Designing Messages to Reduce Meat Consumption:

A Test of the Extended Parallel Process Model

by

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A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Approved July 2015 by the
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ARIZONA STATE UNIVERSITY

August 2015

ABSTRACT

The purpose of this study was to examine the utility of the Extended Parallel Process Model (EPPM) in guiding message design for a new health context, reducing meat consumption. The experiment was a posttest only design with a comparison and a control group. Message design was informed by the EPPM and contained threat and efficacy components. Participants (Americans ages 25-44 who eat meat approximately once a day) were randomly assigned to view a high threat/ high efficacy video, a high threat/ low efficacy video, or to be in a control group. Dependent variables were danger control outcomes (i.e., attitudes, intentions, and behavior) and fear control outcomes (i.e., perceived manipulative intent, message derogation, and defensive avoidance). Outcomes were assessed at an immediate posttest (Time 1) and at a one-week follow up (Time 2). There were 373 participants at Time 1 and 153 participants at Time 2. The data did not fully fit either the EPPM or the additive model; both videos were equally persuasive and resulted in greater message acceptance (attitude change, behavioral intention, and behavior) than the control group. Because the high threat/ low efficacy group was more persuasive than the control group, the data more closely fit the additive model. Fear control outcomes did not differ between the two video groups. Overall, the study demonstrated the effectiveness of using the EPPM to guide video message design in a new health context, reducing meat consumption. The results supported the EPPM prediction that a high-threat high-efficacy message would result in message acceptance, but support was not found for the necessity of an efficacy component for message acceptance. These findings can be used to guide new or existing health campaigns that

seek to improve public health outcomes, including reducing the incidence of heart disease, cancer, diabetes, and obesity.

Keywords: health, meat consumption, EPPM, additive model

DEDICATION

To my parents, Penny and Dennis Shada, for their unwavering support of my education since Day 1.

ACKNOWLEDGEMENTS

I would like to express my gratitude to my advisor, Dr. Anthony Roberto. Thank you for your generosity of time, for sharing your expertise, and for trusting in me to create my own path.

Thank you to my committee members, who gave their time and expertise in shaping this dissertation. Dr. Mongeau, thank you also for your theoretical and methodological advice on pilot projects. Dr. Wharton, thank you also for fostering my interest in nutrition and food system sustainability, and for your guidance and partnership on research projects that connected the fields of communication, nutrition, and sustainability.

Thank you to the Hugh Downs School of Human Communication for financial support of this dissertation in the form of a summer research grant.

Finally, thank you to my friends and family. You are the foundation of my success.

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CHAPTER 1

PROBLEM STATEMENT

United States Department of Agriculture (USDA) data indicate that Americans' total meat consumption has nearly doubled in the last century (Daniel, Cross, Koebnick, & Sinah, 2011) and consumption is now more than twice the global average (Speedy, 2003). In the U.S., consumption of protein-rich foods, and meat in particular, exceeds federal nutritional recommendations. A growing body of research suggests that consuming large amounts of meat, especially red meat and processed meat, increases the risk of developing health problems such as heart disease, certain cancers, diabetes, and obesity.

The focus of this study is to test the effectiveness of video messages designed to encourage Americans to reduce their meat consumption. The Extended Parallel Process Model, a message design theory used in health contexts, will guide the video message content. Examples of applied campaigns that advocate for a reduction in meat consumption include the Monday Campaigns' "One day a week, cut out meat" Meatless Monday message (Monday Campaigns, 2015) and the Environmental Working Group's "Meat. Eat Less. Eat Greener." message (Hamerschlag, 2011). The more that these types of campaigns are informed by research, the more effective they can be in achieving better health outcomes.

Chronic Diseases and High Meat Diets

Although measuring the effects of meat consumption on Americans' health is a complex issue, research supports the conclusion that diets high in meat are associated with negative health outcomes. Diet-related diseases associated with meat consumption

include heart disease, stroke, diabetes, certain cancers, and obesity. Red meat (e.g., beef, lamb, pork) and processed meat (e.g., deli meat, sausage, hot dogs, bacon) tend to contribute the most risk, while diets that emphasize plant foods (vegetables, fruits, whole grains, beans, nuts, seeds) tend to decrease health risk. Despite current trends toward higher poultry consumption in the U.S., red meat still represents the largest proportion of meat consumed in our diets and nearly a quarter of the meat we consume is processed (Daniel, Cross, Koebnick, & Sinha, 2011).

Heart disease. In the United States, heart disease is the leading cause of death for both men and women, accounting for 25% of all deaths (USDA ERS, 2011). Meat consumption, especially red meat and processed meat, is associated with an increased risk of cardiovascular disease mortality (Pan et al., 2012; Sinha, Cross, Graubard, Leitzmann, & Schatzkin, 2009). In 2012, Harvard researchers published a landmark prospective cohort study on meat consumption that tracked dietary intake from over 120,000 individuals (Pan et al.). They found that consumption of red meat was associated with an increased risk in overall mortality, cardiovascular disease mortality, and cancer mortality. This risk was found for both processed and unprocessed red meat, but the risk was greater for processed red meat. Individuals in the lowest quintile ate 0.22 - 0.53 (results differentiated between two samples) servings of red meat per day compared to 2.36 – 3.10 servings per day in the highest quintile (Pan et al.). The cardiovascular disease mortality hazard ratio (HR)[1] comparing the highest and lowest quintile of red meat consumption was 1.27 HR for men and 1.50 HR for women. For processed meat intake,

[1] A hazard ratio (HR) is the ratio of the probability of an event occurring in an exposed group compared to the probability of the event occurring in a non-exposed group. It is calculated as occurring at a specific point in time, typically the end of a trial.

the hazard ratio was 1.09 HR for men and 1.38 HR for women. The population-attributable risk[2] of mortality was 9% for men and 8% for women if consumption was less than half a serving (1.5 ounces) of red meat per day.

In another prospective study, Sinha, Cross, Graubard, Leitzmann, and Schatzkin (2009) found similar results to Pan et al. (2012). The researchers assessed mortality outcomes from over 500,000 individuals aged 50-71 at a 10-year follow up. For men and women, respectively, the lowest quintile of red meat consumption was 9.1 – 9.3 g/1000kcal/d (0.64 – 0.66 oz for a 2000 calorie per diet) and the highest quintile was 68.1 – 65.9 g/1000kcal/d (4.8 – 4.6 oz for a 2000 calorie per day diet). Processed meat consumption was 5.1 – 3.8 g/1000kcal/d (0.36 – 0.26 oz for a 2000 calorie per day diet) in the lowest quintile and 19.4 – 16.0 g/1000kcal/d (1.37 – 1.13 oz for a 2000 calorie per day diet) in the highest quintile. Compared to individuals in the lowest quintile of red and processed meat consumption, individuals in the highest quintile had a higher risk for overall mortality, cardiovascular mortality, and cancer mortality. The population-attributable risk was 11% for men and 16% for women if red meat consumption had been in the lowest quintile.

Pan et al. (2012) outlined several possible mechanisms to explain the mortality risk associated with red meat consumption. Red meat contains high amounts of saturated fat and cholesterol, which may explain the association with coronary artery disease, in particular. The Seven Countries Study, led by Ancel Keys from 1958 -1970, was the first to make the connection between saturated fat and cholesterol, and cholesterol with cardiovascular disease risk (Keyes, 1970). In addition to saturated fat, Pan et al. also

[2] The population-attributable risk indicates the percentage of cases that could have been prevented.

suggested that heme iron, a type of dietary iron high in red meat, might also play a role in cardiovascular disease, as it has been associated with myocardial infarction and fatal coronary heart diseases. Sodium (through its affect on blood pressure) and nitrates (blood nitrates have been associated with problems in the inner lining of the blood vessels) in processed meat might be the cause of the additional risk associated with processed meat (Pan et al., 2012). Sinha et al. (2009) also suggested several potential mechanisms for the relationship between meat and cardiovascular mortality. Higher blood pressure associated with red and processed meat could be a factor, and this could be explained by the lack of protective plant foods such as fruits, vegetables, and grains. Higher total cholesterol and low-density cholesterol (LDL) and lower levels of essential fatty acids might also play a role (Sinha et al.).

Cancer. Half of all men and one third of all women develop cancer at some point during their lifetimes. In the two prospective studies that connected meat consumption and heart disease (Pan et al., 2012 & Sinha, et al., 2009), red and processed meat were also found to be associated with total cancer mortality. The cancer mortality hazard ratio comparing the highest and lowest quintile of red meat consumption was 1.22 for men and 1.20 for women (Sinha et al.). For processed meat intake, the hazard ratio was 1.12 for men and 1.11 for women (Sinha et al.). In addition to total cancer mortality, meat consumption has been associated with developing specific cancers, including colorectal (Norat & Riboli, 2009), prostate (Ma & Chapman, 2009), breast (Cho et al., 2003), and lung, esophageal, and liver cancers (Cross et al., 2007).

Colorectal cancer is the third most common cancer in the U.S, and is the type of cancer with the strongest link to meat consumption. In a review of the epidemiological

evidence on meat consumption and colorectal cancer, researchers from the International Agency for Research on Cancer (IARC) concluded that meat consumption, especially red and processed meat, is associated with an increased risk of colorectal cancer risk (Norat & Riboli, 2009). The percentage of relative risk[3] comparing high and low meat consumption groups was 13.9% for total meat, 30.8% for red meat, and 39.3% for processed meat. Some of the reviewed studies indicated that certain preparation methods (e.g., cooking at high heat or until well-done) might also make the risk even greater. Similarly, the World Cancer Research Fund (WCRF) and the American Institute for Cancer Research (AICR) reviewed over 7,000 studies and found convincing evidence that red and processed meat increase the risk of colorectal cancer (WCRF, 2007). As a result, WCRF and AICR recommendations for cancer prevention include eating a plant-based diet, limiting red meat intake (maximum of 11 ounces per week or 1.6 oz per day for the population average) and avoiding processed meat completely (WCRF, 2007).

While not studied as extensively as colorectal cancer, epidemiological studies have also found an association between high meat consumption and an increased risk for developing other cancers. Researchers from the National Cancer Institute (NCI) found that red and processed meat consumption are associated with colorectal and lung cancer, and red meat consumption is associated with esophageal and liver cancer (Cross et al., 2007). Comparing the lowest quintile (9.8 g/1000kcal/d or .69 oz for a 2,000 calorie per day diet) and highest quintile (62.7 g/1000kcal/d or 4.42 oz for a 2,000 calorie per day diet) of red meat intake, there was an increased risk for developing colorectal (1.24 HR),

[3] A relative risk ratio (RR) is the ratio of the probability of an event occurring in an exposed group to the probability of the event occurring in a non-exposed group. It is calculated as occurring over the duration of the trial.

lung (1.20 HR), esophageal (1.51 HR), and liver (1.61 HR) cancers. For processed meat intake, the there was an increased risk of colorectal (1.20 HR) and lung (1.16 HR) cancers. In a prospective study of over 90,000 premenopausal women aged 26-46 years, Cho et al. (2009) found that high consumption of animal fat (in particular, from red meat and dairy products) was associated with the increased risk of breast cancer. Finally, in a review of the available research on dietary factors and prostate cancer, Ma and Chapman (2009) recommended avoiding excessive meat consumption.

There are several potential mechanisms for the relationship between meat and cancer mortality. Many authors suggest that the creation of carcinogenic compounds during high temperature cooking may be responsible for the association (Cross et al., 2007; Pan et al., 2012; Sinha et al., 2009). Others have suggested iron in red meat may increase oxidative damage (i.e., excess free radicals) (Pan et al., 2012; Sinha et al., 2009) and that saturated fat could also be a potential mechanism (Sinha et al., 2009).

Diabetes. Diabetes is a serious medical condition affecting more than 1 in 10 adults (11.3%) in the U.S and the majority (90-95%) of diagnosed cases are Type 2 diabetes (CDC, 2011). A meta-analysis of 12 cohort studies found that meat consumption, especially red meat, increased the risk of Type 2 diabetes (1.14 HR for one serving or three ounces of total red meat; Pan et al., 2011). In another meta-analysis of 7 cohort studies, total meat (1.12 RR) and processed meat (1.19 RR) were found to be associated with a higher risk of Type 2 diabetes (Micha, Wallace, & Mozaffarian, 2010). Pan et al. (2011) suggested several potential mechanisms that could explain the association, including heme-iron in red meat and its impact on oxidative stress, sodium and nitrites in processed meats, or it could be partly mediated by obesity.

Obesity. In the U.S., over 1 in 3 adults (36%) and nearly 1 in 6 children (17%) are obese (Ogden, Carroll, Kit, & Flegal, 2012). Obesity refers to the condition of having excess body fat; adults with a body mass index of 30.0 or greater are considered obese. Obesity is associated with serious health consequences, including overall mortality, heart disease, stroke, and certain cancers (CDC, 2015). Several studies suggest that a relationship between obesity and meat consumption exists, though there is no known mechanism that explains the relationship. Individuals who eat meat-free and low-meat diets tend to have healthier weights (Berkow & Barnard, 2006; Newby, Tucker, & Wolk, 2005). In a review of observational studies on weight, Berkow and Barnard (2006) found that obesity prevalence rates tend to be far less in vegetarian populations (0-6%) than in non-vegetarian populations (5-45%). In a cross-sectional study of 55,459 healthy women, Newby et al. (2006) found the prevalence of overweight or obesity to be 29% in vegetarians and semivegetarians and 40% among omnivores. A long-term study of nearly 400,000 people in 10 European countries found that meat consumption was associated with weight gain in both men and women (Vergnaud et al., 2010). After adjusting for energy intake, a 250 g/d increase in meat consumption was estimated to result in two kg of weight gain after five years. The strength of the association between meat consumption was strongest for poultry, then processed and total meat, and finally, red meat.

U.S. Meat Consumption and Federal Dietary Recommendations

Meat consumption estimates. U.S. meat consumption can be estimated using two types of federal data sources: agricultural supply and dietary intake. The United States Department of Agriculture (USDA) Economic Research Service (ERS) maintains a database called the Loss-Adjusted Food Availability per Capita Data System (USDA

ERS, 2012). Based on agricultural supply data with adjustments for losses at the farm, retail, and consumer level, the database provides estimates of the amount of foods in the U.S. food supply available for consumption. The major limitation of this data source is that it is a proxy for intake rather than a direct estimate of intake. The second type of data source is the dietary intake interview component of the National Health and Nutrition Examination Survey (NHANES; CDC, 2015). NHANES data are obtained from 24-hour dietary recalls from a nationally representative sample. The USDA Agricultural Research Service maintains the Food Patterns Equivalents Databases, where summary data tables on consumption estimates (USDA ARS, 2014). Though having the advantage of being a direct estimate of consumption, one major limitation is that dietary recalls are known to suffer from underreporting. Specifically, studies assessing unbiased biomarkers of protein intake (i.e., urinary nitrogen), have found underreporting of protein intake in dietary recall data to be 11-15% (Subar et al., 2003).

