfeld et al., 2006). Additionally, water sources are polluted not only by animal waste, but also by antibiotics and hormones used in raising animals, chemicals from hide processing, fertilizers and pesticides, nitrogen and phosphorous, and erosion-related sediment. These patterns of pollution lead to eutrophication and the creation of “dead zones” in the planet’s oceans, destruction of coral reefs, and public-health problems including antibiotic resistance (Steinfeld et al., 2006). Livestock production also impedes the ability of ecosystems to replenish freshwater supply through soil compaction, erosion and other effects of land use.

Decreasing biodiversity

Livestock production is a major threat to biodiversity, as it contributes to the habitat loss for most of the world’s threatened species. It also threatens the health and survivability of many species via the water and air-pollution threats listed above (Steinfeld et al., 2009).

1.2 Promoting Environmentally Responsible Behaviors

In 1989, Geller proposed a model that would expand the principles of applied behavior analysis to include marketing strategies for maximizing the benefits of interventions in this field. The Antecedent-Behavior-Consequence (ABC) was explained as the foundation to creating and evaluating interventions to increase ERBs and decrease environmentally-harmful behaviors.

Lehman and Geller found in their 2004 review of behavior-focused interventions to increase the frequency of ERBs that most interventions were from other, non-behavioral subfields of psychology. They also noted that those few interventions that were successful have faced the typical problem of not reaching those in a position of power to create and implement large-scale interventions. The authors also recommend that consequence interventions be adopted institutionally so incentive/reward contingencies are not withdrawn.

Osbaldiston's 2004 meta-analysis of 62 studies on the promotion of ERBs, which included 133 effect sizes, examined the types of intervention employed, the ERBs targeted, the potential moderators of successful interventions, and the applicability of various theoretical interpretations. Of the different interventions tested, goal-setting and commitment strategies were the most effective. These two interventions had a mean weighted effect size of 0.55 (95% CI = .39, .72) and were significantly more successful than the other interventions studied, including consequence interventions ($\chi^2 (1) = 6.62, p = .01$).

Theory of Commitment

A commitment strategy usually involves making “a pledge or promise...regarding performance of future behavior” (Staats, Harland, & Wilke, 2004). Commitment strategies may be of the “do-your-best” type, or may include specific goals. According to Locke (1968), when the goal is assigned by the researchers rather than chosen by the participants, specific, challenging goals correlated to better performance than non-specific or easy goals. Cialdini (2001) proposed that commitment strategies work because of an individual's desire to be consistent with a stated commitment and prevent cognitive dissonance.

Commitment strategies often result in significant maintenance after an intervention is withdrawn. Werner et al. (1995) propose this occurs because of a long-term change in self-concept that results from changing behavior. The authors tested this theory and found that a long-term behavior change resulting from commitment could lead to a change in attitudes. In other words, people can act themselves into changing their attitudes.

Commitment and Goal-Setting Strategies in the ERB literature

DeLeon and Fuqua (1995) found that asking participant to make a public commitment to recycle was successful only when combined with a feedback strategy. Dickerson, Thibodeau, Aronson, and Miller (1992) found that participants significantly reduced the length of their showers when they were asked to commit publicly to reducing water consumption by signing a poster, then asked to consider a time when they had not saved water. Neither intervention alone resulted in less water usage than used by the control group. Assigning participants a specific goal and asking them to commit (either

publicly or privately) to this assigned goal was significantly effective at increasing the number of cans recycled in a 1982 study conducted by McCaul and Kopp. Similarly, Katzev and Johnson (1984) found that asking participants to commit to a 15% reduction in energy consumption was more successful than providing a monetary incentive. Wang and Katzev (1990) found that making a private commitment to recycle paper led to more recycling than either a public commitment or an incentive in both treatment and follow-up periods.

Osbaldiston (2004) also concluded the field would benefit greatly from targeting new behaviors. The benefits of expanding the field of psychological research to new realms of ERBs are twofold. First, research conducted on new behaviors would test the external validity of those interventions that have already enjoyed empirical support. One should not assume that an intervention that prevents littering, increases recycling, and decreases energy consumption would necessarily be equally effective at changing other ERBs. Second, targeting behaviors with potentially more far-reaching impact will expand the possible impact of psychology to attenuate the environmental damage caused by human behavior.

1.3 Motivation Toward the Environment Scale

Understanding why individuals perform environmentally responsible behaviors addresses questions of motivation. Self-Determination Theory is a theory of motivation predicated on the notion that we have needs for competency, autonomy, and belongingness, and these needs, although often in competition with each other, direct our behavior (Deci, Koestner, & Ryan, 1999). Self-Determination theory includes four sub-theories (Deci & Ryan, 2002). The most relevant one for the current research is cognitive evaluation theory (CET), which examines the impact of extrapersonal factors on motivation, and theorizes that what is most important is not necessarily a person's actual motivation, but the *perception* of their own motivations for behavior (Moller, Deci, & Ryan, 2006).

Although Deci and Ryan initially proposed a dichotomous division of motivation into intrinsic and extrinsic, they expanded the extrinsic category to consider various modes of motivation that represent different levels on the spectrum of autonomy vs. control (Moller, Ryan, & Deci, 2006). Lowest on the scale of autonomy is external

regulation. This refers to a person's behavior being driven completely by external reward or punishment contingencies. Introjected motivation is in place when an individual performs a certain behavior because of socially-driven internal consequences, e.g. in order to feel proud of themselves, or to avoid the shame and guilt of *not* doing the behavior.

