



Missouri State
UNIVERSITY

BearWorks
Institutional Repository

MSU Graduate Theses

Summer 2016

Message Framing And Source Factors: Peers' Impact On Exercise Intentions

Samantha Grace Lynn Hunter

Follow this and additional works at: <http://bearworks.missouristate.edu/theses>



Part of the [Psychology Commons](#)

Recommended Citation

Hunter, Samantha Grace Lynn, "Message Framing And Source Factors: Peers' Impact On Exercise Intentions" (2016). *MSU Graduate Theses*. Paper 2965.

This article or document was made available through BearWorks, the institutional repository of Missouri State University. The work contained in it may be protected by copyright and require permission of the copyright holder for reuse or redistribution.

For more information, please contact [BearWorks@library.missouristate.edu](mailto: BearWorks@library.missouristate.edu).

**MESSAGE FRAMING AND SOURCE FACTORS: PEERS' IMPACT ON
EXERCISE INTENTIONS**

A Masters Thesis

Presented to

The Graduate College of
Missouri State University

In Partial Fulfillment

Of the Requirements for the Degree
Master of Science, Psychology

By

Samantha Grace Lynn Hunter

July 2016

Copyright 2016 by Samantha Grace Lynn Hunter

**MESSAGE FRAMING AND SOURCE FACTORS: PEERS' IMPACT ON
EXERCISE INTENTIONS**

Psychology

Missouri State University, July 2016

Master of Science

Samantha Grace Lynn Hunter

ABSTRACT

The present study examined reported exercise intentions, confidence ratings, and exercise behaviors by manipulating the health status of the message source (lifetime healthy, reformed unhealthy) and message frame (gain, loss). Participants read background information pertaining to the health experience of the message source. Participants then read a physical activity health pamphlet that was attributed to the message source. The health pamphlet provided four arguments that were presented in either a gain or loss frame depending on experimental condition. The results revealed that there was a strong positive relationship between exercise intentions and actual exercise behavior reported during the follow up study. The data revealed that framing impacts confidence, a weak indicator of persuasion, as a function of message source. A loss frame message increases confidence to exercise more in the future only among participants receiving a health message from the unhealthy reformed source. Furthermore, the reformed unhealthy source was perceived as significantly more knowledgeable and intelligent than the lifetime healthy source. These results appear to suggest that there is a need for further research to examine the persuasive influence of message frame and message source with a varied health background on exercise confidence ratings and exercise intentions.

KEYWORDS: message framing, message source, health status, exercise, persuasion

This abstract is approved as to form and content

Christie L. Cathey, PhD
Chairperson, Advisory Committee
Missouri State University

**MESSAGE FRAMING AND SOURCE FACTORS: PEERS' IMPACT ON
EXERCISE INTENTIONS**

By

Samantha Hunter

A Masters Thesis
Submitted to the Graduate College
Of Missouri State University
In Partial Fulfillment of the Requirements
For the Degree of Master of Science, Psychology

July 2016

Approved:

Christie L. Cathey, PhD

Erin M. Buchanan, PhD

David M. Zimmerman, PhD

Julie Masterson, PhD: Dean, Graduate College

ACKNOWLEDGEMENTS

I would like to thank my thesis committee, Dr. Christie Cathey, Dr. Erin Buchanan, and Dr. David Zimmerman, for their guidance, dedication, and invaluable advice throughout the duration of my thesis project. I want to express my heartfelt gratitude to my thesis chair, Dr. Cathey, for her warm encouragement and thoughtful advice. I am grateful to Dr. Zimmerman for his patience and invaluable guidance as both a research advisor and thesis committee member. I am indebted to Dr. Buchanan for her direction in the statistical analysis of this project and her unwavering support. The discussion, ideas, and feedback from my thesis committee have been instrumental in the completion of my thesis.

I would also like to thank the amazing faculty and staff in the Psychology department who have contributed to my development as a scientist. Additionally, I would like to thank the Graduate College staff for their encouragement and support in my educational and personal pursuits.

I am especially thankful to my parents, Karen Rutherford and Kevin Rutherford, for their steadfast support throughout the duration of my graduate studies. I would also like to express my gratitude to my family for their love and support throughout my educational endeavors. My success and commitment to my education would not be possible without the support of my wonderful family.

TABLE OF CONTENTS

Introduction	1
Message Framing	2
Message Source.....	6
The Present Study.....	10
Method	12
Participants and Design.....	12
Message Source and Framing.....	13
Measures	14
Procedure	18
Results	20
Exercise Intentions and Behavior at Follow Up.....	20
Previous Exercise Behaviors	22
Message Source Characteristics.....	24
Message Evaluation	25
Manipulation Check.....	26
Discussion	27
Exercise Intentions and Exercise Behavior at Follow Up.....	27
Exercise Intentions and Previous Exercise Behaviors	29
Message Source.....	30
Message Evaluation	31
Conclusions	33
References	35
Appendix	46