Despite known limitations, these two types of data sources offer the best available estimates of U.S. per capita meat, protein foods, and protein consumption. The most recent consumption estimates for total meat range from 4.4 oz/d (2011-2012 NHANES dietary intake data) to 5.9 oz/d (2012 loss-adjusted agricultural supply data). For the Protein Foods Group, consumption estimates range from 6.2 oz-eq/d (2011-2012 NHANES dietary intake data) to 7.6 oz-eq/d (2012 loss-adjusted agricultural supply data). Protein intake is estimated at 79.9 g/capita (2011-2012 NHANES dietary intake data; there are no loss-adjusted agricultural protein supply data).

Federal dietary recommendations. Despite the growing body of evidence linking meat consumption (particularly of red and processed meats) to chronic diseases,

federal dietary recommendations lack specificity regarding meat consumption. However, two federal health initiatives, the Healthy People 2020 Objectives (HHS ODPHP, 2010) and the 2010 U.S. Dietary Guidelines for Americans (USDA & HHS, 2011), provide limited guidance on meat consumption.

Working with several federal agencies, the U.S. Department of Health and Human Services (HHS) publishes science-based health objectives for the nation. The Healthy People 2020 national objectives advised adults and children age 2 and older to reduce saturated fat and increase the amount and variety of fruits and vegetables in the American diet. Specifically, the Healthy People 2020 objectives aim to reduce the nation's saturated fat intake by 16% (from a baseline of 11.3% of daily caloric intake to a 2020 target of 9.5% of daily caloric intake)[4].

The most recent federal dietary guidelines, the 2010 U.S. Dietary Guidelines for Americans, was published in 2011 by the United States Departments of Agriculture (USDA) and Health and Human Services (HHS). Of relevance to the question of meat consumption, the 2010 Dietary Guidelines recommended that Americans decrease cholesterol and saturated fat intake (less than 10% of calories should be from saturated fat), eat a balanced variety of protein foods (e.g., seafood, lean meat and poultry, eggs, beans and peas, soy products, and unsalted nuts and seeds), replace some meat and poultry with seafood, replace protein foods that are high in solid fat[5] with those that are low in solid fat, and increase consumption of nutrient-dense fruits, vegetables, and whole

[4] A similar Healthy People 2010 objective prompted the creation of the Meatless Monday campaign as a way to reduce Americans' saturated fat intake.
[5] Solid fats are solid at room temperature and come from animal foods (e.g., butter, meat fat) or hydrogenated vegetable oils (e.g., margarine). There are generally high in saturated and/or trans fats.

grains (USDA & HHS, 2011). Importantly, the U.S. Dietary Guidelines did not include a recommendation about reducing meat consumption despite the Dietary Guidelines' Scientific Advisory Committee's 2010 (USDA & HHS, 2010) recommendation to adopt a plant-based diet with only "moderate amounts of lean meats, poultry, and eggs (p. 2) and the recently released 2015 Committee's (USDA & HHS, 2015) recommendation to reduce red and processed meat while increasing plant-based alternatives.

U.S. Dietary Guidelines form the basis of the MyPlate recommendations, which are intended to translate the recommendations into understandable messages for the American lay audience regarding healthy amounts and types of food. In the MyPlate food system, foods are categorized into five major food groups including fruits, vegetables, grains, dairy, and protein foods. The protein foods group includes red meat, poultry, seafood, eggs, beans, peas, processed soy products, nuts, and seeds. As a result, federal recommendations primarily exist for these protein-rich foods as a group, rather than meat specifically. For individuals consuming a 2,000-calorie diet, the 2010 Dietary Guidelines recommended consuming approximately 5.5 oz-eq/d from the Protein Foods Group; for meat specifically, the recommended range was 0 to 4.5 oz/d depending on dietary choice.

Consumption data comparisons with federal dietary recommendations. Federal dietary recommendations suggest that individuals consuming a 2,000- calorie diet should consume approximately 5.5 oz-eq/d from the Protein Foods Group with 0 to 4.5 oz/d coming from meat. Federal consumption estimates for the Protein Foods Group (6.2 – 7.6 oz-eq/d) and for total meat (4.4 – 5.9 oz/d), suggest that Americans well exceed these recommendations. The proportion of each type of food eaten within the Protein Foods Group also raises health concerns. Instead of consuming a balanced variety of

protein foods as recommended by the U.S. Dietary Guidelines, meat constitutes the majority of intake from the Protein Foods Group (71%, 2011-2012 NHANES dietary intake data; 78%, 2012 USDA loss-adjusted agricultural supply data). Furthermore, red and processed meat, the types of meat associated with the greatest health risks, make up the majority of the total meat consumed. Over half of the meat consumed in America is red meat (53%; 2012 USDA loss-adjusted agricultural supply data) and nearly a quarter of the meat consumed in America is processed (22% of the total meat; NHANES 2011-2012 data).

In sum, the average American diet exceeds federal nutritional requirements for protein, protein-rich foods, and meat. Meat constitutes the majority of consumption within the diverse Protein Foods Group, and red and processed meat in particular are consumed in high amounts. In order to improve public health and decrease the prevalence of chronic diseases in the U.S., the American diet must shift to one that is lower in meat.

Problem Statement Conclusion

Epidemiological evidence has increasingly implicated high meat consumption with health problems such as heart disease, certain cancers, diabetes, and obesity. Americans meet or exceed federal dietary recommendations for consumption from the MyPlate Protein Foods Group, but the high proportion of meat consumed, especially red and processed meat, raises public health concerns. Research-based campaigns that effectively encourage consumers to change their eating behaviors could result in better public health outcomes. Collectively, consumer choices can make a powerful financial impact on the market, demonstrating to producers and policy makers that consumers support healthy, sustainable diets that can meet the need of growing world population.

CHAPTER 2

LITERATURE REVIEW

Health Communication Campaigns

Health communication is "the study and use of communication strategies to inform and influence individual and community decisions that enhance health" (NCI, 2004, p. 2). Rogers and Story (1987) specified that a health communication *campaign* "(1) intends to generate specific outcomes or effects (2) in a relatively large number of individuals, (3) usually within a specified period of time, and (4) through an organized set of communication activities." (p. 821). Several steps are required prior to implementing a health communication campaign, including (a) defining goals, (b), defining the target audience, (c) creating messages, and (d) testing messages (NCI). Evaluation of campaign effectiveness during and after implementation is also critical to success (NCI). Campaigns goals typically center on influencing a specific health behavior, with the aim of reaching a wide audience through the use of mass media (NCI).

One major example of applied efforts to reduce meat consumption is the Meatless Monday campaign. Meatless Monday has a primary goal of improving public health and reducing environmental impact (Harris, 2009; Sheffield & Galvez, 2009). To accomplish these goals, the campaign encourages Americans to "cut out meat one day a week". Historically, Meatless Monday has been used during times of war to ensure the availability of key staples. During World War II, approximately 10 million families pledged to observe Meatless Monday. In 2003, the campaign was revitalized to address the Healthy People 2010 objective of reducing saturated fat and to reduce the prevalence of diet-related diseases in America. Now, the campaign has become a global movement

with participating individuals, schools and universities, restaurants, and worksites. Over 30 public schools of public health have backed the campaign. Though the campaign has been successful in terms of broad reach, using theory to design messages and testing the effectiveness of these messages could help the campaign strengthen its impact on health outcomes.

In the present study, the overall goal is to reduce the incidence of chronic diseases associated with high meat consumption. The target behavior is eating less meat and the target audience is Americans ages 25-44 who eat meat approximately once per day or more. The present study fits within the health campaign stage, creating and testing messages (NCI). Knowledge gained from this study can help campaigns aimed at reducing Americans' meat consumption to create effective messages. Campaign messages should be based on a theory (or theories) that explains how to persuade the target audience (NCI). The present study utilizes the Extended Parallel Process Model, a message design theory that explains the conditions under which fear appeals work or fail.

Previous Research on Reducing Meat Consumption

Reducing meat consumption is an important, yet understudied health behavior. Past research has examined perceived benefits and barriers to adopting a plant-based diet (Lea, Crawford & Worsley, 2006), benefits and barriers to adopting a vegetarian diet (Lea & Worsley, 2003), and vegetarians' dietary motivations (Fox & Ward, 2007; Haverstock & Forgays; Ruby, 2011). Several studies measured intention to reduce meat consumption and found individual characteristics that were useful predictors of intention, including having both positive and negative feelings about meat consumption (Berndsen & van der Pligt, 2005; Povery, Wellens, & Conner, 2001), belief in equality; de Boer,

Hoogland, & Boersema, 2007), valuing caring for nature (de Boer, Schosler, & Boersema, 2012), belief in climate change (de Boer, Schosler, & Boersema), and vegetarian cooking skills (Schosler, de Boer, & Boersema, 2011). Although these studies provided insight to the topic of reducing meat consumption, more research is needed on how best to implement public communication campaigns from a health perspective (Joyce, Dixon, Comfort, & Hallet, 2012).

One notable exception in the literature was Wyker and Davison's (2010) test of the Theory of Planned Behavior (TPB) on the context of adopting a plant-based diet. Using structural equation modeling, the authors found that increases in attitudes, subjective norms, and perceived behavioral control predicted increases in intention to adopt a plant-based diet in a college student audience. Wyker and Davison also assessed sex differences; females reported significantly higher favorable attitudes and intentions to adopt a plant-based diet. Males and females similarly rated subjective norms and perceived behavioral control, but females reported significantly higher positive attitudes and intentions toward adopting a plant-based diet. Both males and females indicated that better health and weight loss were the greatest advantages of adopting a plant-based diet and that nutritional deficiency and a lack of protein were the greatest disadvantages. Males were more concerned with poor taste and muscle loss while females were more concerned with nutrition, food variety, and food enjoyment. The findings from the study (a) underscored the need to focus on attitude change, changing perceptions of norms, and increasing perceptions of behavioral control (i.e., self-efficacy), (b) the need to focus messages on advantages such as health, weight loss, and nutritional advantages of a

plant-based diet, and (c) highlighted the potential utility of tailoring messages based on sex.

A preliminary research study (Fehrenbach, 2013) on reducing meat consumption used an experimental design to test website messages on a college student audience. Website content was informed by a message design theory, the Extended Parallel Process Model (EPPM), which stated that messages that elicit high levels of perceived threat combined with an efficacious response will result in message acceptance. Participants were randomly assigned to read one of three high threat/ high efficacy websites based on different contexts: health impacts, environmental impacts, or control (the control website content was about the Rolling Stones). Manipulation checks indicated that the health and environment messages produced greater perceptions of threat and efficacy than the control group, although the effect sizes were larger in the health group than the environment group. Results indicated that the health and environmental messages were significantly more persuasive than the control message and created favorable attitude change and intention to eat less meat. This study demonstrated that the EPPM was useful in guiding message design in the context of reducing meat consumption, offering support for the EPPM prediction that high-threat high-efficacy messages would result in message acceptance.

The Extended Parallel Processing Model

The primary goal of this investigation is to test health messages designed to encourage consumers to reduce meat consumption. The Extended Parallel Processing Model (EPPM; Witte, 1992) is a message design theory that furthers understanding of why fear appeal messages succeed or fail. Kim Witte proposed the EPPM in 1992 and

found support for the theory in 1994 with the first test of the EPPM in the context of HIV prevention. For the present study, message design was informed by the EPPM and adapted to fit the context of meat consumption. The key EPPM variables (including fear, threat, and efficacy), as well as EPPM associated outcomes, are outlined in the following sections. In addition, the current state of the EPPM, including a modification to the EPPM model, is described.

The first step in using the EPPM to guide message design is to define a goal, or a recommended response. In Witte's (1994) original test of the EPPM, for example, the goal was to motivate people to wear condoms in order to reduce HIV infection. Since then, the EPPM has been successfully applied to a wide variety of health behaviors, such as smoking cessation, drinking and driving, sunscreen use, and exercise promotion (Witte & Allen, 2000). It has also been applied to a wide variety of target audiences such as physicians (Roberto & Goodall, 2009), farmers (Witte et al., 1993), adolescents (Witte & Schösler, 1995), and African-Americans (Witte et al., 1998).

EPPM Variables. The main EPPM variables are fear, threat, and efficacy. There are two subdimensions each for the threat and efficacy variables. Severity and susceptibility constitute threat; response-efficacy and self-efficacy constitute efficacy.

Fear. Emotional experiences can be highly influential to decision making. Especially when faced with complex decisions in situations of uncertainty, cognition alone may be insufficient for decision-making; emotions can unconsciously provide information relevant to the decision-making process (Dunn, Dalgleish, & Lawrence, 2006). Emotions are considered to have important characteristics, including cognitive, affective, physiological, and behavioral responses (Mongeau, 2013). According to Witte

(1992), fear is a "negatively valenced emotion accompanied by a high level of arousal and is elicited by a threat that is perceived to be significant and personally relevant" (p. 331). This definition of fear noted the cognitive element (i.e., assessment of an environmental threat), the affective element (i.e., negative valence), and the physiological element (i.e., arousal) (Mongeau, 2013). Although this definition did not incorporate the behavioral characteristics of fear, in the EPPM, experiencing fear is what motivates an individual to take action (Witte & Allen, 2000).

Functional emotion theory specified that emotions have inherent adaptive function, are personally relevant, place individuals in specific states that influences them to take a specific type of action, and organize and motivate behavior (Nabi, 1999). Behavioral tendencies are adaptations that refer to the cognitive or physical activity that individuals are inclined to engage in when experiencing a specific emotion. These action tendencies assist goal achievement and are the "means by which the functions are realized" (Dillard, Plotnick, Godbold, Freimuth, & Edgar, 1996, p. 49). The action tendency of fear is flight (Kemeny & Shestyuk, 2008).

Threat. Threat is a key variable in the EPPM and is both a component of message design and measured as a perception. Researchers manipulate the level of threat by creating message content (typically through strong text and images) in order to generate fear. Observers of a message have perceptions of the level of the threat both pre- and post-message exposure. Perceived threat arises when an individual perceives a serious harm that he or she is likely to experience (Witte, 1992). Threat is comprised of two subdimensions: *severity* and *susceptibility*. Perceived severity refers to an individual's belief that the threat could cause serious harm (i.e., "Eating a diet high in meat is harmful

to my health"), whereas perceived susceptibility refers to an individual's belief that the threat is likely to cause harm (i.e., "It is likely that eating a diet high in meat will negatively impact my health").