The most autonomous of these levels of extrinsic motivation is identified, which occurs when an individual performs a behavior because they acknowledge its importance or consider it to be consistent with their values. Intrinsic motivation, on the other hand, is present when a behavior is satisfying and enjoyable in and of itself, regardless of consequences.

Pelletier, Tuson, Green-Demers, Noels, and Beaton (1998) developed the Motivation Toward the Environment Scale in order to classify motivations for ERBs along a scale according to the level of self-determination; a copy of this scale can be found in Appendix A. They found that self-determination theory is particularly useful in understanding how behavioral regulation is internalized. This scale allows further testing of theories to explain why commitment strategies lead to greater maintenance of behavior post-intervention. Participants taking this scale receive a score on each of six motivation domains (from most to least self-determined: intrinsic, integrated, identified, introjected, external) as well an amotivation score.

In the current study, MTES scores were calculated in order to determine if they were predictive of meat-eating behavior, willingness to make a commitment to reduce meat consumption for environmental reasons, and compliance with assignment to the treatment condition. In order to include the MTES as a predictor, it was necessary to create a single self-determined motivation score for each participant. In a 1990 study on self-determination and couple happiness, Blais, Sabourin, Boucher and Vallerand assigned weights to each level of self-determination in order to calculate a single score. Intrinsic, integrated, and identified motivation were assigned weights of +3, +2 and +1, respectively, while amotivation, external, and introjected motivation were assigned -3, -2 and -1, respectively. The same weighting scales were used to weight each response item

on the MTES according to the level of self-determined motivation it reflects in order to calculate a single total score for each participant.

The current study employed an ABA (baseline-intervention-withdrawal) design with a control group to assess the effectiveness of commitment to an assigned goal in reducing weekly meat consumption among university participants by three meals per week (the equivalent of an additional meat-free day). The current study also included demographic questions and the Motivation Towards the Environment Scale for exploratory analyses.

2. Methods

2.1 Hypotheses

It was hypothesized that participants who were randomly assigned to the treatment condition would have significantly lower rates of meat consumption during the treatment phase than participants who are randomly assigned to the control group (H1). It was predicted that participants who agreed to be randomized would have higher levels of self-determined motivation toward ERBs, as assessed by the MTES (H2). It was also predicted that participants in the treatment condition would experience a greater increase in rate of meat consumption from treatment to withdrawal phase than participants in the control group (H3). Lastly, it was hypothesized that rates of meat consumption during the withdrawal phase would remain lower than rates from the initial baseline phase (H4).

2.2 Participants

An a priori power analysis of adding group assignment as a predictor to a multiple regression model with an alpha of .05, power of .80, and an anticipated medium effect size of ($f^2=.15$) revealed that 60 participants would be needed for phases 2 and 3 of the study 9. This number was doubled in anticipation of attrition and the screening process in phase 1, so the target number of participants for the initial phase was 120.

Ultimately, two phases of recruitment were needed to achieve a desired sample size. The participants were 70 undergraduate psychology students at Virginia Polytechnic Institute and State University (Virginia Tech). Because of the small sample size initially obtained ($n=38$), a second set of Phase I sessions was held two weeks following the first Phase I sessions. These later participants were referred to as “Wave 2” participants ($n=32$). All phases of the study were administered to the Wave 2 participants two weeks after the Wave 1 participants.

Research assistants visited undergraduate psychology classes to inform students about the study. Participants signed up for the study via SONA, the university’s online research website. To be eligible for the study, students were informed they must have a University meal plan and could not be vegetarians. A total of 46 women and 24 men participated in the study. Of these participants, 7 reported that they had previously been vegetarian. Their mean score on the Motivation Toward the Environment Scale was 43.04.

2.3 Setting

The in-person sessions of the study were conducted in a classroom in the psychology department. Participants returned diaries to the Center for Applied Behavior Systems in the department of Psychology or to research assistants stationed outside the lecture auditorium where the Introduction to Psychology class was held.

2.4 Measures

Participants were given food diaries to complete and envelopes labeled by week (“week 1”, “week 2”, etc.) in which to return their diaries, along with dining hall receipts. All participants watched a PowerPoint presentation detailing the environmental damage of meat production, the environmental benefits of reducing the rate of meat consumption, and suggestions for meat-free meals on campus. The participants also completed the Motivation Toward the Environmental Scale (MTES) (Pelletier et al., 1998; Appendix A). An additional sheet of demographic questions was added to this scale, as given in Appendix B.

2.5 Procedure

Phase 1

Participants, all of whom registered for the study via SONA, were asked to sign up for one of three initial sessions offered on three subsequent days. During this initial session, research assistants from the Center for Applied Behavior Systems (CABS) distributed the informed consent form (see Appendix C) to all participants and gave them the opportunity to review it and ask questions before signing it. Research assistants then administered the demographic questionnaire and the MTES. Research assistants explained the nature and requirements of the study, including the length of the study and the potential phases. They subsequently explained how to complete the meal diary.

The meal diary (shown in Appendix D) asked participants to classify each meal they consume as containing meat or meatless; the definition of meat was given as including pork, beef, game, and fowl (excluding seafood, eggs and dairy). Participants were given three weekly diaries, each dated by week, and instructed to begin completing the diary on the following Monday. They also received as well as three envelopes (one per week) and were asked to collect and return as many receipts as possible from dining halls.