LIST OF TABLES

Table 1. Summary of Three-Way Mixed ANOVA on Intentions to Engage in Light, Moderate, and Vigorous Activity.....	38
Table 2. Summary of Three-Way Mixed ANOVA on Previous Exercise Behaviors and Exercise at Follow Up.....	39
Table 3. Summary of Three-Way Mixed ANOVA on Percentage of Time Spent Engaging in Light, Moderate, and Vigorous Activity Prior to the Study.....	40
Table 4. Summary of Two-Way ANOVAs for Message Source Characteristics Items ..	41

LIST OF FIGURES

Figure 1.....	42
Figure 2.....	43
Figure 3.....	44
Figure 4.....	45

INTRODUCTION

Physical activity is a preventive behavior that greatly reduces risk factors associated with major chronic diseases such as type II diabetes and cardiovascular disease (Centers for Disease Control and Prevention, 2015). Despite the health benefits of exercise, only 21% of adults meet the CDC recommendation guidelines for regular physical activity (Centers for Disease Control and Prevention, 2014). It is important to examine the most effective way to design a persuasive health message, since regular physical activity can significantly reduce risk factors associated with several chronic diseases. Health care professionals, business corporations, and government institutions use persuasive messages as a tool to encourage the public to either adopt healthy behaviors or modify unhealthy behaviors. Although, health promotion messages are readily available to the public through media such as, newspapers, informational pamphlets, radio, and television, not all message designs are equally effective (Rothman & Salovey, 1997). Given the cost and effort that goes into creating health messages, it is essential to conduct further research to determine the message design that is most effective in changing the targeted behavior. While there are a number of factors that can be manipulated in the promotion of a health message (e.g., message frame, source credibility, strength of the message, tailored message, evidence format, and, risk severity), this research focuses on investigating the manipulation of health status of the message source and message frame for physical activity promotion.

Message Framing

Prospect theory is a decision-making model under risk that is designed to explain the evaluation of uncertain outcomes. The theory proposes a descriptive model that has a value function based on gains and losses. Prospect theory asserts that people respond differently to messages depending on how they are framed, with messages being framed as either gains (benefits of performing behavior) or losses (consequences of not performing behavior) (Tversky & Kahneman, 1981). People are risk seeking (i.e., more willing to accept risks) when they assess their options framed as losses, but they are risk averse (i.e., they avoid risks) when they assess their options framed as gains. For example, when people are presented with two identical decision problems with one outcome framed in lives saved and the other outcome framed as lives lost, they will shift from risk averse to risk seeking choices (Tversky & Kahneman, 1981). This shift occurs due to contradictory attitudes towards risk when outcomes are framed as gains or losses.

Research suggests that message framing outcomes are context dependent, and most scholars agree that health behaviors commonly targeted in health messages fall into one of two contexts. These health behaviors are described as falling into the context of either a detection or prevention behavior. However, it should be noted that Rothman and Salovey (1997) propose recuperative behaviors as a possible third health behavior context that targets those who already have a health abnormality that can be treated, such as cancer.

Detection behaviors typically involve the individual searching for a health irregularity to determine if they are unhealthy. For example, people typically choose to be screened for diseases such as HIV, STDs, and, cancer when they believe they are sick

rather than healthy. Performing these detection behaviors are perceived as risk-taking due to the possibility of finding a health related abnormality, which may have long-term health consequences. Individuals presented with a loss framed message encouraging a detection behavior increases risk seeking, which makes the reader more likely to engage in the desired health behavior. Previous health message research indicates that loss framed messages are most effective in encouraging detection behaviors, such as self-breast examinations (Meyerowitz & Chaiken, 1987) and mammography (Banks et al., 1995). For example, a study by Banks et al. (1995) recruited women who failed to meet the federal guidelines for breast cancer screenings to participate in a study where they watched an educational video on mammography. The study revealed that up to a year after watching the video, women who viewed the loss framed video were more likely to have been screened for breast cancer than those who viewed the gain framed video.

Conversely, prevention behaviors are best supported by a gain framed message rather than a loss framed message. Prevention behaviors are perceived as a tool that minimizes risk in the future by maintaining or improving one's health status. The lack of risk associated with prevention behaviors results in risk averse health decisions.

Considering that prevention behaviors provide health benefits, the only possible risk is failure to engage in the behavior. Health message research indicates that gain framed messages are most effective in encouraging prevention behaviors, such as sunscreen use (Detweiler, Bedell, Salovey, Pronin, & Rothman, 1999) and regular physical exercise (Jones, Sinclair, & Courneya, 2003). A study by Detweiler et al. (1999) found that beach-goers who received a gain framed message about sunscreen use and skin cancer

prevention were more likely to redeem a ticket for a free sample of sunscreen than those who read a loss framed message.

Recuperative behaviors involve an attempt to cure or treat an ongoing health behavior (e.g., radiation therapy for cancer) to prolong life. Participants in recuperative behavior studies choose treatments that provided greater long-term benefits despite short-term consequences when presented in a gain frame (Rothman & Salovey, 1997). McNeil, Pauker, Sox, and Tversky (1982) presented participants with the choice to treat a hypothetical case of lung cancer with either surgery or radiation therapy. Surgery offered a better long-term survival rate at the expense of a small short-term risk of preoperative death, whereas radiation therapy offered no short-term risk but a shorter long-term survival rate. Those in the loss frame message condition who read about mortality rates choose surgery 58% of the time, whereas people who read a gain framed message about survival rate chose surgery 75% of the time. Participants still favored surgery due to its greater long-term survival rate, despite a 10% chance of perioperative death in the loss framed message.