Efficacy. Efficacy is another key EPPM variable that is both a component of message design and measured as a perception. Researchers manipulate the level of efficacy by creating message content, while observers of a message have perceptions of the level of the efficacy both pre- and post-message exposure. Efficacy is an individual's belief that a recommended behavior is effective in averting a threat and is feasible and easy to carry out (Witte, 1992). Efficacy is comprised of two subdimensions: *self-efficacy* and *response-efficacy*. Perceived self-efficacy refers to an individual's belief that her or she is able to carry out the recommended response (i.e., "I am able to eat less meat to help protect my health"). In order to have self-efficacy, an individual must not only have skills, but also have confidence or belief in having those skills (Bandura, 1997). Perceived *response-efficacy* is an individuals' belief that the recommended response will effectively avert a threat (i.e., "Eating a diet high in meat is an effective way to help protect my health").

Predicted outcomes. A full test of the EPPM includes four experimental conditions in which threat and efficacy are manipulated to create messages that are either (a) high threat/high efficacy (HTHE), (b) high threat/low efficacy (HTLE), (c) low threat/high efficacy (LTHE), or (d) low threat/low efficacy (LTLE). As a result of exposure to one of these four conditions, the EPPM proposed three potential outcomes: (a) message acceptance, (b) message rejection and (c) no response.

The EPPM proposed that high perceptions of threat generate fear and motivate an individual to respond, but the perceived level of efficacy changes the nature of that response. Under conditions of HTHE, the individual actively attempts to avert the threat through adaptive outcomes such as favorable attitudes toward the recommended behavior, intention to adopt the recommended behavior, and behavior change. This process is referred to as *danger control* and is expected to result in message success. Under conditions of HTLE, an individual perceives no way to address the threat, and addresses his or her fear through maladaptive outcomes such as assessing the message as manipulative, message derogation, or actively avoiding thinking about the threat. This process is referred to as *fear control* and is expected to result in message failure. Thus, the EPPM proposed a threat by efficacy interaction that explained the role of fear in fear appeals and described the conditions under which fear appeals either succeed or fail.

Danger control process and message acceptance. The EPPM proposed that exposure to a HTHE message would result in a danger control process (Witte, 1992). In a danger control process, the individual is exposed to a high threat health message and feels frightened or worried. This fear motivates him or her to seek a potential way to relieve this fear. However, the high efficacy perception changes the nature of the response to a cognitive process. In an attempt to control the danger (i.e., threat), the individual consciously accepts the recommended response by changing *attitudes* (how they feel about the recommended behavior), creating *intentions* to change behavior, and/or changing actual *behavior*.

Fear control process and message rejection. The EPPM proposed that exposure to a HTLE efficacy message would result in a fear control process (Witte, 1992). The

EPPM proposed that individuals exposed to a high threat message would experience fear. This fear will drive him or her to seek a potential way to relieve this fear. The low efficacy perception changes the nature of the response to a fear control process. If the message offers no way to address the threat (i.e., low efficacy), the individual will engage in an emotional, rather than cognitive, process in which he or she attempts to address the fear rather than the threat. In an attempt to relieve the fear, an individual could engage in maladaptive outcomes, such as *perceived manipulative intent, message minimization* and/or *defensive avoidance*. Perceived manipulative intent is a type of reactance and is the degree to which the individual perceived the message as manipulative (Witte, 1994). Message derogation is a type of reactance that assesses an individual's impressions of the message, specifically the degree to which the individual minimized the message content. Defensive avoidance refers to the degree to which an individual actively avoids processing the content of the message through inattentiveness (e.g., looking away) or suppression of thoughts (Witte, 1992).

No response. A final potential outcome possible in a full test of the EPPM model is no response. A lack of response is expected under low threat conditions (LTHE or LTLE). The EPPM proposed that threat generates the initial response, so if threat is too low, individuals have no motivation to pay attention to the message or the recommended behavior.

Potential modification to the EPPM: the additive model. The EPPM proposed a *multiplicative* threat by efficacy interaction, such that high threat fear appeals are only persuasive under conditions of high threat combined with high efficacy (Witte & Allen, 2000). In the EPPM, messages high in both threat and efficacy should elicit the greatest

persuasive effects, and the other three conditions should be equally unpersuasive (i.e., HTHE > HTLE = LTHE = LTLE) (Witte & Allen, 2000). Due to the interaction effect between threat and efficacy, Witte and Allen (2000) described the EPPM as a *multiplicative model*.

A modification to the EPPM, called the additive model, suggested a modification to the EPPM's danger control process. The additive model described an *additive* (rather than multiplicative) persuasive effect. Both the EPPM and the additive model predicted that the greatest persuasive effects occur under HTHE conditions. However, the additive model differed from the EPPM by stating that a high threat or high efficacy message *alone* could also produce persuasive effects, though these persuasive effects would not be as great as a message with both components. In the additive model, messages high in both threat and efficacy are still expected to achieve the greatest persuasive effects, but messages high in threat or efficacy alone should elicit greater persuasive effects than messages low in both threat and efficacy, i.e., HTHE > HTLE = LTHE > LTLE.

Meta-analysis. Witte and Allen (2000) conducted a meta-analysis of the fear appeal literature to (a) assess both danger control and fear control outcomes and (a) assess the fit of the data to both fear appeal models. Clarification on the fit of these models is important for persuasion theory because it would provide guidance regarding the expected outcomes associated with threat and efficacy components in campaign message design.

Main effects were found for individual message components on danger control variables. Results indicated that the stronger the message component (i.e., severity, susceptibility, self-efficacy, and response-efficacy), the stronger the favorable attitude,

intention, and behavior toward the recommended response. Effect sizes on the danger control outcomes are listed in Table 1.

In addition, a 2 x 2 analysis of variance assessing the four EPPM cells (i.e. high or low threat and high or low efficacy) showed main effects of threat ($\eta^2 = .22$) and efficacy ($\eta^2 = .13$) on persuasive effects[6]. Although no interaction effect between threat and efficacy was found for the traditional ANOVA, Witte and Allen continued with post hoc tests and reported the statistically significant pattern of means consistent with the additive model, i.e., HTHE > HTLE = LTHE > LTLE.

Finally, Witte and Allen examined two effects-coded models that represented the pattern of means expected with the EPPM (i.e., HTHE > HTLE = LTHE = LTLE) and the pattern of means expected with the additive model (i.e., HTHE > HTLE = LTHE > LTLE). Both statistical models fit the data. However, the pattern of means was consistent with the additive model, which suggested that a message with threat or efficacy alone is more persuasive than a message low in both threat and efficacy.

Table 1

Effect Sizes of EPPM Message Components on Danger Control Variables

		Severity	Susceptibility	Response-efficacy	Self-efficacy
Attitudes	*r*	.15	.12	.14	.12
Intention	*r*	.14	.17	.17	.17
Behavior	*r*	.13	.14	.13	.13

[6] For the ANOVA analysis, no further information on the definition of the dependent variable, "persuasive effects" was described.

Note: Data presented from Witte & Allen's (2000) meta-analysis (p. 599).

To assess fear control outcomes, Witte and Allen assessed the effects of the higher order variables, threat and efficacy (rather than the four sub-dimensions) on fear control variables. Fear control variables were treated as a single construct. Results indicated that the stronger the threat, the stronger the fear control response (r = .12); the weaker the efficacy, the greater the fear control response (r = - .11); and that fear control responses were negatively correlated with danger control responses (r = -.18). These results showed support for the EPPM claim that inclusion of an efficacy component can help reduce fear control outcomes.

Other assessments of the models. In a review of Witte and Allen's meta-analysis, Mongeau (2013) similarly noted that threat alone and efficacy alone (HTLE or LTHE) are more persuasive than the EPPM model predicts, which suggests that an additive model might provide a better description of the findings than the EPPM model.

Roberto and Goodall (2009) compared the EPPM and additive model in the context of primary care physicians' testing patients for kidney disease. This examination had mixed results. The group means in the initial behavioral intention measure followed the pattern expected by the additive model, but the group means in the initial behavior measure, the follow-up intention measure, and the follow-up behavior measure followed the pattern expected by the EPPM model.

Present Study

Using an experimental design, this research study will test the effectiveness of video messages designed to encourage Americans to reduce their meat consumption. The

video content will be guided by the EPPM. The proposed study seeks to extend the preliminary study (Fehrenbach, 2013) by answering questions about health campaign outcomes, including the effectiveness of a new medium (videos), the role of efficacy in message acceptance and rejection, whether an online intervention can influence actual behavior, and the effectiveness of messages on a new target population. Theoretical and practical findings from this type of research can lead to the implementation of effective, research-based health campaigns.

The experiment will be a posttest only design with a comparison and a control group. There will be two experimental conditions (HTHE video and HTLE video) and a no-message control group (LTLE). Adaptive outcomes (i.e., attitudes, intentions, and behavior) will be assessed for their fit with the additive model and the EPPM's danger control process. Maladaptive outcomes (i.e., perceived manipulative intent, message derogation, and defensive avoidance) will be assessed in terms of their fit with the EPPM's fear control process.

Threat. Both experimental conditions will contain a high threat message component, which should elicit perceptions of high threat. Thus, perceived threat should be greater in the experimental conditions than in the control group.

H_1: The high threat/ high efficacy and high threat/ low efficacy conditions will be equal to each other and greater than the control condition in levels of *threat* (i.e., HTHE = HTLE > Control).

Efficacy. The two experimental conditions will have a high threat message component combined with either a high or low efficacy message component. The high efficacy condition should elicit greater perceptions of efficacy than the low efficacy or

control conditions, and the low efficacy condition should elicit greater perceptions of efficacy than the control condition. Thus, the following hypothesis is proposed:

H_2: The high threat/high efficacy condition will be greatest in *efficacy*, followed by the high threat/ low efficacy condition, followed by the control condition (i.e., HTHE > HTLE > Control).

Danger control outcomes. In the context of meat consumption, the high threat message component will include credible information about the connection between negative health outcomes and high meat diets (severity), an explanation that their diet is high in meat (susceptibility), and images that capture attention and support the threat information. The high efficacy component will describe the positive health outcomes associated with diets low in meat (response-efficacy) and recommendations on how to eat less meat (self-efficacy). Thus, the HTHE meat consumption message is expected to engage the danger control process and lead to adaptive outcomes, including more favorable attitudes toward reducing meat, intentions to reduce meat consumption, and actual reduction of the amount of meat eaten.

The EPPM stated that adaptive outcomes occur only under conditions of high threat and high efficacy and all other conditions are equally less persuasive (i.e., HTHE > HTLE = LTHE = LTLE). The additive model stated that high threat or high efficacy *alone* would increase adaptive outcomes (i.e., HTHE > HTLE = LTHE > LTLE). The results of a meta-analysis of fear appeal studies (Witte & Allen, 2000) suggested that although the EPPM and the additive model both fit the data (the models are highly correlated), an examination of the pattern of means was more consistent with the additive model. In a review of Witte and Allen's meta-analysis, Mongeau (2013) similarly noted

that threat alone and efficacy alone are more persuasive than the EPPM model predicted. Roberto and Goodall's (2009) study found support for both models; the additive model was a better fit for one dependent variable (i.e., behavioral intentions in an initial survey) and the EPPM model was a better fit for the other three dependent variables (i.e., behavior in an initial survey and intentions and behavior in a follow-up survey). Further assessments of the EPPM and the additive model could offer clarification of the role of threat and efficacy in fear appeals and warrants further study.

There are no low threat experimental groups in the present study, so a full comparison of the additive and EPPM models is not possible. In both models, the HTHE group is expected to have the greatest persuasive effects. However, if the data are consistent with the additive model, the HTLE group (i.e., threat alone) will be significantly greater than the control group (i.e., LTLE) in adaptive outcomes. If the data are consistent with the EPPM, the HTLE group (i.e., threat alone) will not differ from the control group (i.e., LTLE) in adaptive outcomes. To assess the fit of these two models, two competing hypotheses are advanced for the danger control variables.

If the data are consistent with the additive model:

H_{3a}: The high threat/high efficacy condition will elicit the greatest *danger control outcomes* (i.e., attitudes, intentions, and behaviors), followed by the high threat/low efficacy condition, followed by the control condition (i.e., HTHE > HTLE > Control).

Alternatively, if the data are consistent with the EPPM:

H_{3b}: For *danger control variables* (i.e., attitudes, intentions, and behavior), the high threat/high efficacy condition will be greater than both the high

threat/low efficacy and control conditions, and the high threat/low efficacy and control conditions will be equal to one another (i.e., HTHE > HTLE = Control).

Fear control outcomes. Without an effective and easy way to avert the threat, individuals in exposed to a HTLE message are expected to reduce their fear through a fear control process. Observers of the message might believe that the message source was manipulative, believe the message was untrue or inflated, and/or purposely ignore the message. Therefore, the following hypothesis is proposed:

H_4: The high threat/low efficacy condition will elicit greater level*s* of *fear control outcomes* (i.e., perceived manipulative intent, message derogation, and/or defensive avoidance) than the high threat/high efficacy condition (i.e., HTLE > HTHE).

CHAPTER 3

METHOD

Overview

The purpose of this research study was to test messages designed to encourage consumers to make healthy dietary choices. The target population was Americans ages 25-44 that typically eat meat one or more times per day. Participant recruitment occurred via Qualtrics, Inc. Participants were randomly assigned to one of three conditions (two experimental and one control). Message design was informed by the Extended Parallel Processing Model (EPPM; Witte, 1992) and was designed to elicit perceptions of high threat combined with either high or low efficacy. Dependent variables were measured at Time 1 (immediate posttest) and Time 2 (one week posttest). Dependent variables measuring danger control outcomes included attitude toward reducing meat consumption, behavioral intention, and behavior change. Dependent variables measuring fear control outcomes included perceived manipulative intent, message derogation, and defensive avoidance. Please see Appendix A for the IRB approval letter.

Design

The experiment was a posttest only design with a comparison and a control group (see Table 2). Participants were randomly assigned to one of three groups: high threat/high efficacy (HTHE), high threat/low efficacy (HTLE), and a control group (see Table 3). Participants in the experimental conditions were exposed to one of two video messages. Dependent variables were measured at Time 1 (immediate posttest) and Time 2 (one week posttest).

Message design was informed by the Extended Parallel Processing Model (EPPM; Witte, 1992) and was designed to elicit perceptions of high threat combined with either high or low efficacy. The high threat/high efficacy group viewed a 7-minute video that informed viewers of the negative health effects of high meat consumption (high threat) and suggested easy ways to reduce their meat consumption (high efficacy). The recommended action was to reduce meat consumption; suggested methods for accomplishing this goal included eating smaller portion sizes of meat, eating more meatless meals, and/or choosing to go meatless on one or more days per week. See Appendix B for the full HTHE video script. The high threat/low efficacy health group viewed a 4-minute video containing the same information about the negative health effects of high meat consumption along with the recommended action to eat less meat, but only included a very minor efficacy component in the conclusion. See Appendix C for the full HTLE video script. See Table 4 for example video statements and accompanying images for the threat and efficacy variables. The control group completed the surveys at Time 1 and Time 2 but did not watch the video.