Participants were asked to return diaries and receipts to the CABS office in Williams Hall or to research assistants waiting outside the introductory psychology classroom. Each participant received one point of extra credit for attending this initial session, and those who returned all three diaries at the end of three weeks were given two additional points of extra credit.

Phase 2

Before this phase began, researchers calculated the rate of meat consumption for each participant during the first week as well as the average number of meals containing meat each participant ate during the first two weeks. Participants were matched based on their Week 1 rate of meat consumption and were randomly assigned from within these matched pairs to either the treatment or control condition; a corresponding packet was prepared for each participant.

After three weeks of the initial baseline phase, participants were asked to sign up for a second in-person session via the SONA system. These sessions were offered on three consecutive evenings, exactly three weeks after the Phase I session. During this session, a research assistant gave a PowerPoint presentation on the environmental damage caused by livestock production, how reducing meat consumption can attenuate these negative effects, and the options for meat-free dining available on campus.

Each participant was then given a form asking if they were willing to make a commitment to reduce their meat consumption (see a sample form in Appendix E). Participants exited the session individually and presented this sheet to a research assistant, who verified they had answered the question and included their PID. The RA excused participants who answered “no” to the willingness question. If they answered “yes” they were directed to another research assistant. The second research assistant gave each participant a set of papers.

Each participant’s packet contained a “feedback sheet” (see Appendix F for a sample) which informed the participant of the average number of meals they consumed during the first two weeks of the study that contained meat, and an “acknowledgement sheet” (given in Appendix G) that asked participants to sign and acknowledge they will complete their meal diaries for the next four weeks, collect as many receipts as possible for the next four weeks, and submit both weekly to the CABS office.

Additionally, the packets for participants in the treatment condition also contained a pledge sheet, a sample of which can be seen in Appendix H, asking them to commit to reducing their meat consumption by three meals per week for the following four weeks. Participants received a point of extra credit for attending the session, and a point for each weekly diary they returned during this phase.

Phase 3

After four weeks, all participants received an e-mail from the researchers. For participants in the control condition, this e-mail reminded participants to continue to complete their diaries, collect receipts, and return each weekly to the CABS office for the next two weeks in order to receive two additional points of extra credit and be eligible for the raffle drawing. The e-mail to participants in the treatment condition included all of this information, in addition to a confirmation that their commitment to reducing meat consumption has ended. At the end of Phase 3, participants were notified their participation in the study was complete and they were no longer required to submit diaries and receipts. The names of all the participants who had completed the study were entered into a raffle for a \$50 gift card to a store of their choice, and a second raffle for another gift card was held using all the receipts participants had returned.

Dependent Variables

For the purposes of analyses, two dependent variables were considered. Rate of meat consumption was operationalized as the number of meals containing meat consumed during a particular period divided by the total number of meals consumed during the same period of time. Additionally, the percentage of participants who increased or decreased their meat consumption from baseline to treatment phase was also calculated.

3. Results

3.1 Preliminary Analyses

Before running the above-described tests, three matched pairs *t*-tests were conducted to compare the overall rate from each phase to the rate during the first week of that phase (see Table 1). This was done in order to determine if meat consumption rate during an entire phase was an appropriate representation of the weeks within that phase, or if each week of data must be considered separately. As significant differences were not found, it was determined that use of an overall treatment rate for analyses was appropriate.

Participants were run in two “waves” that began two weeks apart. In order to ensure these two waves were not significantly different, we compared rates of consumption during each phase between the two groups; no significant differences emerged, and it was thus concluded that it was appropriate to collapse waves for analytical purposes, $t(61)=-.45, p=.65$, $t(50)=-1.05, p=.30$, $t(46)=-.93, p=.36$. A *t*-test revealed that baseline rates of meat consumption were not significantly different between the treatment and control groups, confirming that the randomization process was successful, $t(57) = .61, p = .54$.

In order to assess whether participants who only turned in part of the required materials could be included in the study, each weekly rate was compared to the overall rate for its phase. Given the very high correlations between each weekly rate and its corresponding phase rate (see Table 3), participants who turned in at least one weekly meal diary during a phase were included in analyses of consumption rate for that entire phase, with rate being the overall number of meals containing meat during that phase divided by the overall number of meals eaten during that phase. Listwise deletion was used for participants who did not return any materials during the particular phase involved in the analysis. Attrition analyses revealed the excluded participants did not significantly differ from those included on total score on the MTES or on baseline rate of meat consumption (see table 5).

We also calculated concordance rates between receipts and diaries; for each instance in which a participant turned in a receipt, we compared whether or not the receipt indicated they had consumed meat to what the participant had indicated on their

diary. The concordance rate during the baseline phase was 83% (receipts and diaries matched 83% of the time), and during the treatment phase it was 82.6%. Both of these exceed 80% and are thus considered acceptable levels of reliability.