A meta-analysis by Gallagher and Updegraff (2012) on the framing of health messages provides further support for specific message framing when presenting detection and prevention behaviors. They found that there was a significant, but weak advantage for gain framed messages for preventive behaviors, and the same was also true for loss framed messages when promoting detection behaviors. The study also discovered that the largest difference for persuasive effects between gain and loss framed messages for prevention behaviors were evident in the studies that targeted smoking cessation, skin cancer prevention, and physical activity. However, the smallest

differences between loss and gain frames were found in studies that targeted diet and vaccination. The results of the meta-analysis indicate that further research should aim to measure actual behavior as a dependent variable to identify the factors that moderate the effects of message frame on behavior. While the findings of this study are promising, it should be noted that the factors that potentially moderate the influence of message framing on outcome behaviors have been historically difficult to pinpoint.

The health research literature proposes several variables that may moderate the influence of message framing on behaviors, including perceived risk and susceptibility. An individual's perception of their risk and susceptibility to the consequences associated with a health behavior may moderate the expected influence of message framing. People who believe they are susceptible to a health problem may be especially vigilant about the negative health outcomes, whereas individuals who are low in susceptibility may be focused on positive health outcomes (Updegraff, Brick Emanuel, Mintzer, & Sherman, 2015). Therefore, a gain framed message may be more persuasive for prevention behaviors targeted at individuals with low perceived susceptibility to health consequences, whereas a loss framed messages may be more effective for detection behaviors amongst individuals with high perceived susceptibility to health consequences. A study by Gallagher, Updegraff, Rothman, and Sims (2011) revealed that women who have an elevated perception of susceptibility to breast cancer reported greater rates of subsequent mammography screening if they received a loss framed message as compared to those who received a gain framed message. However, there was no framing effect on mammography screenings amongst women who had low perceived susceptibility to breast cancer. Additionally, there was a significant correlation between perceived risk

with mammography screening and elevated levels of susceptibility to breast cancer. These results suggest that an individual's perceived susceptibility and risk plays a role in determining the most effective message frame for promoting breast cancer screening and perhaps other detection behaviors.

A study focusing on oral health, a prevention behavior, found that participants who received a message frame that matched their beliefs about susceptibility were more likely to meet the guidelines for flossing at the six month follow up study (Updegraff et al., 2015). However, those who received a message frame that mismatched their susceptibility beliefs or received no frame manipulation at all were less likely to meet the flossing guidelines at the six month follow up. The study found that those with low perceived susceptibility flossed significantly more after viewing the gain framed video as compared to those who viewed the loss framed video, which supports Updegraff et al.'s (2015) assertion that those low in susceptibility are likely focused on positive outcomes when presented with a prevention behavior. Furthermore, participants high in perceived susceptibility who watched the loss framed video flossed more, but not significantly more, than those who viewed the gain framed video. These findings provide further evidence for the moderating role of susceptibility in message framing studies.

Message Source

Research suggests that a credible source is typically a more persuasive communicator than a low credibility source (Hovland & Weiss, 1951; Levine, Moss, Ramsey, & Fleishman, 1978; Maddux & Rogers, 1980). Research on communication effectiveness suggests that the expertise, attractiveness, and trustworthiness of a source

determines the perceived level of credibility (Hovland & Weiss, 1951; Pornpitakpan, 2004). A study by Kareklas, Muehling, and Weber (2015) investigated the role that source credibility and online comments played in a Web-based health message focusing on vaccination. They found that the more credible source (medical doctor) had a greater impact on vaccination attitudes than the low credibility source (lobbyist) when their online comments were perceived as highly credible, regardless of whether the message supported or opposed vaccination.

A number of studies have investigated the role that expertise, attractiveness, and trustworthiness play in creating a credible source. For example, Andreoli and Worchel (1978) found that communicators perceived as trustworthy produced greater attitude change concerning liquor legalization compared to communicators perceived as less trustworthy. A study conducted by Maddux and Rogers (1980) manipulated both the expertise and the attractiveness of the communicator when delivering a message about sleep. They found that the physical attractiveness of the source had no effect on agreement with the communicator's argument position. However, individuals were more likely to yield to the argument when the communicator was both attractive and an expert than if the source was unattractive regardless of expertise. These findings suggest that trustworthiness is an important factor in designing a credible source and suggests that expertise may play a greater role than attractiveness in shaping health decisions.