Table 2

Experimental Design

Random Assignment	Intervention	Immediate Posttest	One Week Posttest
R	X	O_1	O_2
R	X	O_1	O_2
R	-	O_1	O_2

Table 3

Experimental/Intervention Conditions

HTHE	HTLE	Control
High Threat High Efficacy	High Threat Low Efficacy	No-Message Control

Table 4

Example Video Statements and Accompanying Images for Threat and Efficacy Variables

Variable	Example Statements
Perceived severity	"Diets high in meat, especially red and processed meat, are linked to cancer, heart disease, and stroke. A meat-heavy diet can lead to higher body weight, obesity, and eventually, diabetes." (animated body cartoon demonstrating that a meat-heavy diet affects each of these health issues) "Numerous studies conducted by top institutions tracking hundreds of thousands of people have linked meat consumption with some of the leading causes of death in the U.S." (images of studies showing negative effects of meat consumption piling up)
Perceived susceptibility	"If you normally eat meat once a day, you're probably eating too much meat. And, if you eat meat more than once a day, you're probably eating *way* too much meat." (image of meal calendar) "Americans eat more protein, and meat in particular, than is recommended by federal dietary guidelines…. In this graph you can see from the red bar that we exceed the protein recommendation by about 1½ times. So, we have a lot of room in our diet to eat less meat." (image of protein bar chart)

Table 4 (continued)

Example Video Statements and Accompanying Images for EPPM Variables

Variable	Example Statements
Perceived response-efficacy	"The good news is, you don't have to cut out meat altogether. Even cutting back a little can boost your health." ("Would you consider a meatless meal?" image) "Eating less meat is a health behavior just like exercising. Every step counts. For example, if you go for a ten-minute walk a couple of times a week, that's good for your health. If you extend that walk to 30 minutes or walk every day, that's even better… It's the same with eating less meat. Every bite counts. You can start out by cutting out meat one day a week, or eating smaller portion sizes than you normally would." (animated walking cartoon, animated Meatless Monday image, images of plate and portion size)
Perceived self-efficacy	"If you're like most people, it would be hard to give up meat all together. But eating <u>less</u> meat is <u>easy</u> to do, and you don't have to be perfect at every meal. Many people like you have been successful at cutting back." (plate image showing healthy portion size of meat) "Here's how to begin: Take your usual meal, and eat a smaller portion of meat. Or, make a meatless meal, swapping out the meat for some veggies." (images of old meals with large portions of meat swapped for new meals with smaller portions of meat and images of meals with meatless alternatives)

Procedure

Qualtrics, Inc. handled participant recruitment and data collection. Qualtrics, Inc. works with partner companies that maintain national panels of over six million individuals in the United States. Study participants were anonymous to Qualtrics, Inc.

and the researcher. Qualtrics' partner companies held all identifying information and connected Time 1 and Time 2 responses with panel participant identification codes.

Study invitations were emailed to panel members who met the age criteria (25-44 years). After indicating informed consent, participants responded to screening questions. In addition to age, participants were included on the basis of dietary status (omnivore), frequency of meat consumption (at least 7 times per week), and sex (minimum of 40% for either sex). Those participants that met the inclusion criteria were randomly assigned to one of three groups: a HTHE video, a HTLE video, and a no-message control group. All three groups completed the Time 1 survey (immediate posttest assessment), which included the dependent variables, demographic, dietary, and other questions. During the Time 1 survey, Qualtrics, Inc. further excluded those participants who (a) were taking the survey on a mobile device and those participants who failed (b) an attention filter or a (c) survey duration check. Seven days later, participants who completed the Time 1 survey were invited to participate in the Time 2 survey, the one-week posttest assessment.

Participants

The basic demographic inclusion criteria were as follows: U.S. resident, 25-44 years of age, and consume meat at least 7 times per week. Participants were selected from a national panel of survey respondents based on these criteria. After meeting the inclusion criteria, Qualtrics, Inc. further excluded participants for the following reasons: (a) sex (after reaching a maximum of 60% for either sex), (b) taking the survey on a mobile device (the survey did not display optimally on a mobile device), (c) failing an attention filter (participants were asked to select a specific response to a question), and (d) completing the survey too quickly (the survey duration check was one-third the median

duration). In addition, the researcher excluded two participants from data analysis. One participant stated that he/or she was not able to view or hear the video, watched very little of the video, and typed in nonsensical important video points. The second participant stated that he/or she was not able to view or hear the video, didn't watch the video, and left the important video points blank. The final sample size was 373 at Time 1 and 153 at Time 2. The attrition rate was 59.0%.

The mean age was 34.42 years (*SD* = 5.38) for Time 1 participants and 35.77 years (*SD* = 4.84) for Time 2 participants. The sample included more females (Time 1 = 57.4%, Time 2 = 57.5%) than males (Time 1 = 42.6%, Time 2 = 42.5%). Regarding ethnicity, the majority identified themselves as not of Spanish, Hispanic, or Latino origin (Time 1 = 85.5%, Time 2 = 84.3%). The majority of the sample was White/Caucasian (Time 1 = 75.1%, Time 2 = 80.4%), but there was also a significant minority of Black/African-Americans (Time 1 =15.3%, Time 2 = 11.8%) and Asian or Asian Americans (Time 1 = 7.0%, Time 2 = 5.9%).

Pre-intervention, the average frequency of meat consumption was 13.64 out of a possible 21 meals (*SD* = 4.21) for Time 1 participants and 13.75 out of a possible 21 meals (*SD* = 4.26) for Time 2 participants. About half of the participants reported eating meat approximately 1-2 times per day on average (7-13 meals containing meat per week, Time 1 = 50.7%, Time 2 = 51.0%), while half of the participants reported eating meat 2-3 times per day on average (14-21 meals containing meat per week, Time 1 = 49.3%, Time 2 = 49.0%).

All demographic characteristics for the Time 1 and Time 2 participants, including age, sex, ethnicity, race, education level, household income, family structure, U.S. region of residence, and pre-intervention meat consumption frequency, can be found in Table 5.

Table 5

Demographic Characteristics of the Time 1 and Time 2 Samples

	Time 1 Sample N= 373		Time 2 Sample N = 153	
Demographic Characteristic	%	n	%	%
Age				
25-29 years	22.8	85	13.7	21
30-34 years	26.8	100	22.2	34
34-39 years	29.2	109	37.9	58
40-44 years	21.2	79	26.1	40
Sex				
Male	42.6	159	42.5	65
Female	57.4	214	57.5	88
Ethnicity				
Hispanic	11.0	41	13.1	20
Not Hispanic	85.5	319	84.3	129
Race				
White or Caucasian	75.1	280	80.4	123
Black or African American	15.3	57	11.8	18
Asian or Asian American	7.0	26	5.9	9
American Indian or Alaska Native	2.4	9	1.3	2
Native Hawaiian or Pacific Islander	0.8	3	1.3	2
Other	2.1	8	2.6	4
U.S. region of residence				
Northeast	19.1	70	19.1	29
Midwest	24.6	90	28.9	44
South	39.9	146	36.8	56
West	16.4	60	15.1	15
Family structure				
Single without children	27.6	101	23.5	36
Single with children	13.4	49	15.0	23
Married without children	10.4	38	12.4	19
Married with children	33.3	122	39.2	60
Partner without children	6.6	24	3.9	6
Partner with children	8.7	32	5.9	9

Table 5 (continued)

Demographic Characteristics of the Time 1 and Time 2 Samples

	Time 1 Sample N= 373		Time 2 Sample N = 153	
Demographic Characteristic	%	n	%	%
Education level				
Less than high school	3.8	14	2.6	4
High school or GED	21.0	77	22.2	34
Some College	30.0	110	28.8	44
2 year degree	13.6	50	17.0	26
4 year degree	21.8	80	22.2	34
Masters degree	8.4	31	5.2	8
Doctoral degree	0.5	2	1.3	2
Professional degree	0.8	3	0.7	1
Household income				
< 30K	32.0	117	27.0	41
30-39K	13.9	51	11.2	17
40-43K	9.8	36	9.2	14
50-59K	9.8	36	13.2	20
60-69K	9.3	34	9.9	15
70-79K	6.0	22	9.2	14
80-89K	4.6	17	5.9	9
90-99K	6.0	22	5.9	9
>100K	8.5	31	8.6	13
Pre-intervention frequency of meat consumption				
7-13 meals per week	50.7	189	51.0	78
14-21 meals per week	49.3	184	49.0	75

Instrumentation

The independent variable was condition, i.e., HTHE, HTLE, or Control. Dependent variables measuring danger control outcomes (attitude change, intention to reduce meat consumption, and self-reported behavior) and fear control outcomes (perceived manipulative intent, message derogation, and defensive avoidance) and reliability coefficients are listed in Table 6. Attitudes and behavioral intentions were measured post-intervention at Time 1 and Time 2; behaviors were measured at Time 2,

the one-week follow up. Please see Appendices D and E for Time 1 and Time 2 surveys respectively.

Demographic variables. Participants provided demographic information including age, sex, ethnicity, race, education level, household income, family structure, and U.S. region of residence. Dietary information included dietary status (vegan, vegetarian, pescatarian, or omnivore) and frequency of meat consumption.

Threat and efficacy. In a review of EPPM literature, Popova (2012) noted that threat and efficacy are conceptualized as higher-order constructs each with two subdimensions (i.e., severity and susceptibility comprise threat; self-efficacy and response-efficacy comprise efficacy). Three items for each subdimension were used to measure severity, susceptibility, self-efficacy, and response-efficacy. These items were based on Witte et al.'s (1996) Risk Behavior Diagnostic Scale and were measured on a 5-point Likert-type scale (1 = strongly disagree, 5 = strongly agree). All four subdimension scales achieved good reliability.

Severity. Perceived *severity* is "an individual's beliefs about the seriousness of the threat" (Witte, 1992, p. 332). Severity was measured using two of Witte et al.'s (1996) severity key words (*severe* and *serious*) and an additional keyword, *harmful*. Three items were used to measure severity, e.g., 'In the long run, eating a diet high in meat is a severe threat to my health' ($\alpha = .93$).

Susceptibility. Perceived *susceptibility* is "an individual's beliefs about his or her chances of experiencing the threat" (Witte, 1992, p. 332). Susceptibility was measured using two of Witte et al.'s (1996) susceptibility key words (*likely* and *possible*) and an additional phrase, "*increases my chances*". Three items were used to measure

susceptibility, e.g., 'It is likely that eating a diet high in meat will negatively impact my health' (α = .89).

Self-efficacy. Perceived *self-efficacy* is "an individual's belief in his or her ability to perform the recommended response" (Witte, 1992, p. 332). Self-efficacy was measured using two of Witte et al.'s (1996) self-efficacy key words (*easy* and *able*) and an additional keyword, "*simple*". Three items were used to measure self-efficacy, e.g., 'Eating less meat is a simple way for me to help protect my health' (α = .79).

Response-efficacy. Perceived *response-efficacy* is "an individual's beliefs as to whether a response effectively prevents the threat" (Witte, 1992, p. 332). Response-efficacy was measured using two of Witte et al.'s (1996) response efficacy key words/phrases (*effective* and *less likely to get*) and an additional keyword, "*helps*". Three items were used to measure response-efficacy, e.g., "Eating less meat is an effective way to help protect my health" (α = .92).

Calculating threat and efficacy. When calculating threat and efficacy, EPPM researchers have typically added the two threat subdimensions (severity and susceptibility) together to create a higher-order threat variable and added the two efficacy subdimensions (response-efficacy and self-efficacy) to create a higher-order efficacy variable (Popova, 2012). Popova explained that this assumption of the relationship between the sub dimensions is problematic. For example, summing the subdimensions would not accurately represent a threat that is extremely harmful (high severity), but not at all likely to occur (no susceptibility). Summing these sub-dimensions would result in a positive score, whereas multiplying the sub dimensions would result in a score of zero. A

score of zero would be a better fit because without any likelihood of occurrence, there can be no perception of threat.

In the present study, the higher-order constructs, threat and efficacy, were conceptualized as a product of the two subdimensions rather than a sum. This is the procedure used by Rimal and Real (2003) and suggested by Popova. After averaging each three-item scale, the severity and susceptibility variables were multiplied together to create the higher-order threat variable, while the response-efficacy and self-efficacy variables were multiplied together to create the higher-order efficacy variable. Since the scales for the each subdimension ranged from 1-5, the means for threat and efficacy had a potential range of 1-25.

Danger control outcomes. The EPPM indicates that favorable attitudes toward the recommended behavior, behavioral intention, and behavior change are expected to occur when an individual is engaged in a danger control process created by a high threat/high efficacy message. The additive model suggests that the danger control process also occurs under conditions with high threat and/or high efficacy. Attitudes and intentions were measured at Time 1 and Time 2; behavior was measured at Time 2.

Attitude. An *attitude* is a "learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object" (Fishbein & Azjen, 1975). In this case, the given object is the recommended behavior. Attitudes toward the recommended behaviors were measured using seven 5-point semantic differential items. Witte (1994) originally used six semantic differential items to measure attitudes and found good reliability at both an immediate posttest ($\alpha = .82$) and at a six-week follow up ($\alpha = .84$).

Attitude toward the recommended behavior was measured using seven five-point semantic differential items and achieved good reliability (Time 1, α = .96; Time 2, α = .96). Identical scales were used at Time 1 and Time 2. Participants responded to the phrase, 'Changing my diet to eat less meat is:' followed by the following five-point semantic differential items: 'very bad—very good, very disadvantageous—very advantageous, very undesirable—very desirable, very negative—very positive, very harmful—very beneficial, very unimportant—very important, very useless—very useful'. The first three semantic differential items were taken from Witte's (1994) study and the last four were added because they fit the context well.

Behavioral intention. *Behavioral intention* is formed by attitudes and subjective norm beliefs about the recommended behavior (Fishbein & Azjen, 1975). In the context of this study, intention referred to performing the recommended behavior to eat less meat. The three intention items were adapted from Witte's (1994) study and were measured on a 5-point scale (1 = strongly disagree, 5 = strongly agree). The Time 1 and Time 2 intention items were equivalent, with differences in the time reference: e.g., 'In the next seven days, I intend to eat less meat' (Time 1, α = .97) and 'Over the next 6 months, I intend to eat less meat' (Time 2, α = .98). In addition, three single item statements measured specific strategies for reducing meat consumption, i.e., '[In the next seven days/over the next 6 months], I will (a) eat smaller portion sizes of meat than usual, (b) eat more meatless meals than usual, and (c) cut out meat on one or more days.