3.2 Hypothesis Testing

Our primary hypothesis was that the control and treatment groups would differ in their rates of meat consumption during the treatment phase (i.e. following administration of the intervention) (H1). Participants who were assigned to the treatment condition did not have significantly lower rates of meat consumption than participants in the control group during the treatment phase. Thus H1 was not supported, $t(48) = .74, p = .47$. Differences during week 4, the first week following the intervention, approached but did not achieve significance in the expected direction ($t = 1.59, p = .12$). An additional test was run to assess if the effect of membership in the treatment group was detectable after controlling for baseline rate of meat consumption. A regression of treatment rate first on baseline rate, then on condition, revealed that adding condition as a predictor to the model did not significantly increase the predicted variance in treatment rate, $b = -.02, t(49) = -.53, p = .60$.

The percentage of participants in each group (treatment vs. control) who reduced meat consumption from baseline to treatment phase was also calculated. Out of 24 participants in the control group, 19 reduced meat consumption (79%); 27 of 28 (96%) participants in the treatment condition reduced meat consumption (see Table 6).

Given that all but one participant agreed to be randomized in Phase II of the Study, the hypothesis (H2) that participants who were more self-determined in their motivations toward the environment would be more likely to consent to randomization could not be tested.

Our hypothesis (H3) that participants in the treatment group would increase their meat consumption rates from treatment to withdrawal phase more than participants in the control group was not supported. A t-test comparing the difference scores (withdrawal rate-treatment rate) for the two groups was not significant ($t(47) = -1.52, p = .14$).

Our hypothesis that rates during the withdrawal phase rates would remain lower than baseline rates was supported, $t(50) = 6.37, p < .001$.

3.3 Exploratory Findings

Subsequent analyses were not based on a priori hypotheses, and were thus considered exploratory in the context of this study. In order to assess if baseline rates of meat consumption moderated the relationship between condition and treatment rates of meat consumption, a stepwise multiple regression was used to test for a potential interaction between randomly assigned condition and baseline rates of meat consumption. The interaction term (baseline rate * condition) was not a significant predictor of treatment phase consumption, $b=.22$, $t(47)=1.07$, $p=.29$, when added to the model including condition and baseline rate as predictors.

Given the lack of significant differences between meat consumption rates for the treatment and control groups, the groups were collapsed into a single sample in order to assess if participants' rates of meat consumption differed among baseline, treatment, and withdrawal phases, regardless of condition. A repeated measures analysis of variance revealed significant differences by phase, $F(1, 47)=36.90$, $p<.001$). Subsequent t-tests to probe these differences revealed that treatment consumption rates were lower than baseline rates, $t(51)=-8.60$, $p<.001$. Rates also significantly increased from treatment to withdrawal phase, $t(47)=-2.31$, $p=.025$, although, as described above, withdrawal phase rates of meat consumption remained significantly lower than baseline phase rates.

In order to determine if baseline rates of meat consumption were related to the amount of decrease in meat consumption for all participants, a difference score was calculated for each participant (baseline phase rate minus treatment phase rate), and then these difference scores were regressed on the baseline rate. Baseline rate of meat consumption was a significant predictor of change during the treatment phase, with participants at higher rates of meat consumption during baseline experiencing a greater decrease ($b=.44$, $t=3.50$, $p<.001$). When condition was added as a predictor to this model, it did not significantly increase the amount of variance predicted, $b=.02$, $t(49)=.53$, $p=.60$; nor did adding an interaction term (condition * baseline rate) increase the variance predicted in the change score from baseline to treatment, $b=-.22$, $t(48)=-1.07$, $p=.29$.

3.4 Motivation Toward the Environment Scale

As described above, a single total score was calculated on the MTES for each participant. A regression analysis revealed that total score was not a significant predictor of baseline rate of meat consumption ($b=-.03$, $t(67)=-.26$, $p=.80$) or of treatment rate of consumption ($b=.08$, $t(51)=.53$, $p=.60$). A stepwise regression to test for an interaction revealed that there was no interactive effect of randomly assigned condition with MTES total score on treatment rate of consumption $b=.001$, $t(48)=-.63$, $p=.54$.

4. Discussion

The primary hypothesis of this study, that participants in the treatment group would have significantly lower rates of meat consumption following the commitment intervention than participants in the control group, was not supported. However, exploratory statistics revealed a number of results with important implications for the research in the field of ERBs.

Previous research has suggested that a commitment strategy is generally successful in promoting increased frequency of target ERBs, with an average medium effect size (mean $d=.55$) (Osbaldiston, 2004). A number of factors may have contributed to these divergent results. The first explanation may have to do with the exploratory nature of the study. Reducing meat consumption has not yet been studied in the experimental literature as an ERB, and was not included in the meta-analysis. It is possible this particular behavior does not respond to interventions the same way as other behaviors, such as recycling, disposing of litter properly, and taking shorter showers. This could be because individuals do not perceive it as an ERB for which an injunctive norm exists (i.e. people know they should recycle, shouldn't litter, should drive less). It is also possible that, while the ERBs studied previously are considered public behaviors, meat consumption may be considered a private behavior that is less likely to be observed by others; it may also be tied into issues of identity and personal choice more than other behaviors.

There are also methodological factors that might have led to the lack of success of the interventions. Most notably, it is possible the manipulation involving the pledge sheet was weakened by including multiple other elements of the session in phase 2. Recall that during this session, all participants were exposed to information that was likely novel about the environmental impact of livestock, as well as meatless dining options on campus, and assessed for willingness to make a commitment. Any of these may have lessened the impact of the pledge sheet given increased cognitive demands of the other tasks and elements involved.