Although the research suggests an advantage to using a highly credible source, there are some mixed findings that contradict the current literature, which makes it difficult to make clear recommendations to health care professionals who want to design health promotional messages. Research suggests that weak or no supporting arguments

may contribute to these mixed findings on credibility. For example, a study by Maddux and Rogers (1980) found that agreement with a message source was greatest when supporting arguments were included in the message, and agreement with the source decreased when supporting arguments did not follow the message. Interestingly, supporting arguments enhanced the persuasiveness of all communicators including the expert, non-expert, attractive, and unattractive message sources. This suggests that supporting arguments are an important component in creating an effective persuasive message, regardless of the communicator's expertise or attractiveness.

High internal motivation to change may be another factor that contributes to contradictory findings in source credibility research (Rothman & Salovey, 1997). Smokers who have a high internal motivation to quit smoking (i.e., smokers who are dissatisfied with their image as a smoker) reported that a non-expert source exerted more influence than an expert source over their intentions to quit, despite reading the same anti-smoking message (Falomir-Pichastor, Mugny, & Invernizzi, 2006). Moreover, a study by Falomir-Pichastor, Butera, and Mugny (2002) revealed that a non-expert source was more persuasive amongst smokers with high internal constraint (i.e., smokers who had insufficient reasons for smoking) as compared to those with low internal constraint (i.e., smokers who had sufficient reasons for smoking). Across both studies, smokers who had either high internal constraint or high internal motivation to change found the non-expert source to be more informative and persuasive than the expert source who was perceived as trying to convince the reader. The perceived motivation of the source to either inform or convince may moderate the way the reader perceives the influence relationship between themselves and the message source. These findings suggest that in

some situations a low-credibility source is more persuasive than a high-credibility source. However, the research literature proposes that a highly credible source is more effective in producing changes in attitudes and intentions.

Health message research that explores the manipulation of both the message source and the message frame is limited. However, the studies within the literature that are relevant to the present study have focused on promoting increased physical activity. These studies suggest that using a highly credible source and a gain frame produces the most persuasive message design when promoting health behaviors. Jones et al. (2003) found that health promotion messages focusing on regular physical activity have the greatest influence on exercise intentions when using both a credible source and gain framed message. Another study on health message research found that exercise brochures are most persuasive when using a gain frame and healthy message source that sets realistic health goals as compared to a sedentary source that sets unrealistic health goals. (Siu, 2007).

While health message research has investigated the persuasiveness of source credibility, the research has failed to explore the effectiveness of manipulating health status of the source as a variable. Researchers in the health message field who want to design an impactful health message should examine the tactics of consumer marketing teams of large business corporations for guidance. Marketing teams have been manipulating the health status of their spokespeople for decades to increase sales. For example, actresses Kristie Alley and Valerie Bertinelli have both acted as spokespeople for the Jenny Craig weight loss program and Jared Fogle acted as the long-time spokesperson for Subway. Celebrity communicators such as Kristie Alley and Valerie

Bertinelli use their celebrity status as an indicator of their credibility, whereas average citizens such as Jared Fogle must create credibility for themselves through sharing a personal experience. Considering the success of Jenny Craig and Subway, the marketing campaigns mentioned above demonstrate that manipulating the health background of the source can be an effective tool in selling a product or encouraging a health behavior. In both examples given, the spokesperson is using their personal health journey from unhealthy to healthy as an example of how well the program works, while also encouraging others to adopt a healthy lifestyle change. Despite how often corporations use this technique with consumers, the health research field has failed to extensively investigate the effectiveness of varying the health status of the message source in changing health behaviors. Given the cost and effort that goes into creating these marketing campaigns targeting health and fitness, it is important that researchers consider health status as a variable in health messages. Further research into the persuasiveness of varying health status of the message source may result in designing a more effective health promotion campaign resulting in the prevention of preventable chronic diseases, such as type two diabetes.

The Present Study

The present study builds on previous health promotion literature and extends the investigation to examine the effects of message frame and message source health status on exercise intentions, confidence, perceived characteristics of the message source, message evaluation, and actual exercise behavior at follow-up.

In this study, participants read a physical activity health pamphlet that was presented in either a gain or loss frame. The source of the message was described as either a person who has engaged in regular physical activity over her lifetime (lifetime healthy source), or as a person who experienced a health scare due to inactivity that motivated her to begin exercising to improve her health (reformed unhealthy). The researchers made the following predictions:

- 1) Based on the findings by Siu (2007), the researchers predicted that a message delivered by a lifetime healthy source would be more influential than a message delivered by a reformed unhealthy source. However, it is important to note, that this study examined two active sources with different health backgrounds, whereas the study by Siu (2007) focuses on altering the status of the source by designating them as either active or sedentary.
- 2) Given that exercise is a preventive behavior, the researchers expect the gain framed message to be more effective in increasing exercise intentions than the loss framed message.
- 3) Based on previous research (Siu, 2007), the researchers predicted that a gain framed message from a lifetime healthy source will result in the highest physical activity intentions and behaviors as compared to the three other conditions.