Behavior change. *Behavior change* was measured at Time 2, the one-week follow up. Behavior refers to the actual performance of the recommend response (to eat less meat). The single-item measure for self-reported behavior was similar to the

intention items and measured change in the amount of meat consumed. Participants chose one of three responses: 'In the past seven days, [I ate less meat than usual/the amount of meat I ate remained the same/I ate more meat than usual]'.

As a follow-up, participants who had indicated they ate less meat in the past 7 days were asked whether they used specific strategies to eat less meat, e.g., smaller portion sizes, more meatless meals and/or more meatless day(s). For each of these strategies, those participants who had indicated that they had used each strategy were asked to indicate the number of meals they choose to eat smaller portion sizes (0-21), the number of meatless meals they chose to eat (0-21), and/or the number of days they chose to cut out meat (0-7)[7].

Behavior change was also measured as a reduction in the *frequency* of meat consumption, a proxy for eating less meat. Participants indicated how many meals they ate containing meat in the past 7 days for breakfast (0-7), lunch (0-7), and dinner (0-7). The weekly total of frequency of meat consumption ranged from 0-21 meals per week and was measured at Time 1 (pre-intervention) and at Time 2. As a result, two measures were available for analysis of behavior change: (a) *meat consumption frequency* (Time 2) and (b) *change in meat consumption frequency* (Time 2 – Time 1).

Fear control outcomes. Perceived manipulative intent, message derogation, and/or defensive avoidance are expected to occur when an individual is engaged in a fear control process created by a high threat/low efficacy message. All three variables were measured at Time 1. Defensive avoidance was also measured at Time 2; Witte (1994)

[7] The use of this progressive skip pattern resulted in too few participants to appropriately compare groups using inferential statistics. As such, only descriptive statistics were reported in the results section for the strategies measure.

recommended delaying the measurement of defensive avoidance until the Time 2 measure, since thought suppression can occur over the long term. Only participants in the experimental groups responded to the fear control measures because the measures are operationalized as a reactance to a message (and the control group was not exposed to a message).

Manipulative intent. Perceived *manipulative intent* is a type of reactance and is the degree to which the individual perceived the message as manipulative (Witte, 1994). Items were based on Witte's (1994) study. Perceived manipulative intent was measured with three items on a 5-point scale (1 = strongly disagree, 5 = strongly agree), e.g., 'The video deliberately tried to manipulate my feelings' (Time 1, $\alpha = .94$).

Message derogation. Message derogation is a type of reactance that assesses an individual's impressions of the message, specifically the degree to which the individual minimized the message content. Message derogation was based on Witte's (1994) study and was measured using four 5-point semantic differential items that asked the participants how they felt about the information in the video, i.e., the degree the information was 'distorted,' 'overblown,' 'exaggerated,' or 'overstated' (Time 1, $\alpha = .91$).

Defensive avoidance. Defensive avoidance refers to the degree to which an individual actively avoids processing the content of the message through inattentiveness (e.g., looking away) or suppression of thoughts (Witte, 1992). Defensive avoidance was measured at Time 1 and Time 2 with three items on a 5-point scale (1 = strongly disagree, 5 = strongly agree). The items were equivalent at Time 1 and Time 2, e.g., 'When watching the video, my first instinct was to avoid thinking about the negative effects of

meat consumption' (Time 1, α = .88) and 'In the past 7 days, I avoided thinking about the negative effects of meat consumption' (Time 2, α = .89).

Table 6

Dependent Variables and Reliability Coefficients

	Number of Items	σ
Time 1 Dependent Variables		
Threat		
Severity	3	.93
Susceptibility	3	.89
Efficacy		
Self-efficacy	3	.79
Response-efficacy	3	.92
Danger Control Outcomes		
Attitudes	7	.96
Intentions in next 7 days – less meat	3	.97
Intentions in next 7 days – smaller portions	1	-
Intentions in next 7 days – meatless meals	1	-
Intentions in next 7 days – meatless days	1	-
Fear Control Outcomes		
Message derogation	3	.91
Manipulative intent	3	.94
Defensive avoidance	3	.88
Time 2 Dependent Variables		
Danger Control Outcomes		
Attitudes	7	.96
Intentions over next 6 months – less meat	3	.98
Behavior change last 7 days – ate more, same, or less meat		
Behavior proxy last 7 days – meat consumption frequency	1	-
Behavior proxy last 7 days – change in meat consumption frequency (Time 2 – Time 1)	1	-
Fear Control Outcomes		
Defensive avoidance	3	.89

Other measures. Participants in the two experimental conditions responded to additional questions so that the researcher could assess whether they had been properly exposed to the message. Immediately after viewing the video, participants were asked in an open-ended question to identify the three most important points from the video. In addition, they were asked two closed-ended questions: whether they could hear and view the video okay, and how carefully they watched the video.

CHAPTER 4

RESULTS

Threat and Efficacy

Hypothesis one predicted that both experimental messages would be equal to each other and greater in levels of threat than the control group. Hypotheses two predicted that the HTHE condition would be greatest in efficacy, followed by the HTLE condition, followed by the control condition. Two one-way ANOVAs were used to test for group differences. The independent variable, message type, had three levels: HTHE, HTLE, and Control. The omnibus F test was significant for the dependent variables, threat and efficacy. Follow-up LSD pairwise comparisons indicated that the pattern of means was consistent with both hypotheses, i.e., HTHE = HTHE > Control for threat and HTHE > HTLE > Control for efficacy[8]. Table 7 presents the ANOVA results for each of the dependent variables, Table 8 presents the pairwise comparisons, and Table 9 presents the means and standard deviations of the dependent variables for each message type.

[8] Efficacy was conceptualized as a product of self-efficacy and response-efficacy (Popova, 2012; Rimal & Real, 2003). When analyzed as an individual variable, the pattern of means for response-efficacy was also consistent with the hypothesis, i.e., HTHE > HTLE > Control. When self-efficacy was analyzed as an individual variable, the high threat/high efficacy condition was not significantly greater than the high threat/low efficacy group ($p = .10$); however, self-efficacy was significantly greater in both the high threat/high efficacy and high threat/low efficacy conditions when compared to the control groups ($p < .001$), i.e., HTHE = HTLE > Control.

Table 7

One-Way ANOVAs for Threat and Efficacy Variables

Dependent Variable	*df*	*F*	*p*	η^2
Threat***	2,365	57.67	< .001	.24
Severity***	2,365	55.27	< .001	.23
Susceptibility***	2,365	48.79	< .001	.21
Efficacy***	2,365	38.23	< .001	.17
Self-efficacy***	2,365	20.64	< .001	.10
Response-efficacy***	2,365	34.94	< .001	.20

Note: *p < .05, **p < .01, and ***p < .001 indicate a significant ANOVA. Threat was conceptualized as a product of severity and susceptibility; efficacy was conceptualized as a product of self-efficacy and response-efficacy.

Table 8

Post Hoc Tests for Threat and Efficacy Variables

Dependent Variable	Pairwise Comparisons	*p*
Threat***	HTHE = HTLE	.49
	HTHE > Control	< .001
	HTLE > Control	< .001
Severity***	HTHE = HTLE	.44
	HTHE > Control	< .001
	HTLE > Control	< .001
Susceptibility***	HTHE = HTLE	.40
	HTHE > Control	< .001
	HTLE > Control	< .001
Efficacy***	HTHE > HTLE	.04
	HTHE > Control	< .001
	HTLE > Control	< .001
Self-efficacy***	HTHE = HTLE	.10
	HTHE > Control	< .001
	HTLE > Control	< .001
Response-efficacy***	HTHE > HTLE	.049
	HTHE > Control	< .001
	HTLE > Control	< .001

Note: *$p <$ .05, **$p <$ .01, and ***$p <$ .001 indicate a significant ANOVA. Pairwise comparisons were assessed using LSD post hoc tests. Significance levels reported are one-tailed.

Table 9

Means and Standard Deviations of Threat and Efficacy Variables for Each Condition

Time 1 Dependent Variable		High Threat High Efficacy *n* = 120	High Threat Low Efficacy *n* = 124	No Message Control *n* = 124
Threat***	*M*	16.36	16.34	9.30
	SD	6.27	6.19	5.39
Severity***	*M*	3.86	3.88	2.73
	SD	.96	.95	1.02
Susceptibility***	*M*	4.08	4.05	3.15
	SD	.81	.80	.92
Efficacy***	*M*	16.33	15.07	10.47
	SD	5.88	5.70	4.99
Self-efficacy***	*M*	3.86	3.72	3.19
	SD	.89	.84	.83
Response-efficacy***	*M*	4.10	3.92	3.10
	SD	.81	.88	.96

Note: *$p <$ .05, **$p <$ .01, and ***$p <$ .001 indicate a significant ANOVA. The means for severity, susceptibility, self-efficacy, and response-efficacy could range from 1 to 5. Threat was conceptualized as a product of severity and susceptibility; efficacy was conceptualized as a product of self-efficacy and response-efficacy. The means for these higher-order variables could range from 1 to 25.

Danger Control Outcomes

Hypothesis 3 advanced two competing hypotheses for the danger control outcomes. Hypothesis 3a proposed that the pattern of means would be consistent with the additive model, i.e., HTHE > HTLE > Control; while hypothesis 3b proposed that the pattern of means would be consistent with the EPPM, i.e., HTHE > HTLE = Control. One-way ANOVAs were used to test for group differences. The independent variable, message type, had three levels: HTHE, HTLE, and Control. Message success was

assessed with danger control dependent variables including favorable attitudes and several measures of behavioral intention and behavior change. The dependent variables at Time 1 were attitudes and intentions in the next seven days. The dependent variables at Time 2 were attitudes, intentions over the next six months, and behavior change in the past 7 days. For all significant omnibus ANOVAS, follow-up LSD tests were used to examine pairwise differences among the means.

Time 1 outcomes. Dependent variables at Time 1 included attitude toward eating less meat and intentions to eat less meat in the next seven days (i.e., to eat less meat in general, to eat smaller portion sizes of meat, to eat more meatless meals, and to eat more meatless days). Omnibus ANOVA results for all Time 1 dependent variables were significant. The pattern of means followed the expected direction of the additive model for attitudes, intention to eat less meat, intention to eat smaller portion sizes, and intention to eat more meatless meals, but not intention to cut out meat on one or more days. However, for all Time 1 dependent variables, the HTHE groups were not significantly greater than the HTLE groups, i.e., HTHE = HTLE > Control. Thus, partial support was found for Hypothesis 3, the additive model. Table 10 presents the ANOVA results for each of the dependent variables, Table 11 presents the pairwise comparisons, and Table 12 presents the means and standard deviations of the dependent variables for each message type.

Table 10

One-Way ANOVAs for Time 1 Danger Control Variables

Dependent Variable	*df*	*F*	*p*	η^2
Attitude**	2,365	30.06	< .001	.14
Intention – Next 7 Days***	2,364	35.01	< .001	.16
Intention – Next 7 Days Smaller Portions***	2,364	21.55	< .001	.11
Intention – Next 7 Days More Meatless Meals***	2,364	16.97	< .001	.09
Intention – Next 7 Days More Meatless Day(s) ***	2,364	12.58	< .001	.07

Note: *$p <$ .05, **$p <$ .01, and ***$p <$ .001 indicate a significant ANOVA. Intention to Eat Smaller Portion Sizes failed the homogeneity of variances assumption. However, a Welch one-way ANOVA, which does not assume homogeneity of variances, yielded identical results: $F(2,364) = 21.55$, $p < .001$.

Table 11

Post Hoc Tests for Time 1 Danger Control Variables

Dependent Variable	Pairwise Comparisons	*p*
Attitude**	HTHE = HTLE	.28
	HTHE > Control	< .001
	HTLE > Control	< .001
Intention – Next 7 Days***	HTHE = HTLE	.06
	HTHE > Control	< .001
	HTLE > Control	< .001
Intention – Next 7 Days Smaller Portions***	HTHE = HTLE	.08
	HTHE > Control	< .001
	HTLE > Control	< .001
Intention – Next 7 Days More Meatless Meals***	HTHE = HTLE	.15
	HTHE > Control	< .001
	HTLE > Control	< .001
Intention – Next 7 Days More Meatless Day(s) ***	HTHE = HTLE	.32
	HTHE > Control	< .001
	HTLE > Control	< .001

Note: *$p <$ .05, **$p <$ .01, and ***$p <$ .001 indicate a significant ANOVA. Pairwise comparisons were assessed using LSD post hoc tests. Significance levels reported are one-tailed.

Table 12

Means and Standard Deviations of Time 1 Danger Control Variables for Each Condition

Time 1 Dependent Variable		High Threat High Efficacy *n* = 119	High Threat Low Efficacy *n* = 124	No-Message Control *n* = 124
Attitude**	*M*	3.90	3.84	3.16
	SD	.83	.81	.86
Intention – Next 7 Days***	*M*	3.69	3.46	2.57
	SD	1.05	1.13	1.12
Intention – Next 7 Days Smaller Portions***	*M*	3.75	3.55	2.85
	SD	1.06	1.08	1.21
Intention – Next 7 Days More Meatless Meals***	*M*	3.37	3.21	2.54
	SD	1.16	1.24	1.14
Intention – Next 7 Days More Meatless Day(s) ***	*M*	3.35	3.43	2.73
	SD	1.23	1.17	1.23

Note: *$p <$ .05, **$p <$ .01, and ***$p <$ .001 indicate a significant ANOVA. The HTHE group mean for attitudes was 120.

Time 2 outcomes. Dependent variables at Time 2 included attitude toward eating less meat, intentions to eat less meat over the next six months (i.e., to eat less meat in general, to eat smaller portion sizes of meat, to eat more meatless meals, and to eat more meatless days), and behavior change in the past seven days (i.e., eat more, same, or less meat; meat consumption frequency; and change in meat consumption frequency)[9]. The omnibus ANOVAs were significant for attitudes, intentions, and eating more, same, or less meat. The omnibus ANOVAs were not significant for meat consumption frequency or change in meat consumption frequency. For the dependent variables with significant ANOVAs, the pattern of means followed the expected direction of the additive model. However, the HTHE groups were not significantly greater than the HTLE groups for attitudes, intentions to eat less meat, intention to eat smaller portion sizes of meat, and intention to eat more meatless days, i.e., HTHE = HTLE > Control. For intention to eat more meatless meals, the pattern of means was significant for all mean comparisons in the additive model, i.e., HTHE > HTLE > Control. Thus, partial support was found for Hypothesis 3a, the additive model. Table 13 presents the ANOVA results for each of the dependent variables, Table 14 presents the pairwise comparisons, and Table 15 presents the means and standard deviations of the dependent variables for each message type.