Additionally, the current intervention, because of its exploratory nature and the need to control variables as much as possible, involved commitment to a private, assigned goal; Cialdini (2001) has argued that the most effective commitment is public,

voluntary, and active. Thus, the process of commitment may have been substantively different, and may have led to different results, if the commitment portion had been conducted to utilize those elements which Cialdini hypothesized make a commitment more effective.

Finally, the phrasing of the willingness to random assignment (see Appendix E) may have been viewed in and of itself as a commitment—in polite conversational language, responding to “would you be willing” in the positive may be seen not as a response to a hypothetical question, as intended, but a polite way of requesting participants to make the commitment involved. Thus some participants in the control group may have considered they made a commitment. This was supported by the decrease in meat consumption by the control group.

Exploratory analyses found that, although there were not significant differences between participants in each condition, when groups were collapsed, participants *in general* decreased their meat consumption from baseline to treatment phases, and meat consumption increased from treatment to withdrawal, while still remaining below initial baseline levels. As mentioned above, it is likely that the effect of the pledge was diluted by the other elements of the Phase II meeting—essentially, all participants were subjected to an intervention, and it only included the pledge sheet for some.

Given that all other components of the intervention were delivered uniformly and simultaneously to all participants, it is impossible to test statistically which elements may have led to a change in meat consumption behavior. However, an exploration of the theory and previous research behind the other elements contained may help to assess the potential for each to have influenced behavior and to identify factors for consideration in future research.

Mckenzie-Mohr (2000) noted the use of information-only campaigns is often the default chosen by public institutions seeking to change behaviors, the rationale being that if people understand the issues involved, they will make a personal choice to change their behavior in order to protect the environment. Mckenzie-Mohr, however, laments the popularity of this method among designers and implementers of interventions to promote ERBs, noting that “a variety of studies have established that enhancing knowledge and creating supportive attitudes often has [sic] little or no impact upon behavior” (2000, p.

544). It is possible that the information provided during the phase II sessions was sufficient to motivate those participants who were inclined to commit and ERB, and that the commitment strategy was not strong enough to motivate those participants not already motivated by the information component.

Osbaldiston (2004) found that the 12 studies in his meta-analysis that employed this kind of technique had an average small effect size ($d=.20$). It is interesting to consider why such findings may not extend to the current study. One potential explanation for its effectiveness in this particular situation is novelty. It is likely that other studies have examined behaviors that participants were already aware of and had mentally categorized as consistent with efforts to protect the environment. However, reducing meat consumption for global environmental concerns (rather than, say, animal rights considerations) may not have been construed as an ERB to participants, and it is likely that had not previously been exposed to, and thus unaware of, the impact of their food choices in this realm on global warming and other environmental threats.

Providing procedural information (an explanation of *how* to perform a behavior) has also been tested as a common intervention for promoting ERBs. Osbaldiston (2004) found that 11 studies employing this technique had, on average, a small effect size of ($d=.36$) and noted that this was significantly less than the effect size for commitment when compared using a chi-square statistic. It is, however, possible that in this instance, procedural information was effective in decreasing meat consumption in the current study.

At the phase II in-person session, participants received feedback in the form of a sheet that indicated the average number of meals containing meat that they had contained during the first two weeks of the study. Feedback is one of many typical interventions provided to participants in order to increase ERB performance. However, it is important to note that in the current study, feedback was delivered only once and simultaneously with other intervention components; in a typical study, feedback is given repeatedly, or even continuously, to provide participants with immediate information about the success of their behavior change. It is unlikely that, in this case, providing participants information about the typical number of meals per week they consume containing meat *before* the expected change had an impact on their behavior.

The most likely component of the intervention to have been successful is the information, despite its lack of success in previous interventions. However, given that a number of elements that can be considered interventions were delivered simultaneously, it is also possible that interventions interacted with another and were more effective in combination than individually, and that adding a commitment to what might have been an already powerful intervention did not significantly change it.

Unexpectedly, participants' scores on the Motivation Toward the Environment Scale were not at all predictive of baseline meat consumption nor of treatment phase meat consumption, and they did not interact with the commitment intervention. Villacorta, Koestner and Lekes (2003) found that scores on the MTES correlated highly with peer reports of environmental motivation. It is worth exploring why a validated measure of self-determined motivation towards the environment failed to predict a reduction in meat consumption after an environmental rationale for making such a reduction was provided.

One possible explanation is that, as mentioned above, reducing meat consumption is a distinctly different type of behavior, more resistant to change than, and perhaps also uncorrelated with, other, more typically studied behaviors, such as recycling and reducing household energy consumption. Additionally, it is possible the aggregate score of the Motivation Towards the Environment Scale not an appropriate representative of individuals' motivations towards the environment, and that disaggregating scores into their individual components (so each participant had a score on each type of motivation) might have a higher level of predictive validity.

4.1 Limitations

The major limitation of this study is the weakness of the tested intervention, the commitment strategy. Specifically, a commitment strategy might have been more likely to be successful if the commitment had been participatory, voluntary, and public, rather than a randomly assigned, private commitment. Additionally, conclusions about the effectiveness of various intervention components (other than the commitment strategy) cannot be drawn as they were administered together. Thus it is not clear if a specific other element of the treatment (feedback, persuasive information, etc.) was responsible for diluting the effectiveness of the commitment strategy or for overall changes during phases of treatment.