METHOD

Participants and Design

A total of 176 undergraduate students at a Midwestern university volunteered to take part in this study in exchange for course credit. The Missouri State University IRB approved this project for use of human participants (April 6, 2016; approval code #16-0387). The experimenters randomly assigned participants to conditions in a 2 (message frame: gain, loss) X 2 (message source: lifetime healthy, reformed unhealthy) between subjects design. A total of five participants were removed from the analysis during data screening for missing 90 percent or more of their data, resulting in a final sample of 171 participants (87% white, 67% female). Participants received a follow up study two weeks after the completion of the first part of the study. Of the original sample, 56 participants (32%) volunteered to take part in the follow-up study in exchange for course credit and entry into a gift card drawing for a \$50 Amazon gift card. There were no significant differences between groups for gender, $\chi^2(1) = .53, p = .47, V = .06$, message source, $\chi^2(1) = .18, p = .47, V = .03$, or message frame, $\chi^2(1) = .17, p = .67, V = .03$ in dropout rates.

Message Source and Framing

In order to manipulate the message source, the experimenter created two versions of the health background materials. These author descriptions presented the message source as either an athletic source (lifetime healthy) or as source who had experienced a

health scare resulting in the adoption of a healthier lifestyle (reformed unhealthy). In the lifetime healthy source condition, the background information stated,

Taylor Johnson is a sophomore at Missouri State University who is working on her Bachelor of Science in Nursing (BSN) degree. Taylor is currently volunteering at Mercy Hospital and has been asked to create a pamphlet about physical exercise. She is excited about designing the pamphlet because she wants to share what she has learned with others. Taylor has worked hard to increase her physical activity over the last year in order to stay in shape and *maintain a healthy weight that she has achieved through many year of physical activity*. In the picture below, Taylor can be seen participating in exercise.

In the reformed unhealthy condition, the background information states the exact same information above with the exception of the last sentence which reads, “Taylor has worked hard to increase her physical activity over the last year in order to get in shape and *reduce weight after being diagnosed as pre-diabetic.*” On the same screen of the survey, participants read the source health information followed by a picture of the presumed message source being physically active.

The image was the same across all conditions to emphasize that both message sources were equally fit, despite different health backgrounds. The experimenters pilot tested the message source manipulation to ensure that they were perceived as similar. A total of 10 participants read the description of the lifetime healthy source, and eight participants read the description of the reformed unhealthy source. The pilot test revealed that there were no significant differences between the two sources on any of the tested characteristics. Most importantly, the pilot test revealed that participants perceived the two message sources as being credible and physically fit.

In order to manipulate message framing, the experimenters wrote two versions of a health pamphlet promoting physical activity that was attributed to the message source. The pamphlet contained important information regarding how regular physical exercise

can provide health benefits and protect against preventable chronic diseases. Each version of the pamphlet contained four strongly worded arguments framed as either the benefits of exercise (gain frame) or consequences of an inactive lifestyle (loss frame) (see Appendix). These arguments focused on emphasizing both the physiological and psychological aspects of exercise, while aiming to encourage regular physical activity. The arguments were factually equivalent across conditions with only minor changes to the wording to reflect framing manipulations. For example, participants read the following in the first argument of the gain frame condition, “with *regular physical activity*, you *gain* muscle mass, which *speeds* metabolism, leading to *better weight management*, and *increased* stamina.” The same argument in the loss frame condition reads as follows, “with a *sedentary lifestyle*, you *lose* muscle mass, which *slows* metabolism, leading to *weight gain*, and *decreased* stamina.” The three other arguments in the pamphlet focused on psychological well-being, risk associated with preventable chronic diseases, and longevity. These three arguments were also designed to mirror one another with the exception of minor changes to wording to fit the appropriate framing condition. After reading the four arguments, participants read information regarding the amount of exercise recommended by the CDC for adults.

Measures

Manipulation checks. The manipulation check consisted of four items designed to assess how well participants retained important health information from the pamphlet. The items included questions that inquired about why the message source was exercising, how much time should be spent exercising each week to reap health benefits, the chronic

diseases mentioned in the pamphlet that could be prevented by regular physical activity, and the ways that exercise affects psychological well-being as listed in the pamphlet.

The four manipulation checks were followed by a question that was used to determine the effectiveness of the message framing manipulation. More specifically, the researchers wanted to know if participants perceived the loss and gain framed messages differently. The item asked participants, “How positive was the message of the pamphlet?” on a Likert scale ranging from 1 (*negative*) to 7 (*positive*). The positivity item was placed in the manipulation check section to avoid arousing participant suspicion that the message frame was altered across conditions.

Exercise intentions. Participants responded to four items designed to measure their reported intentions to engage in moderate physical activities over a two-week period following the study. Participants responded to exercise questions with moderate physical activities in mind that would be participated in for at least 20 minutes at a given time. Respondents read that moderate physical activities were those that make you breathe somewhat harder than normal. Participants answered two questions, “Over the next two weeks, I intend to exercise at least ____ days” and “On the days that I plan to exercise, I intend to exercise at least ____ minutes per day.” Participants responded to these questions by filling in the blank with the appropriate number. The number of days and minutes provided were multiplied to create one measure of overall time spent exercising. Next, participants provided the percentage of time they planned to spend doing light, moderate, and vigorous exercise over the next two weeks. Prior to reading the question, participants were given information defining the different types of activity: “Light physical activity involves very little exertion that makes you breathe slightly harder than

normal. Moderate physical activity makes you breathe somewhat harder than usual and vigorous physical activity makes you breathe much harder than usual.” Participants were instructed to provide responses that would result in the three percentages summing to 100%. Finally, participants rated, “How confident are you in your ability to follow through with your exercise plans indicated above?” on a Likert scale ranging from 1 (*not at all confident*) to 7 (*completely confident*).