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[9] In the behavior measures of specific strategies for eating less meat, the use of a progressive skip pattern resulted in too few participants to appropriately compare groups using inferential statistics (degrees of freedom was 10 in the control group). As such, only descriptive statistics were reported for the Time 2 behavioral measure of eating smaller portion sizes, eating more meatless meals, and cutting out meat on one or more days. For the 105 Time 2 participants who were in the experimental groups, 53 stated that they ate less meat than usual in the past seven days. Of those 53, 41 stated that they ate smaller portion sizes of meat, 49 stated that they ate more meatless meals, and 43 stated that that they cut out meat on one or more days. For the 48 Time 2 participants who were in the control group, 10 stated that they ate less meat than usual; of those 10, 9 ate smaller portion sizes, 8 ate more meatless meals, and 8 cut out meat on one or more days.

Table 13

One-Way ANOVAs for Time 2 Danger Control Variables

Dependent Variable	*df*	*F*	*p*	η^2
Attitude***	2,150	8.59	< .001	.10
Intention – Next 6 Months***	2,150	8.14	< .001	.10
Intention – Next 6 Months Smaller Portions**	2,150	6.74	< .01	.08
Intention – Next 6 Months More Meatless Meals***	2,150	9.04	< .001	.11
Intention – Next 6 Months More Meatless Day(s)***	2,150	9.88	< .001	.12
Behavior – Last 7 Days Ate More, Same, or Less Meat**	2,150	4.96	< .01	.06
Behavior Proxy – Last 7 Days Meat Frequency	2,149	1.14	.32	.02
Behavior Proxy – Last 7 Days Meat Frequency Change (Time 2 - Time 1)	2,149	1.18	.31	.02

Note: *p < .05, **p < .01, and ***p < .001 indicate a significant ANOVA. Four Time 2 dependent variables failed the homogeneity of variances assumption. However, a Welch one-way ANOVA, which does not assume homogeneity of variances, yielded identical results: Intention, $F(2,150) = 8.14$, $p < .001$; Intention – Smaller Portion Sizes, $F(2,150) = 6.74$, $p < .01$; Intention – More Meatless Days, $F(2,150) = 9.88$, $p < .001$; Behavior - Ate More, Same, or Less Meat, $F(2,150) = 4.96$, $p < .01$.

Table 14

Post Hoc Tests for Time 2 Danger Control Variables

Dependent Variable	Pairwise Comparisons	*p*
Attitude***	HTHE = HTLE	.28
	HTHE > Control	< .001
	HTLE > Control	< .001
Intention – Next 6 Months***	HTHE = HTLE	.24
	HTHE > Control	< .001
	HTLE > Control	< .001
Intention – Next 6 Months Smaller Portions**	HTHE = HTLE	.44
	HTHE > Control	< .01
	HTLE > Control	< .001
Intention – Next 6 Months More Meatless Meals***	HTHE > HTLE	.02
	HTHE > Control	< .001
	HTLE > Control	< .01
Intention – Next 6 Months More Meatless Day(s)***	HTHE = HTLE	.10
	HTHE > Control	< .001
	HTLE > Control	< .001
Behavior – Last 7 Days Ate More, Same, or Less Meat**	HTHE = HTLE	.49
	HTHE > Control	< .01
	HTLE > Control	< .01
Behavior Proxy – Last 7 Days Meat Frequency	Non-significant ANOVA	-
Behavior Proxy – Last 7 Days Meat Frequency Change (Time 2 - Time 1)	Non-significant ANOVA	-

Note: *$p <$ .05, **$p <$ .01, and ***$p <$ .001 indicate a significant ANOVA. Pairwise comparisons were assessed using LSD post hoc tests. Significance levels reported are one-tailed.

Table 15

Means and Standard Deviations of Time 2 Danger Control Variables for Each Condition

Time 2 Dependent Variable		High Threat High Efficacy $n = 46$	High Threat Low Efficacy $n = 59$	No Message Control $n = 48$
Attitude	*M*	3.78	3.68	3.10
	SD	.77	.86	.97
Intention – Next 6 Months	*M*	3.71	3.54	2.78
	SD	1.12	1.01	1.46
Intention – Next 6 Months Smaller Portions	*M*	3.70	3.73	3.00
	SD	.99	.93	1.41
Intention – Next 6 Months More Meatless Meals	*M*	3.67	3.22	2.67
	SD	1.12	1.15	1.29
Intention – Next 6 Months More Meatless Day(s)	*M*	3.78	3.49	2.75
	SD	1.03	1.04	1.42
Behavior – Last 7 Days Ate More, Same, or Less Meat	*M*	-.48	-.47	-.19
	SD	.59	.54	.45
Behavior Proxy – Last 7 Days Meat Frequency	*M*	11.72	10.66	11.83
	SD	3.94	4.78	4.53
Behavior Proxy – Last 7 Days Meat Frequency Change (Time 2 - Time 1)	*M*	-2.11	-3.16	-1.92
	SD	4.38	4.51	4.61

Notes: $*p < .05$, $**p < .01$, and $***p < .001$ indicate a significant ANOVA. Means for the meat consumption measure, ate more (= 1), same (= 0), or less meat (= -1), had a possible range of -1 to 1. Means for the meat consumption proxy measure, Time 2 meat frequency, could range from 0-21 meals in the last 7 days. Means for the meat frequency change (Time 2 – Time 1) measure had a possible range of -21 to 14. The meat frequency measure could range from 7-21 meals per week at Time 1, so participants could potentially reduce their meat consumption frequency by up to 21 meals per week and increase their meat consumption frequency by up to 14 meals per week.

Fear Control Outcomes

Hypotheses 4 predicted that the HTLE condition would elicit greater levels of fear control outcomes than the HTHE condition, i.e., HTLE > HTHE. Independent samples *t*-tests were used to test for group differences, comparing the HTHE and HTLE groups. The independent variable was message type, HTHE or HTLE. The dependent variables were Time 1 message derogation, Time 1 perceived manipulative intent, and Time 1 and Time 2 defensive avoidance. Though the group means followed the expected direction for all four dependent variables, those differences were not found to be statistically significant. Thus, Hypothesis 4 was not supported. Table 16 presents the results of the *t*-tests, along with the means and standard deviations of the dependent variables for both conditions.

Table 16

T-tests, Means, and Standard Deviations of Fear Control Variables for the Experimental Conditions

	t-tests			Means and Standard Deviations		
Dependent Variable	*t*	*df*	*p*		High Threat High Efficacy	High Threat Low Efficacy
Time 1 – Message derogation	-1.52	241	.07	*M* *SD* *n*	2.54 1.06 119	2.75 1.06 124
Time 1 – Manipulative intent	-1.65	241	.05	*M* *SD* *n*	2.31 .99 119	2.53 1.08 124
Time 1 – Defensive avoidance	-.74	241	.23	*M* *SD* *n*	2.40 .94 119	2.49 .98 124
Time 2 – Defensive avoidance	-.24	87	.40	*M* *SD* *n*	2.60 1.05 40	2.65 1.00 49

Note: The *t*-tests did not indicate statistically significant differences between the group means.

CHAPTER 5

DISCUSSION

The purpose of this study was to examine the utility of the Extended Parallel Process Model (EPPM) in guiding message design for a new health context, reducing meat consumption. The target population was Americans ages 25-44 that typically eat meat one or more times per day. The experiment was a posttest only design with a comparison and a control group (see Table 2). Participants were randomly assigned to one of three groups: high threat/high efficacy (HTHE), high threat/low efficacy (HTLE), and a control group (see Table 3). Participants in the experimental conditions were exposed to one of two video messages. Dependent variables were measured at Time 1 (immediate posttest) and Time 2 (one week posttest).

EPPM and Message Design

This study found that both videos (HTHE and HTLE) induced intended levels of EPPM variables (perceptions of threat and efficacy), as well as adaptive outcomes (attitude change, behavioral intention, and behavior). The EPPM was useful in guiding message design the new context of reducing meat consumption; the results supported the EPPM prediction that HTHE messages would result in message acceptance. Compared to the control group, participants who watched either video reported more positive attitudes, short- and long-term intention to eat less meat, and the behavior of eating less meat in the short-term.

A major aim of the study was to assess the fit of the data with the EPPM and the additive model. If the data had fit the EPPM, the HTHE message would be the most persuasive and the HTLE message and control group would be equal to each other. If the

data had fit the additive model, the HTHE would be the most persuasive, followed by the HTLE message, followed by the control group. The results did not fully fit either model; both videos were equally persuasive and resulted in greater message acceptance (attitude change, behavioral intention, behavior) than the control group. Because the HTLE group was more persuasive than the control group, the data more closely fit the additive model. This is consistent with the results of Witte and Allen's (2000) meta-analysis and Roberto and Goodall's (2009) results with respect to an initial behavior measure in the context of kidney disease testing; both found that the data fit the additive model better.

The finding that both videos were equally persuasive was an unexpected outcome. According to both the EPPM and the additive model, the HTHE video should have been more persuasive than the HTLE video. Though the means for adaptive outcomes were greater in the HTHE than the HTLE group, these mean differences neared, but did not reach, statistical significance. There are several potential explanations for this outcome. First, the efficacy manipulation might not have been strong enough in the high efficacy group. Though efficacy was greater in the high efficacy message than the low efficacy message, the difference between means was small. Additionally, when the two subdimensions of efficacy were examined individually, only response-efficacy, and not self-efficacy, was greater in the high efficacy group. Second, while the efficacy manipulation was designed to be minimal in the low efficacy condition, the manipulation still might have been too strong. The conclusion of the video suggested that "eating less meat is easy to do, and can help protect you against serious health problems". A no-efficacy manipulation might have produced a greater difference between the video groups. Third, it is possible that the high threat component indirectly induced perceptions

of efficacy. Eating less meat is a relatively straightforward behavior, and learning about the health risks associated with high meat consumption might have resulted in participants thinking of ways to eat less meat on their own. While there are certainly obstacles to eating less meat (e.g., cultural norms or cooking skills), the behavior is likely not as difficult to adopt compared to other health behaviors like stopping an addictive behavior (e.g., smoking). Witte and Allen (2000) stated "If no information with regard to the efficacy of the recommended response is provided, individuals will rely on past experiences and prior beliefs to determine perceived efficacy" (p. 595). With meat consumption on the decline nationally, widespread awareness of the Meatless Monday campaign, and greater acceptance of vegetarianism, it is possible that high efficacy perceptions can be induced by a minimal efficacy prompt or even threat alone.

Another study aim was to assess the EPPM's expected outcomes related to the fear control process. The EPPM predicted that HTHE messages would result in message acceptance, while HTLE messages would result in message rejection. In the HTLE condition, an individual perceives a high threat and feels fearful, but with no way to avert the perceived threat, he or she attempts to reduce the fear (rather than the threat) by derogating the message, believing the message was manipulative, and/or suppressing thoughts about the threat. Though the means for the fear control variables were greater in the HTLE group than the HTHE group, these mean differences neared, but did not reach, statistical significance. As such, the results did not indicate that the fear control process was engaged in the HTLE condition. Similar to the danger control outcomes, this result could be explained by the efficacy manipulation being too low in the HTHE group, the efficacy manipulation being too high in the HTLE group, or that in the context of

reducing meat consumption, high perceptions of efficacy can easily be induced with a minimal efficacy message or even threat alone.

Strengths and Limitations

Sample. Overall, one of the major strengths of the study was the sample. The intended population was Americans aged 25-44 who eat meat approximately once per day or more. The sample was obtained from a large national panel of survey respondents, which resulted in a diverse sample in terms of age, sex, U.S. region of residence, family structure, education level, and household income. However, the sample was largely Caucasian/white and non-Hispanic, so there could have been greater diversity in terms of race and ethnicity. Overall, the sample was fairly diverse, which leads to greater generalizability. The sample size was 373 at Time 1 and 153 at Time 2. The attrition rate of 59% was high, but the demographic profile of participants who participated at Time 1 was quite similar to the demographic profile at Time 2. Though significant differences between groups were found, many of the nonsignificant findings were in the expected direction of the hypotheses and neared statistical significance. With a larger sample size, significant differences might have been found.

Measurement. The attitude, behavioral intention, and fear control measures were informed by validated scales and achieved good reliability, and allowed assessment of several potential outcomes. The study focused on the three primary adaptive outcome variables measured in health communication research, i.e., attitude, behavioral intention, and behavior. Group means for these adaptive outcome variables were assessed in terms of their fit with both the EPPM and the additive model. The study also assessed three fear control variables (i.e., perceived manipulative intent, message derogation, and defensive

avoidance) regarding the EPPM's predicted fear control process. The findings can help health campaigns aimed at reducing meat consumption create effective messages. Specifically, messages that are high in threat will likely induce the intended outcomes. Where resources are limited (e.g., length of a video, space on a website) the inclusion of an efficacy component may not be critical to message acceptance.

A Time 2 follow-up measure allowed for measurement of self-reported behavior in the short-term, i.e., over a one-week period. Behavioral intentions and actual behavior were both significant for the one-week period following the intervention. Although the one-week follow–up was significant, higher effect sizes might have been found if participants were given more than one week to change behavior through activities such as consuming already purchased meat, going grocery shopping, and/or planning meals.

Behavioral intentions were also significant for the six-month period, but without a long-term behavior measure, it is unknown whether behavior change would have been sustained over the six-month period. Meta-analyses have demonstrated the relationship between behavioral intention and behavior (see, for example, Albarracin et al., 2001 on the topic of condom use). The use of a follow-up behavior measure supported this finding.

In contrast to the behavior measure, the proxy measurements for behavior (i.e., frequency of meat consumption and change in frequency of meat consumption) were not different between groups. The reason for this discrepancy is unknown. One possible explanation is that recalling frequency of meat consumption is difficult, especially over a one-week period. Another possible explanation is that the participants believed that they were eating less meat, but in actuality were not doing so. Use of different behavior and/or

behavior proxy measures, such as food dairies, 24-hour recalls, or objective measures of food purchasing data (e.g., household food inventoried, food purchase records, and UPC scans) could improve internal validity.

One final measurement improvement relates to the measurement of specific behaviors (i.e., smaller portion sizes, more meatless meals, and more meatless days). Due to the use of a progress skip pattern on the survey, most participants did not respond to these measures. As a result, the sample size was too small for analysis of these particular behaviors.

Study design. The use of an experimental design allowed for causal conclusions related to the effectiveness of the videos. However, it is possible that the Time 1 measure influenced the groups. This is of greatest concern for the HTLE and the control groups. Completing the efficacy measures and the specific behavioral intention measures (i.e., smaller portion sizes, more meatless meals, more meatless days) could have been informational, inducing perceptions of efficacy and greater message acceptance than otherwise would have occurred. The inclusion of a second control group, one in which participants only complete the Time 2 measure, would resolve this confound issue.

Another study design issue was that there was no LTHE condition. A full test of the EPPM and additive models would have included a LTHE group (the control group served as a proxy for the LTLE group). The decision to leave out the LTHE group was because the expected outcome for low threat conditions is no response. Realistically, health campaigns are unlikely to create messages that induce only low levels of threat with no expected outcomes. In the present study, having larger group sample sizes for the

three conditions was more valuable than spreading the same sample size across four groups.