Additional concerns with the study are related to the environmental impact of the behavior targeted. A more sensitive measure of meat consumption would be quantity of meat consumed, rather than number of meals that contained meat. Additionally, although reducing meat consumption in a global sense should reduce one's environmental footprint, a more nuanced approach might lead to greater environmental benefit. Asking participants to purchase meat that was locally grown and sustainably raised, for example, would be a more specific way of reducing carbon emissions than simply reducing meat consumption in general. Finally, suggesting substitutions with minimal impact would ensure that the choice to reduce meat consumption would indeed have a beneficial environmental impact. The reduction in carbon emissions from avoiding a meal containing meat, for example, might be negated if the alternative chosen was a highly-processed and packaged vegetarian meal.

4.2 Future Directions

The implications for future studies are clear. It will be important to determine if commitment strategies can be a successful intervention for impacting meat consumption. It is recommended that future studies seek to maximize the impact of a commitment strategy by employing a public commitment; if possible within a controlled experimental setting, the manipulation might also be stronger if it involved a participatory, or self-selected, goal on the part of the participants. Additionally, the commitment process could be formalized by having another person, such as a research assistant, witness the signature of the pledge.

Additionally, future research should seek to elucidate which of the components of the intervention, or if some combination of them, was responsible for the changes in meat consumption in the expected directions during the various phases of the study. The first study might include simply the presentation of information. Although this type of persuasive appeal is not generally found to be successful, it may have been effective for this behavior, given its novel contextualization as an ERB.

Lastly, exploratory or qualitative research might be beneficial to understand why meat consumption was not related to scores on the MTES. This might include administering a survey at a single point in time that assessed a number of ERBs; this kind of cross-sectional data might allow researchers to determine if meat consumption is

correlated with performance of common ERBs, such as recycling and reducing energy consumption, as well as to assess attitudes toward meat consumption and perception of it as a behavior with potential environmental impact.

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Table 1

Descriptive statistics and comparison of phase rates to the first week of each phase.

	n	Mean	Standard Deviation	Skewness	Difference	Significance (2-tailed test)
Baseline phase rate	68	.4985	.1511	.407	-.0049	ns ($p=.586$)
Week 1 rate	68	.5034	.1640	.323		
Treatment phase rate	52	.3339	.1390	.564	-.0219	ns ($p=.401$)
Week 4 rate	52	.3258	.1609	.277		
Withdrawal phase rate	50	.3517	.1318	1.139	-.0112	ns ($p=.387$)
Week 8 rate	50	.3581	.1430	1.043		

Table 2

Pearson correlations between baseline Phase Rate and weeks 1 through 3.

	Baseline Phase Rate	Week 1 Rate	Week 2 Rate	Week 3 Rate
Baseline Phase Rate				
Week 1 Rate	.891			
Week 2 Rate	.921	.745		
Week 3 Rate	.874	.604	.728	

Note. All correlations were significant, $ps < .001$.

Table 3

Pearson correlations between treatment Phase Rate and weeks 4 through 7.

	Treatment Phase Rate	Week 4 Rate	Week 5 Rate	Week 6 Rate	Week 7 Rate
Treatment Phase Rate					
Week 4 Rate	.905				
Week 5 Rate	.935	.796			
Week 6 Rate	.917	.764	.799		
Week 7 Rate	.925	.750	.750	.925	

Note. All correlations were significant, $ps < .001$.

Table 4

Pearson correlations between Withdrawal Phase Rate and weeks 8 and 9.

	Withdrawal Phase Rate	Week 8 Rate	Week 9 Rate
Withdrawal Phase Rate			
Week 8 Rate	.932		
Week 9 Rate	.927	.723	

Note. All correlations were significant, $ps < .001$.

Table 5

Attrition Analyses: Description of Included versus Excluded Cases.

	MTES Total Score	Baseline Consumption
Included	43.23	.476
Deleted	42.64	.542
<i>t</i> -test	<i>p</i> =.951	<i>p</i> =.179

Table 6

Participants in each condition who increased or decreased rates of meat consumption from Baseline to Treatment Phase

	Increased	Decreased
Treatment	1	27
Control	5	19

Appendix A – Motivation Towards the Environment Scale

WHY ARE YOU DOING THINGS FOR THE ENVIRONMENT?

There are many things that one can do for the environment. For example, some people recycle old bottles, different types of containers, newspapers, papers, etc. Listed below are several statements concerning possible reasons why people might recycle. Using the scale from 1-7 below, please indicate the degree to which the proposed reasons correspond to your reasons for recycling by selecting the appropriate number to the right of the item.