Previous exercise behaviors. Participants responded to four items to establish a baseline measure of physical activity level prior to the study. Participants responded to exercise questions with moderate physical activities in mind that would be participated in for at least 20 minutes at a time. Participants were asked to answer two questions, “How many days have you exercised over the last two weeks at a moderate intensity?” and “On the days that you exercised, how many minutes on average did you spend exercising each day?” The number of days and minutes provided were multiplied to create an overall measure of time spent exercising. Then, participants provided the percentage of time they had spent doing light, moderate, and vigorous exercise during the two-week time frame with the three responses summing to 100%. Participants received details about what constituted light, moderate, and vigorous activity. This description was the same as that given in the exercise intentions scale. Finally, participants rated the following question on a Likert scale ranging from 1 (*not at all confident*) to 7 (*completely confident*), “Compared to the past two-weeks, how confident are you that you will spend more time exercising in the next two-weeks?”

Message source characteristics. Participants indicated their level of agreement with nine statements about the author of the text on a Likert scale ranging from 1

(*strongly disagree*) to 7 (*strongly agree*). Participants rated their agreement with the following statement, “Taylor Johnson is knowledgeable”. Participants then rated their agreement with the next three statements, “Taylor Johnson is intelligent”, “Taylor Johnson is credible”, and “Taylor Johnson is likeable”. Next, participants indicated their agreement with the following statements, “Taylor Johnson is competent at communicating the benefits of physical activity”, and “Taylor Johnson is physically fit”. Finally, participants responded to the last two questions which stated, “Taylor Johnson is an active person”, and “Taylor Johnson is a healthy person”.

Message evaluation. Participants indicated agreement with five statements evaluating the information in the health pamphlet. Participants responded to all five items using a Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Participants responded to the first item that stated, “The information in the pamphlet was persuasive”. Then participants rated their agreement with two statements, “Reading the text motivated me to exercise more than usual”, and “The pamphlet was easy to understand”. Participants rated their agreement with the fourth item which stated, “The information in the pamphlet was attention-grabbing”. Lastly, participants rated their agreement with the following statement, “The pamphlet should be published by the hospital for future informative use”.

Reported exercise behavior at follow-up. Participants responded to exercise questions with moderate physical activities in mind that were participated in for at least 20 minutes at a time. Respondents read that moderate physical activities were those that make you breathe somewhat harder than normal. Participants answered two questions, “Over the last two weeks, I exercised ____ days”, and “On the days that I exercised, I

exercised at least ____ minutes per day”. Participants responded with the appropriate number in the given blanks. Once again, these numbers were multiplied to create one measure of overall time spent exercising. Lastly, we asked participants, “How satisfied are you with the extent to which you followed through with your exercise plans you set yourself 2 weeks ago?” on a Likert scale ranging from 1 (*not at all satisfied*) to 7 (*completely satisfied*).

Procedure

Participants signed up for a two-part online study that was designed using Qualtrics Survey Software. After giving their electronic informed consent, participants began the survey, which took approximately 10 to 15 minutes to complete.

Randomization software in Qualtrics randomly assigned participants to either the lifetime healthy source or the reformed unhealthy source condition and to the gain or loss frame condition. Participants first read their assigned source information, which appeared on the first screen of the survey, along with a photo of the presumed source. After reading the source information, participants continued to the following screen, where they read their assigned health pamphlet (either gain or loss framed).

On the following screen, participants answered items that assessed their intentions to exercise. After completing the exercise intentions items, participants continued to the following screen, where they reported their prior exercise behaviors. On the next screen, participants responded to nine items assessing message source characteristics followed by another screen, which asked participants to answer five items evaluating the content of the message in the pamphlet. On the following screen, participants answered four

manipulation checks and a question about message positivity. Finally, participants responded to demographic information on the last screen of the survey. These measures allowed the experimenter to assess intentions regarding future exercise intentions, participants' current level of physical activity, and perceptions about both the source and content of the message.

After completing the dependent measures, manipulation checks, and demographic information, participants were informed that they would be sent an email containing a link to a brief follow-up study. The follow-up study consisted of three questions, which assessed actual exercise behaviors two-weeks following the study and exercise satisfaction. Once these measures were completed a debriefing email was sent to all participants.