An additional confound issue was the difference in study duration for the three groups. The HTHE video was 7 ½ minutes, the HTLE video was 4 minutes, and the control group did not watch a video at all. It is possible that the increase in time spent on the study could have been a persuasive influence.

Future Directions

Target populations. This study could be replicated using other target populations, such as parents with young children, college students, or individuals who already have chronic diseases. Expanding the study to other populations could improve generalizability claims and inform the design of tailored messages.

Message design. Newly designed messages could provide clarity regarding expected danger control and fear control outcomes. Specifically, efficacy could be increased in the HTHE condition and/or decreased in the HTLE condition to create greater variance between groups. In addition, the use of qualitative research methods such as focus groups prior to conducting an experiment could result in more effective video messages. Studies could also explore the utility of messages that are based on a context other than health. American consumers have reported a variety of reasons for reducing meat consumption, including not only health, but also the environment, animal welfare, and cost (Thomson Reuters & National Public Radio, 2012). Creating and testing the effectiveness of messages based on these concerns (or specific combinations of these concerns) could also yield information useful to campaigns that seek to reduce meat

consumption. Finally, other technologies could be explored, such as podcasts, apps, and interactive websites.

Experimental design. To clarify the confound issue relating to completing the Time 1 survey measures, future experimental designs could be modified to include a Time 2 only control group. In order to fully test the EPPM and the additive models, a LTHE video group could also be included. A larger sample size would allow the inclusion of these two groups and might also result in statistical significance for the findings that neared, but did not reach, statistical significance.

Measurement. Though costly and time consuming, using established behavior measures might result in more consistent findings related to the behavior outcomes. For example, food dairies, 24-hour recalls, or objective measures of food purchasing data could provide more valid data. A long-term follow-up behavior measure could also demonstrate whether the messages have long-term impact. For the severity, susceptibility, response-efficacy, and self-efficacy items, researchers could explore the use of scales with meaningful zero points. Thus, when threat and efficacy are calculated as a product of their subdimensions, the potential range would also have a meaningful zero point.

Conclusion

This research study created and assessed campaign video messages designed to encourage Americans ages 25-44 to reduce their meat consumption. With diet-related diseases on the rise in America, the problem of overconsumption of meat has broad public health implications. Ultimately, successful research projects can help reduce the incidence of diet-related diseases by informing campaigns that promote healthy food

choices. The more campaigns are informed by research, the more effective they will be in promoting behavior change. This study demonstrated the effectiveness of using the EPPM to guide video message design in a new health context, reducing meat consumption. The results indicated that threat is an important message component for the context of meat consumption. The inclusion of an efficacy component might not offer additional persuasive impact, and was not found to result in unintended consequences. In this study, adding a high efficacy component to a high threat message did not result in greater message acceptance. Moreover, inclusion of only a very minimal efficacy component did not result in message rejection. It is possible that the messages did not have a strong (or weak) enough efficacy component and/or that efficacy for this health behavior is easily implied or generally known by the population. These theoretical and practical findings can be used to implement effective campaigns that seek to improve public health outcomes, including reducing the incidence of heart disease, cancer, diabetes, and obesity.

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APPENDIX A

IRB APPROVAL LETTER

EXEMPTION GRANTED

Anthony Roberto
Human Communication, Hugh Downs School of
480/965-4111
Anthony.Roberto@asu.edu

Dear Anthony Roberto:

On 4/15/2015 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Reducing the Health Impacts of Meat Consumption: Using the Extended Parallel Processing Model to Persuade Consumers to Eat Less Meat
Investigator:	Anthony Roberto
IRB ID:	STUDY00002545
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	• Fehrenbach IRB protocol - dissertation.docx, Category: IRB Protocol; • Survey Time 1.pdf, Category: IRB Protocol; • Survey Time 2.pdf, Category: IRB Protocol; • RobertoInformed Consent.pdf, Category: Consent Form; • Qualtrics Procedures.pdf, Category: Recruitment Materials; • Script for Videos, Category: Other (to reflect anything not captured above)

The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 (2) Tests, surveys, interviews, or observation on 4/15/2015.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

IRB Administrator

cc: Keri Fehrenbach

APPENDIX B

HIGH THREAT/ HIGH EFFICACY VIDEO SCRIPT

HIGH THREAT/ HIGH EFFICACY VIDEO SCRIPT[10]

HTHE Script – Introduction

Script	Image
[Opening] Every Bite Counts: Eat Less Meat to Improve Your Health	Instrumental music
We all know it's important to get enough protein, and that meat is one of the key ways most of us get protein.	Healthy plate
But in the US, we actually eat about 50% more protein than needed.	Protein headline
We didn't always eat this much meat. According to the USDA, we've doubled our meat consumption in just the last century. So what was once the side treat has become the main dish.	Protein graph
Eating small amounts of meat certainly can be part of a healthy lifestyle.	Small steak plate
The problem is, eating too much meat can be harmful to your health.	Big steak plate
Diets high in meat are linked to some of the leading health problems in our country, including heart disease, cancer, diabetes, stroke, and obesity.	Infographic
Does this mean we should give up on meat altogether? Not at all! But how about cutting back one day a week? You could join the global meatless Monday movement.	Cartoon video
Or, just eat smaller portion sizes when you do eat meat!	Smaller portions plate
These small steps could really improve your health.	Health and well-being

[10] The HTHE video mirrored the HTLE video, but included response-efficacy and self-efficacy sections and a longer conclusion.

HTHE Script – Susceptibility

Script	Image
[Transition] Is Your Diet Putting You at Risk?	Instrumental music
Think about how much meat you normally eat. Do you eat meat at breakfast? At lunch? At dinner?	Meat thought bubbles
If you normally eat meat once a day, you're probably eating too much meat. And, if you eat meat more than once a day, you're probably eating *way* too much meat.	Daily log with meat pictures at each meal
Americans eat more protein, and meat in particular, than is recommended by federal dietary guidelines.	Study
In this graph, you can see from the red bar that we exceed the protein recommendation by about 1 1/2 times. So, we have a lot of room in our diet to eat less meat.	Protein bar chart
If you eat less meat, you'll still get enough protein, you'll reduce your risk of health problems, and you'll have more space in your diet for the healthy foods most of us don't get enough of.	Healthy plate

HTHE Script – Severity

Script	Image
[Transition] Eating Too Much Meat Can Harm Your Health	Instrumental music
Diets high in meat, especially red and processed meat, are linked to cancer, heart disease, and stroke. A meat-heavy diet can lead to higher body weight, obesity, and eventually, diabetes.	Cartoon video
Numerous studies conducted by top institutions tracking hundreds of thousands of people have linked meat consumption with some of the leading causes of death in the U.S.	Studies piling up
At the turn of the century, the leading causes of death were infectious diseases like influenza, pneumonia, and tuberculosis. Today, chronic diseases top the charts. Our meat-heavy diet is one of the reasons for this shift and the rise in heart disease and cancer.	Pie charts
For both men and women, heart disease is the top killer, accounting for 1 out of every 4 deaths in the U.S.	Heart
Cancer accounts for another 1 out of every 4 deaths in the U.S.	Ribbon
For men, high meat consumption is associated with prostate cancer, and for women, it's associated with breast cancer.	Ribbon
There are many other cancers that are associated with high meat consumption, too.	Ribbons
We all know that these are deadly diseases, but the fact is, these diseases affect our overall quality of life long before they take their ultimate toll. Consumed by medical care, many people find it difficult to have peace of mind. With less income and heavy medical expenses, financial well-being can be a challenge. Many people are unable to devote as much time to enjoying family life, maintaining friendships, or enjoying the same hobbies and activities.	Infographic; images of hospital bed, depression, financial trouble, family, friends, and hobbies

HTHE Script – Response-efficacy

Script	Image
[Transition] Eating Less Meat Can Help Protect Your Health The good news is, you don't have to cut out meat altogether. Even cutting back a little can boost your health.	Instrumental music Consider a meatless meal?
As we mentioned earlier, research shows that eating less meat will help you live a longer, healthier life.	Study
And because of this research, leading health organizations encourage Americans to eat diets that emphasize vegetables, fruits, whole grains, and healthy proteins rather than to eat a meat-heavy diet.	Health organization logos
Eating less meat is a health behavior just like exercising. Every step counts. For example, if you go for a ten-minute walk a couple of times a week, that's good for your health. If you extend that walk to 30 minutes or walk every day, that's even better.	Taking a step; Walking cartoon
It's the same with eating less meat. Every bite counts. You can start out by cutting out meat one day a week, or eating smaller portion sizes than you normally would.	Utensils; calendar; smaller portion size

HTHE Script – Self-efficacy

Script	Image
If you're like most people, it would be hard to give up meat all together. But eating less meat is easy to do, and you don't have to be perfect at every meal. Many people like you have been successful at cutting back.	Healthy plate
We know that US meat consumption is still far too high, but the good news is that Americans have started to cut back.	Graph;
A national, independent poll found that 40% of Americans reported eating less meat in the past three years.	NPR poll image
Here's how to begin. Take your usual meal, and eat less meat Or, make a meatless meal, swapping out the meat for some veggies.	Plate; Meal swap
If you are craving a bowl of chili, try going for a cup of chili instead. Or try the black bean chili.	Meal swap
When you go to the grocery store, pick up a half pound of chicken rather than a full pound, and make a stir fry with less meat. Or, pick up some more veggies and try a veggie stir fry.	Meal swap
For a weekend breakfast, if you normally eat 4 links of sausage, cut it down to two. Or, skip the meat altogether and just enjoy the eggs and hashbrowns.	Meal swap
If you want to indulge in a cheeseburger, skip the bacon double cheeseburger and just have a cheeseburger. Or, give a veggie burger with all the fixins a try.	Meal swap
If you like a turkey sandwich for lunch, cut back on the amount of turkey and just put on a slice or two. Or, try a veggie melt.	Meal swap
The possibilities are endless. Take your usual meal, eat less meat. Take your usual meal, swap the meat out for some veggies.	Meal swap
Or, there are plenty of vegetarian meats out there. Here are just a few.	Veggie meats video
Maybe you like to eat out. Not a problem. Pretty much every restaurant has meatless meals. Chinese – Thai - Middle Eastern – Indian – Mexican – ethnic restaurants have great options for meatless meals	Restaurants video; meals video

HTHE Script – Conclusion

Script	Image
[Transition] Every Bite Counts With meat consumption nearly doubling in the last century, and current protein consumption 1.5 times the recommended amount, there is ample room in our diet to eat less meat.	Instrumental music Infographic
Eating less meat is easy to do, and can help protect you against serious health problems. Luckily for our health, meat consumption is starting to decline nationally.	Infographic
You can do it, too – Take your usual meal, eat less meat. Take your usual meal, swap out the meat for some veggies. Or, cut out meat for a whole day with Meatless Mondays.	Meal swaps; Meatless Monday logo
[Closing] Every Bite Counts: Eat Less Meat to Improve Your Health	Instrumental music

APPENDIX C

HIGH THREAT/ LOW EFFICACY VIDEO SCRIPT

HIGH THREAT/ LOW EFFICACY VIDEO SCRIPT[11]

HTLE Script – Introduction

Script	Image
[Opening] Every Bite Counts: Eat Less Meat to Improve Your Health	Instrumental music
We all know it's important to get enough protein, and that meat is one of the key ways most of us get protein.	Healthy plate
But in the US, we actually eat about 50% more protein than needed.	Protein headline
We didn't always eat this much meat. According to the USDA, we've doubled our meat consumption in just the last century. So what was once the side treat has become the main dish.	Protein graph
Eating small amounts of meat certainly can be part of a healthy lifestyle.	Small steak plate
The problem is, eating too much meat can be harmful to your health.	Big steak plate
Diets high in meat are linked to some of the leading health problems in our country, including heart disease, cancer, diabetes, stroke, and obesity.	Infographic
Does this mean we should give up on meat altogether? Not at all! But how about cutting back one day a week? You could join the global meatless Monday movement.	Cartoon video
Or, just eat smaller portion sizes when you do eat meat!	Smaller portions plate
These small steps could really improve your health.	Health and well-being

[11] The HTLE video mirrored the HTHE video, except the response-efficacy and self-efficacy sections were removed and the conclusion was shortened.

HTLE Script – Susceptibility

Script	Image
[Transition] Is Your Diet Putting You at Risk?	Instrumental music
Think about how much meat you normally eat. Do you eat meat at breakfast? At lunch? At dinner?	Meat thought bubbles
If you normally eat meat once a day, you're probably eating too much meat. And, if you eat meat more than once a day, you're probably eating *way* too much meat.	Daily log with meat pictures at each meal
Americans eat more protein, and meat in particular, than is recommended by federal dietary guidelines.	Study
In this graph, you can see from the red bar that we exceed the protein recommendation by about 1 1/2 times. So, we have a lot of room in our diet to eat less meat.	Protein bar chart
If you eat less meat, you'll still get enough protein, you'll reduce your risk of health problems, and you'll have more space in your diet for the healthy foods most of us don't get enough of.	Healthy plate

HTLE Script – Severity

Script	Image
[Transition] Eating Too Much Meat Can Harm Your Health	Instrumental music
Diets high in meat, especially red and processed meat, are linked to cancer, heart disease, and stroke. A meat-heavy diet can lead to higher body weight, obesity, and eventually, diabetes.	Cartoon video
Numerous studies conducted by top institutions tracking hundreds of thousands of people have linked meat consumption with some of the leading causes of death in the U.S.	Studies piling up
At the turn of the century, the leading causes of death were infectious diseases like influenza, pneumonia, and tuberculosis. Today, chronic diseases top the charts. Our meat-heavy diet is one of the reasons for this shift and the rise in heart disease and cancer.	Pie charts
For both men and women, heart disease is the top killer, accounting for 1 out of every 4 deaths in the U.S.	Heart
Cancer accounts for another 1 out of every 4 deaths in the U.S.	Ribbon
For men, high meat consumption is associated with prostate cancer, and for women, it's associated with breast cancer.	Ribbon
There are many other cancers that are associated with high meat consumption, too.	Ribbons
We all know that these are deadly diseases, but the fact is, these diseases affect our overall quality of life long before they take their ultimate toll. Consumed by medical care, many people find it difficult to have peace of mind. With less income and heavy medical expenses, financial well-being can be a challenge. Many people are unable to devote as much time to enjoying family life, maintaining friendships, or enjoying the same hobbies and activities.	Infographic; images of hospital bed, depression, financial trouble, family, friends, and hobbies

HTLE Script – Conclusion

Script	Image
[Transition] Every Bite Counts	Instrumental music
With meat consumption nearly doubling in the last century, and current protein consumption 1.5 times the recommended amount, there is plenty of room in our diet to eat less meat.	Infographic
Eating less meat is easy to do, and can help protect you against serious health problems.	Infographic
[Closing] Every Bite Counts: Eat Less Meat to Improve Your Health	Instrumental music

APPENDIX D

SURVEY – TIME 1

Greetings,

My name is Keri Fehrenbach, and I am a graduate student under the direction of Professor Anthony Roberto in the Hugh Downs School of Human Communication at Arizona State University. I am inviting your participation in my research study about developing effective videos. Participation in this study may aid in efforts that help scholars design successful campaigns. There are no foreseeable risks or discomforts to your participation.