	<u>Does not</u> <u>Correspond at all</u>		<u>Corresponds</u> <u>Moderately</u>			<u>Corresponds</u> <u>Exactly</u>	
1. For the pleasure I experience while I am mastering new ways of helping the environment.	1	2	3	4	5	6	7
2. Honestly, I don't know; I truly have the impression that I'm wasting my time doing things for the environment.	1	2	3	4	5	6	7
3. For the pleasure I experience when I find new ways to improve the quality of the environment.	1	2	3	4	5	6	7
4. Because it is a reasonable thing to do to help the environment.	1	2	3	4	5	6	7
5. Because I like the feeling I have when I do things for the environment.	1	2	3	4	5	6	7
6. I don't really know; I can't see what I'm getting out of it.	1	2	3	4	5	6	7
7. I think I'd regret not doing something for the environment.	1	2	3	4	5	6	7
8. I wonder why I'm doing things for the environment; the situation is simply not improving.	1	2	3	4	5	6	7
9. For the pleasure I get from contributing to the environment.	1	2	3	4	5	6	7
10. Because it's a sensible thing to do in order to improve the environment.	1	2	3	4	5	6	7
11. Because it's a way I've chosen to contribute to a better environment.	1	2	3	4	5	6	7
12. Because other people will be upset if I don't.	1	2	3	4	5	6	7
13. For the recognition I get from others.	1	2	3	4	5	6	7
14. Because I would feel bad if I didn't do anything for the environment.	1	2	3	4	5	6	7
15. Because taking care of the environment is an integral part of my life.	1	2	3	4	5	6	7
16. Because my friends insist that I do it.	1	2	3	4	5	6	7
17. Because it seems to me that taking care of myself and taking care of the environment are inseparable.	1	2	3	4	5	6	7
18. Because I would feel guilty if I didn't.	1	2	3	4	5	6	7
19. Because being environmentally-conscious has become a fundamental part of who I am.	1	2	3	4	5	6	7

	<u>Does not</u>		<u>Corresponds</u>			<u>Corresponds</u>	
	<u>Correspond at all</u>		<u>Moderately</u>			<u>Exactly</u>	
20. Because it's part of the way I've chosen to live my life.	1	2	3	4	5	6	7
21. Because I would feel ashamed of myself if I was doing nothing to help the environment.	1	2	3	4	5	6	7
22. Because I think it's a good idea to do something about the environment.	1	2	3	4	5	6	7
23. To avoid being criticized.	1	2	3	4	5	6	7
24. I don't know; I can't see how my efforts to be environmentally-conscious are helping the environmental situation.	1	2	3	4	5	6	7

Appendix B
Demographics Questionnaire

PID: _____

What is your gender? _____

Have you ever been a vegetarian? YES NO

If yes, what were your reasons? (circle all that apply)

Ethical/Animal Rights Health Religious Reasons Environmental

Other: _____

Do you anticipate abstaining from meat at some point this semester for religious reasons?

YES NO

If “yes”, what dates do you plan on abstaining from meat?

Please explain the nature and the extent of your abstinence from meat.

Appendix C
Informed Consent

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

**Informed Consent for Participants
in Research Projects Involving Human Subjects**

A Study of Meat Consumption Habits

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Center for Applied Behavior Systems
Psychology Department

E. Scott Geller
Alumni Distinguished Professor
Center for Applied Behavior Systems
Psychology Department

Michael Buzzard
Undergraduate Research Assistant
Center for Applied Behavior Systems
Psychology Department

I. Purpose of this project.

The purpose of this project is to conduct research on the meat consumption habits of undergraduate psychology students, and to assess how these habits may be changed. 150 participants will be recruited for the study. In order to participate, you must be 18 years of age or older, you must be enrolled in the Major Flex Meal Plan or Mega Flex Meal Plan, and you must eat meat at least three times a week in a typical week.

II. Procedures

Participants will be recruited online initially. You will attend an initial in-person session in Williams Hall, take a survey, and then watch a presentation by research assistants. This should take about 45 minutes. You will then be asked to fill out a very brief diary every day about your eating habits (this will take less than 5 minutes a day), to collect as many receipts as you can from your meals, and return both receipts and the diary at the end of the week for three weeks. If you complete this, you will then be asked to attend another in-person session, where you will watch another presentation and answer some more questions. This presentation should also take about 45 minutes. Depending on the results of this session, you may then be asked to fill out the daily food diaries and collect receipts for 7 more weeks and return both the diaries and receipts on a weekly basis. You will be contacted at the end of each week by e-mail to remind you to return your diaries and receipts, and if you are late in returning your diaries and receipts you may receive a reminder e-mail from us.

III. Risks

The risks of this study are minimal. There is a slight risk of emotional distress in response to the presentation you will watch in the second session. Research assistants will be present in case you do become distressed. Additionally, you may be asked over the course of the study to change your eating habits, and it is possible that this could present health problems for you. We will provide you with referrals to nutrition counseling in case this is a concern of yours.

IV. Benefits

Benefits of this study may include increased awareness of your eating habits, as well as an understanding of the environmental impact of your eating habits. Benefits of the study to the society at large include potential alleviation of looming environmental threats, and the results of the study will further the field of psychology in its understanding of the choices individuals make for their own good and for the general good of society. No promise or guarantee of benefits has been made to encourage you to participate in this study. You may contact the researcher at Neville@vt.edu in the future for the results of the study.

V. Extent of Anonymity and Confidentiality

As you will use your Virginia Tech PID to identify yourself on study materials, information gathered on you will not be anonymous. However, researchers promise not to divulge information on your specific results, thus keeping your results confidential. At no time will the researchers release the results of the study to anyone other than individuals working on the project without your written consent. To further keep your information confidential, each participant will be assigned a participant code. Upon receipt of study materials, researchers will label each with your participant code and remove and shred the top portion of the sheet where the PID is located. The key that links every PID to its participant code will be kept in a locked cabinet in a locked office in the Center for Applied Behavior Systems, to which only authorized personnel will have access.

It is possible that the Institutional Review Board (IRB) may view this study's collected data for auditing purposes. The IRB is responsible for the oversight of the protection of human subjects involved in research. In some situations, it may be necessary for an investigator to break confidentiality. If researchers have reason to believe that you are a danger to yourself or others investigators will notify the appropriate authorities.