RESULTS

Exercise Intentions and Exercise Behavior at Follow Up

Participants were tested to determine the amount of time that they intended to spend exercising over a two-week period following the study. A total of five participants were removed from this analysis for meeting the outlier criteria (i.e., a z-score of three or greater). A 2 (message source: lifetime healthy, reformed unhealthy) X 2 (message frame: gain, loss) between subjects ANOVA analyzed exercise intentions. There were no significant main effects for message source, $F(1,162) < 1, p = .63, \eta^2 = .001$, or message frame, $F(1,162) < 1, p = .38, \eta^2 = .01$. The message source by message frame interaction, $F(1,162) < 1, p = .47, \eta^2 = .003$, also failed to reach significance with participants in the lifetime healthy/loss frame condition reporting the highest exercise intentions ($M = 308.50, SD = 211.35$) followed by those in the unhealthy reformed/loss frame condition ($M = 300.10, SD = 222.88$). Participants in the unhealthy reformed/gain frame condition reported the third highest intentions to exercise ($M = 294.47, SD = 237.63$), while those in the lifetime healthy/gain condition reported the lowest intentions to exercise ($M = 252.13, SD = 230.54$).

A 2 (message source: lifetime healthy, reformed unhealthy) X 2 (message frame: gain, loss) X 3 (type of activity: light, moderate, and vigorous) mixed ANOVA examined the percentage of time intended to be spent engaging exercise. Data screening revealed that there were no outliers that meet the criteria for exclusion. The only significant effect was a main effect for type of activity, $F(2,334) = 11.06, p < .001, \eta^2 = .06$, with participants reporting the greatest intention to engage in moderate physical activity ($M =$

41.10, $SD = 19.97$) as compared to light ($M = 31.57$, $SD = 25.39$) and vigorous activity ($M = 27.33$, $SD = 22.52$). A dependent t-test *post hoc* analysis using a Bonferroni correction revealed that moderate physical activity was significantly different ($p < .01$, $d_{avg} = -0.42$) from light physical activity. Moderate physical activity was also found to be significantly different ($p < .01$, $d_{avg} = 0.65$) from vigorous physical activity. However, there were no significant differences ($p = .62$, $d_{avg} = 0.18$) between intentions to engage in light and vigorous physical activity. These findings suggest that participants intended to spend more time engaging in moderate physical activity, but the amount of time that they intended to spend engaging in light and vigorous exercise was not distinguishable. All F values are reported in Table 1.

Participants rated their confidence in their ability to follow through with their exercise intention plans. Data screening revealed that there were no outliers that needed to be removed for the following analysis. A 2 (message source: lifetime healthy, reformed unhealthy) X 2 (message frame: gain, loss) between subjects ANOVA assessed confidence ratings. There was no significant interaction $F(1,167) = 1.07$, $p = .30$, $\eta^2 = .006$, or significant main effect for message source, $F(1,167) < 1$, $p = .82$, $\eta^2 < .001$. However, there was a significant main effect for message frame, $F(1,167) = 7.44$, $p = .007$, $\eta^2 = .04$. As shown in Figure 1, those in the loss frame condition ($M = 5.73$, $SD = 1.23$) reported higher levels of confidence to carry out their exercise intentions than those in the gain frame condition ($M = 5.16$, $SD = 1.44$).

The experimenters ran a bivariate correlation between exercise intentions and exercise behavior at follow up to assess the relationship between the two variables. The

analysis revealed that exercise intentions and actual exercise behavior at follow-up were significantly correlated, $r(50) = .51$, $p < .001$, $R^2 = .26$.

Participants who responded to the follow-up study rated their level of satisfaction with the extent to which they followed through with their exercise plans created in part one of the study. Data screening revealed that there were not outliers, hence all participants were retained for this analysis. A 2 (message source: lifetime healthy, reformed unhealthy) X 2 (frame: gain, loss) between subjects ANOVA was used to analyze exercise satisfaction ratings. The interaction, $F(1,51) < 1$, $p = .88$, $\eta^2 < .001$, main effect of message source, $F(1,51) < 1$, $p = .51$, $\eta^2 < .01$, and main effect of message frame, $F(1,51) < 1$, $p = .53$, $\eta^2 < .001$, all failed to reach statistical significance.

Previous Exercise Behaviors

Participants reported the amount of time they actually spent exercising two-weeks before and after part one of the study. The time spent exercising before the study was treated as a pre-test measure and the time spent exercising after part one of the study as a post-test measure to determine if there were differences in the amount of time spent exercising before and after the study. Data screening indicated that there were no outliers that needed to be removed for this analysis. A 2 (message source: lifetime healthy, reformed unhealthy) X 2 (message frame: gain, loss) X 2 (time: pre-test, post-test) mixed ANOVA was used to analyze the overall time spent exercising. The ANOVA revealed that there were no significant interactions or main effects for time spent exercising (see Table 2). These results indicate that reading the health pamphlet did not increase the

amount of exercise that participants engaged in after the completion of part one of the study.

Participants provided the percentage of light, moderate, and vigorous activity completed two-weeks prior to the study. Data screening revealed that there were no outliers, hence all participants were retained for this analysis. A 2 (message source: lifetime healthy, reformed unhealthy) X 2 (message frame: gain, loss) X 3 (type of activity: light, moderate, and vigorous) mixed ANOVA examined the percentage of time spent exercising two-weeks prior to the study. There were no significant interactions or main effect for message source (see Table 3). However, there was a significant main effect for type of activity, $F(2,334) = 12.72, p < .001, \eta^2 = .07$, with the greatest percentage of time being spent engaging in light ($M = 40.57, SD = 31.20$), then moderate ($M = 36.09, SD = 23.82$), and then vigorous activity ($M = 23.34, SD = 24.02$).