Participation in this study involves:

- Answering survey questions and/or viewing a message (approximately 15-20 minutes)
- One week later, answering additional survey questions (approximately 5 minutes)

Your responses will be anonymous. The two surveys will be linked using your participation identification code. Your participation in this study is voluntary. You can skip questions if you wish. If you choose not to participate or to withdraw from the study at any time, there will be no penalty. You must be 18 or older to participate in the study.

If you have any questions concerning the research study, please contact the research team at anthony.roberto@asu.edu. If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at (480) 965-6788.

Sincerely,
Keri Fehrenbach

Clicking "NEXT" will indicate your willingness to participate in this study.

For the first set of questions, please tell us about your diet.

1) Which category best fits your diet?
   - o Omnivore (I eat meat, such as beef, pork, poultry, and/or fish.)
   - o Pescatarian (I don't eat meat, except for fish.)
   - o Vegetarian (I don't eat meat of any kind, but I do eat eggs and dairy products).
   - o Vegan (I don't eat meat, eggs, dairy products, or other animal-derived ingredients).

Please take a moment to think about what you ate for breakfast, lunch, and dinner last week.

2) In the past 7 days, how often did you eat MEAT at your breakfast, lunch, and dinner meals?

   If you ate more than 3 meals per day, please combine the additional meal(s) with the closest breakfast, lunch, or dinner.

In the past 7 days, I ate MEAT at ____ (out of 7) meals for BREAKFAST. ☐ Meals last week

In the past 7 days, I ate MEAT at ____ (out of 7) meals for LUNCH. ☐ Meals last week

In the past 7 days, I ate MEAT at ____ (out of 7) meals for DINNER. ☐ Meals last week

☐ Meals last week [autototal]

Next, please provide some basic demographic information.

3) How old are you?

   ☐

4) What is your sex?
   - o Male
   - o Female
   - o Other

[RANDOMIZATION – HTHE, HTLE, or Control Group]

- HTHE Group

  For the next part of the study, please watch the following 7-minute video. To start or pause, click on the video. We would like to hear your opinions about the video, so please watch it carefully. You will be able to continue to the next page after 7 minutes.

- HTLE Group

  For the next part of the study, please watch the following 4-minute video. To start or pause, click on the video. We would like to hear your opinions about the video, so please watch it carefully. You will be able to continue to the next page after 4 minutes.

- Control Group

  [Skip to description preceding Question 8]

5) Were you able to hear and view the video okay?
   - o Yes, I was able to view and hear the video.
   - o No, I had trouble viewing and/or hearing the video.

6) In your opinion, what were the three most important points from the video?

Important point #1 _____

Important point #2 _____

Important point #3 _____

7) How carefully did you watch the video? (Please answer honestly - we just need to know for data analysis purposes. Your answer will not affect your status as a research participant).
   - o Didn't watch
   - o Watched very little
   - o Watched somewhat carefully
   - o Watched very carefully

The next part of the study involves answering survey questions. Some of the questions in the survey may seem repetitive, but we are actually asking slightly different questions on purpose. We value your time and have made the survey as short as possible. If you could please answer all the questions carefully, we'd appreciate it.

8) To what extent do you disagree or agree with the following statements? [Items were presented in random order.]

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
In the long run, eating a diet high in meat is a severe threat to my health.	❍	❍	❍	❍	❍
In the long run, eating a diet high in meat is harmful to my health.	❍	❍	❍	❍	❍
In the long run, eating a diet high in meat is a serious threat to my health.	❍	❍	❍	❍	❍
Eating a diet high in meat increases my chances of developing health problems.	❍	❍	❍	❍	❍
It is likely that eating a diet high in meat will negatively impact my health.	❍	❍	❍	❍	❍
It is possible that eating a diet high in meat will negatively impact my health.	❍	❍	❍	❍	❍
I am able to eat less eat to help protect my health.	❍	❍	❍	❍	❍
Eating less meat is a simple way for me to help protect my health.	❍	❍	❍	❍	❍
It is easy for me to eat less meat to help protect my health.	❍	❍	❍	❍	❍
Eating less meat is an effective way to help protect my health.	❍	❍	❍	❍	❍
Eating less meat helps to reduce the likelihood of health problems.	❍	❍	❍	❍	❍
Eating less meat helps prevent health problems.	❍	❍	❍	❍	❍
To help us with a data quality check, please select Disagree.	❍	❍	❍	❍	❍

9) Please indicate how you feel about changing your diet to eat less meat. [Items were presented in random order.]

Changing my diet to eat less meat is...

Very Bad	Bad	Neutral	Good	Very Good
○	○	○	○	○

Changing my diet to eat less meat is...

Very Undesirable	Undesirable	Neutral	Desirable	Very Desirable
○	○	○	○	○

Changing my diet to eat less meat is...

Very Negative	Negative	Neutral	Positive	Very Positive
○	○	○	○	○

Changing my diet to eat less meat is...

Very Disadvantageous	Disadvantageous	Neutral	Advantageous	Very Advantageous
○	○	○	○	○

Changing my diet to eat less meat is...

Very Harmful	Harmful	Neutral	Beneficial	Very Beneficial
○	○	○	○	○

Changing my diet to eat less meat is...

Very Unimportant	Unimportant	Neutral	Important	Very Important
○	○	○	○	○

Changing my diet to eat less meat is...

Very Useless	Useless	Neutral	Useful	Very Useful
○	○	○	○	○

10) To what extent do you disagree or agree with the following statements? [Items were presented in random order.]

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
In the next 7 days, I intend to eat less meat.	❍	❍	❍	❍	❍
In the next 7 days, I plan to eat less meat.	❍	❍	❍	❍	❍
In the next 7 days, I will eat less meat.	❍	❍	❍	❍	❍
In the next 7 days, I will eat smaller portion sizes of meat than usual.	❍	❍	❍	❍	❍
In the next 7 days, I will eat more meatless meals than usual.	❍	❍	❍	❍	❍
In the next 7 days, I will cut out meat on 1 or more days.	❍	❍	❍	❍	❍

[Control group skips to Question 13]

11) Please indicate how you felt about the information in the video. [Items were presented in random order.]

Overall, the information in the video about meat consumption was...

Not at All Overblown		Neutral		Very Overblown
○	○	○	○	○

Overall, the information in the video about meat consumption was...

Not at All Exaggerated		Neutral		Very Exaggerated
○	○	○	○	○

Overall, the information in the video about meat consumption was...

Not at All Overstated		Neutral		Very Overstated
○	○	○	○	○

Overall, the information in the video about meat consumption was...

Not at All Distorted		Neutral		Very Distorted
○	○	○	○	○

12) To what extent do you disagree or agree with the following statements? [Items were presented in random order.]

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
The video deliberately tried to manipulate my feelings.	❍	❍	❍	❍	❍
The video deliberately tried to exploit my feelings.	❍	❍	❍	❍	❍
The video deliberately tried to take advantage of feelings.	❍	❍	❍	❍	❍
When watching the video, my first instinct was to avoid thinking about the negative effects of meat consumption.	❍	❍	❍	❍	❍
When watching the video, my first instinct was to choose not to think about the negative effects of meat consumption.	❍	❍	❍	❍	❍
When watching the video, my first instinct was to ignore what the video said about the negative effects of meat consumption.	❍	❍	❍	❍	❍

The last set of questions asks additional demographic information.

13) What is your race? (Please check all that apply)
- American Indian or Alaska Native
- Asian or Asian American
- Black or African American
- Native Hawaiian or Other Pacific Islander
- White or Caucasian
- Other (please specify) _____

14) What is your ethnicity?
- Hispanic or Latino
- Not Hispanic or Latino

15) In which state do you currently reside? [dropdown box with the following options]
- Alabama
- Alaska
- Arizona
- Arkansas
- California
- Colorado
- Connecticut
- Delaware
- District of Columbia
- Florida
- Georgia
- Hawaii
- Idaho
- Illinois
- Indiana
- Iowa
- Kansas
- Kentucky
- Louisiana
- Maine
- Maryland
- Massachusetts
- Michigan
- Minnesota
- Mississippi
- Missouri
- Montana
- Nebraska
- Nevada
- New Hampshire

- New Jersey
- New Mexico
- New York
- North Carolina
- North Dakota
- Ohio
- Oklahoma
- Oregon
- Pennsylvania
- Puerto Rico
- Rhode Island
- South Carolina
- South Dakota
- Tennessee
- Texas
- Utah
- Vermont
- Virginia
- Washington
- West Virginia
- Wisconsin
- Wyoming
- I do not reside in the United States

16) What is the highest level of education you have completed?
- Less than High School
- High School / GED
- Some College
- 2-year College Degree
- 4-year College Degree
- Masters Degree
- Doctoral Degree
- Professional Degree (JD, MD)

17) What is your combined annual household income?
- Less than 30,000
- 30,000 – 39,999
- 40,000 – 49,999
- 50,000 – 59,999
- 60,000 – 69,999
- 70,000 – 79,999
- 80,000 – 89,999
- 90,000 – 99,999
- 100,000 or more

18) What is your current family structure?
- Single without children
- Single with children
- Married without children
- Married with children
- Partner without children
- Partner with children

Thank you for participating in Part 1 of the Study! In one week, you will receive an invitation to participate in the Final Survey. The Final Survey will take less than five minutes to complete. Thanks again - we really appreciate your participation in this research study!

APPENDIX E

SURVEY – TIME 2

Greetings,

My name is Keri Fehrenbach, and I am a graduate student under the direction of Professor Anthony Roberto in the Hugh Downs School of Human Communication at Arizona State University. I am inviting your continued participation in my research study about developing effective videos. Participation in this study may aid in efforts that help scholars design successful campaigns. There are no foreseeable risks or discomforts to your participation.

Participation in this final part of this study involves answering several survey questions and will take approximately 5 minutes.

Your responses will be anonymous. The results of this study may be used in reports, presentations, or publications but your name will not be used. Your name will not be connected to your responses. Your participation in this study is voluntary. You can skip questions if you wish. If you choose not to participate or to withdraw from the study at any time, there will be no penalty. You must be 18 or older to participate in the study.

If you have any questions concerning the research study, please contact the research team at anthony.roberto@asu.edu. If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at (480) 965-6788.

Sincerely,
Keri Fehrenbach

Clicking "NEXT" will indicate your willingness to participate in this study.

Please take a moment to think about what you ate for breakfast, lunch, and dinner last week.

1) In the past 7 days, how often did you eat MEAT at your breakfast, lunch, and dinner meals?

   If you ate more than 3 meals per day, please combine the additional meal(s) with the closest breakfast, lunch, or dinner.

In the past 7 days, I ate MEAT at ____ (out of 7) meals for BREAKFAST. ☐ Meals last week

In the past 7 days, I ate MEAT at ____ (out of 7) meals for LUNCH. ☐ Meals last week

In the past 7 days, I ate MEAT at ____ (out of 7) meals for DINNER. ☐ Meals last week

☐ Meals last week [autototal]

2) Which of the statements below best describes your diet in the past 7 days?
   - o In the past 7 days, I ate less meat than usual.
   - o In the past 7 days, the amount of meat I ate remained the same. [skip to Q 9]
   - o In the last 7 days, I ate more meat than usual. [skip to Q 9]

3) During one or more meals in the past 7 days, did you eat smaller portion sizes of meat than you usually do?
   - o Yes
   - o No [skip to Q 5]

4)

	Number of meals in the past 7 days (0-21)
For how many meals did you choose to eat a smaller portion size of meat?	

5) In the past 7 days, did you eat more meatless meals than you usually do?
   - o Yes
   - o No [skip to Q 7]

6)

	Number of meals in the past 7 days (0-21)
For how many meals did you choose to eat a meatless meal?	

7) In the past 7 days, did you cut out meat on 1 or more days?
   - o Yes
   - o No [skip to Q 9]

.

8)

	Number of days in the past 7 days (0-7)
For how many days did you choose to cut out meat for a whole day?	

9) Please indicate how you feel about changing your diet to eat less meat. [Items were presented in random order.]

Changing my diet to eat less meat is...

Very Bad	Bad	Neutral	Good	Very Good
o	o	o	o	o

Changing my diet to eat less meat is...

Very Undesirable	Undesirable	Neutral	Desirable	Very Desirable
o	o	o	o	o

Changing my diet to eat less meat is...

Very Negative	Negative	Neutral	Positive	Very Positive
○	○	○	○	○

Changing my diet to eat less meat is...

Very Disadvantageous	Disadvantageous	Neutral	Advantageous	Very Advantageous
○	○	○	○	○

Changing my diet to eat less meat is...

Very Harmful	Harmful	Neutral	Beneficial	Very Beneficial
○	○	○	○	○

Changing my diet to eat less meat is...

Very Unimportant	Unimportant	Neutral	Important	Very Important
○	○	○	○	○

Changing my diet to eat less meat is...

Very Useless	Useless	Neutral	Useful	Very Useful
○	○	○	○	○

10) To what extent do you disagree or agree with the following statements? [Items were presented in random order.]

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Over the next 6 months, I intend to eat less meat.	❍	❍	❍	❍	❍
Over the next 6 months, I plan to eat less meat.	❍	❍	❍	❍	❍
Over the next 6 months, I will eat less meat.	❍	❍	❍	❍	❍
Over the next 6 months, I will eat smaller portion sizes of meat than usual.	❍	❍	❍	❍	❍
Over the next 6 months, I will eat more meatless meals than usual.	❍	❍	❍	❍	❍
Over the next 6 months, I will cut out meat on 1 or more days per week.	❍	❍	❍	❍	❍
To help us with a quality check, please select Agree.	❍	❍	❍	❍	❍

11) Please take a moment to think back to your participation in Part 1 of the study about a week ago. When completing the survey, were you asked to watch a video?
- o Yes
- o No [Control group skips to end of survey]

12) To what extent do you disagree or agree with the following statements? [Items were presented in random order.]

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
In the past 7 days, I avoided thinking about the negative effects of meat consumption.	❍	❍	❍	❍	❍
In the past 7 days, I choose not to think about the negative effects of meat consumption.	❍	❍	❍	❍	❍
In the past 7 days, I ignored what the video said about the negative effects of meat consumption.	❍	❍	❍	❍	❍

Thank you so much for participating in our study!