Data will be kept for 3 years, after which time study paper documents will be shredded. Electronic data will be stored in a password-protected computer file (no linking files) on the Center for Applied Behavior Systems' network for 10 years. The data will then be destroyed.

VI. Compensation

You will receive compensation as follows: 1 point of extra credit for attending the initial phase in-person session, 2 additional points if you complete and return your food diaries

and receipts and for the following three weeks. You will receive 1 point of extra credit for attending second in-person session. If you meet screening criteria, you may be asked to return your food diaries and receipts for seven more weeks, and you will receive 6 additional points of extra credit for doing so. If you complete all portions of the study (attend two in-person sessions and return ten weeks of food diaries), you will be entered in a raffle to win a \$50 gift cards to a store of your their choice. A second raffle for a \$50 gift card will be held using the receipts submitted by all participants. You are eligible to receive extra credit in other ways than participating in human subjects research. Consult your course syllabus for further information. If as a result of a research project, the investigator determines that you should seek counseling or medical treatment, a list of local services will be provided. Any expenses accrued will be your responsibility of and not that of the research project, research team, or Virginia Tech.

VII. Freedom to Withdraw

You are free to withdraw from this study at any time without penalty. If you do so, the extra credit you receive will be prorated for the extent of your participation, as noted above. You are free not to answer any question or respond to experimental situations that you choose without penalty. There may be circumstances under which the investigator may determine that a subject should not continue as a subject. In this case, your compensation will be prorated for the portion of the project completed.

VIII. Subject's Responsibilities

I voluntarily agree to participate in this study. I have the following responsibilities:

To consult with my health care provider or a nutrition counselor if I have any concerns about participating in a study that may involve changing my eating habits.

IX. Subject's Permission

I have read the Consent Form and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent.

Signature

Contact Information

Co-Investigator:

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540-231-4422

If I should have any questions about the protection of human research participants regarding this study, I may contact Dr. David Moore, Chair Virginia Tech Institutional Review Board for the Protection of Human Subjects, telephone: (540) 231-4991; email: moored@vt.edu; address: Office of Research Compliance, 2000 Kraft Drive, Suite 2000 (0497), Blacksburg, VA 24060.

Appendix D

Weekly Meal Diary

Start Date:

End Date:

Date _____ Day of Week _____

Breakfast

- Meat
- No Meat
- (did not eat)

Lunch

- Meat
- No Meat
- (did not eat)

Dinner

- Meat
- No Meat
- (did not eat)

4th Meal/Snack

- Meat
- No Meat
- (did not eat)

Date _____ Day of Week _____

Breakfast

- Meat
- No Meat
- (did not eat)

Lunch

- Meat
- No Meat
- (did not eat)

Dinner

- Meat
- No Meat
- (did not eat)

4th Meal/Snack

- Meat
- No Meat
- (did not eat)

Date _____ Day of Week _____

Breakfast

- Meat
- No Meat
- (did not eat)

Lunch

- Meat
- No Meat
- (did not eat)

Dinner

- Meat
- No Meat
- (did not eat)

4th Meal/Snack

- Meat
- No Meat
- (did not eat)

Date _____ Day of Week _____

Breakfast

- Meat
- No Meat
- (did not eat)

Lunch

- Meat
- No Meat
- (did not eat)

Dinner

- Meat
- No Meat
- (did not eat)

4th Meal/Snack

- Meat
- No Meat
- (did not eat)

Date _____ Day of Week _____

Breakfast

- Meat
- No Meat
- (did not eat)

Lunch

- Meat
- No Meat
- (did not eat)

Dinner

- Meat
- No Meat
- (did not eat)

4th Meal/Snack

- Meat
- No Meat
- (did not eat)

Date _____ Day of Week _____

Breakfast

- Meat
- No Meat
- (did not eat)

Lunch

- Meat
- No Meat
- (did not eat)

Dinner

- Meat
- No Meat
- (did not eat)

4th Meal/Snack

- Meat
- No Meat
- (did not eat)

Date _____ Day of Week _____

Breakfast

- Meat
- No Meat
- (did not eat)

Lunch

- Meat
- No Meat
- (did not eat)

Dinner

- Meat
- No Meat
- (did not eat)

4th Meal/Snack

- Meat
- No Meat
- (did not eat)

Appendix E
Willingness to Commit

PID: _____

Based on the presentation you just viewed, would you be willing to commit to reducing your meat consumption for a period of time? (By marking “yes”, you are acknowledging that you may be randomly assigned to making such a commitment.)

Yes _____ No _____
Signature *Signature*

Appendix F
Feedback Sheet

PID: Sample123

Based on the data you submitted in the first week of this study, you consume an average
of:

XX

meals per week containing meat.

Appendix G
Acknowledgement Sheet

PID: _____

I acknowledge that I am responsible for completing and returning my food diaries to the CABS office, as well as collecting and returning as many meal receipts as I can, for the duration of this study (6 more weeks). If I do so, I will be eligible to receive the maximum amount of extra credit (6 more points) and will be entered in a raffle to receive one of two \$50 gift cards to a store of my choice.

Signature

Appendix H
Pledge Sheet

PID: _____

I pledge to reduce the number of meals I consume containing meat by three meals per week for the next four weeks, beginning Friday.

Signature