A dependent t-test *post hoc* analysis was run using a Bonferroni correction. There was a significant difference ($p < .001, d_{avg} = 0.62$) between light and vigorous physical activity. There was also a significant difference ($p < .001, d_{avg} = 0.53$) between moderate and vigorous activity. However, there were no significant differences ($p = .73, d_{avg} = 0.16$) between the percentage of light and moderate physical activity.

Participants rated their confidence that they would exercise more during the two-week period following the study than they had in the past. Data screening revealed that there were no outliers that meet the criteria for exclusion. A 2 (message source: lifetime healthy, reformed unhealthy) X 2 (message frame: gain, loss) between subjects ANOVA analyzed confidence ratings and found a significant message source X message frame interaction, $F(1,166) = 3.87, p = .05, \eta^2 = .02$. As shown in Figure 2, those in the

reformed unhealthy/loss frame reported the highest level of confidence ($M = 5.26$, $SD = 1.60$) followed by those in the lifetime healthy/ gain frame ($M = 5.21$, $SD = 1.31$). Participants in the lifetime healthy/loss frame reported the third highest confidence ratings ($M = 4.93$, $SD = 1.61$) and those in the reformed unhealthy/ gain frame reported the lowest confidence ratings ($M = 4.53$, $SD = 1.57$).

An independent t-tests for the *post hoc* analysis was run with a Bonferroni correction on the interaction between Message Source and Message Frame. Confidence ratings for those in the unhealthy reformed/gain condition ($M = 4.53$, $SD = 1.57$) and the unhealthy reformed/loss condition ($M = 5.26$, $SD = 1.60$) were significantly different ($p = .04$, $d = -0.46$). Confidence ratings were not significantly different ($p = .55$, $d = 0.13$) between participants in the lifetime healthy/gain condition ($M = 5.12$, $SD = 1.31$) and lifetime healthy/loss condition ($M = 4.93$, $SD = 1.61$).

Message Source Characteristics

Participants responded to nine items evaluating characteristics of the message source. Data screening indicated that there were no outliers that needed to be removed for this analysis. A 2 X 2 between subjects MANOVA was analyzed with message source (lifetime healthy, reformed unhealthy) and message frame (gain, loss) predicting nine message source characteristics (knowledge, intelligence, credibility, likability, communication effectiveness, physical fitness, physical activity, and activeness).

There was a significant multivariate main effect for message source, $F(9,159) = 2.62$, $p = .007$, $\eta^2 = .13$, but not for the main effect of message frame, $F(9,159) = 1.06$, $p = .40$, $\eta^2 = .06$, or the interaction between message source and message frame, $F(9,159)$

$< 1, p = .61, \eta^2 = .04$. A univariate ANOVAs was used to examine individual dependent variable contributions to the main effect of message source. There was a significant difference between how participants perceived the message source on the first item, $F(1,167) = 6.22, p < .01, \eta^2 = .04$, with those in the reformed unhealthy condition ($M = 6.14, SD = .87$) perceiving the source as more knowledgeable than those in the lifetime healthy condition ($M = 5.71, SD = 1.23$). A second univariate ANOVA revealed significant differences in ratings of perceived intelligence of the message source, $F(1,167) = 8.32, p = .004, \eta^2 = .05$. Participants in the reformed unhealthy condition ($M = 6.13, SD = .94$) rated the source as more intelligent than those in the lifetime healthy condition ($M = 5.60, SD = 1.28$). All other message source characteristic F values are reported in Table 4. Figures 3 and 4 display the ratings for the perceived level of knowledge and intelligence of the message source.

Message Evaluation

Participants evaluated five items pertaining to the health pamphlet. The data was screen for outliers and assumptions and all participants were retained for this analysis. A 2 X 2 between subjects MANOVA was conducted with message source (lifetime healthy, reformed unhealthy) and message frame (gain, loss) predicting five statements about the effectiveness of the health pamphlet. There were no significant main effect found for message source, $F(5,163) < 1, p = .71, \eta^2 = .02$, or for the main effect of message frame, $F(5,163) < 1, p = .64, \eta^2 = .02$, or the interaction between message source and message frame, $F(5,163) < 1, p = .72, \eta^2 = .02$. These results suggest that participants across conditions evaluated the five health pamphlet items similarly.

Participants rated the overall positivity of the health pamphlet. Data screening indicated that there were no outliers that needed to be removed for this analysis. A 2 (message source: lifetime healthy, reformed unhealthy) X 2 (message frame: gain, loss) between-subjects ANOVA was used to analyze the perceived positivity of the health message. The ANOVA revealed that there were no significant interactions, $F(1,163) < 1$, $p = .88$, $\eta^2 < .001$, main effect for message source, $F(1,163) < 1$, $p = .42$, $\eta^2 < .01$, or message frame, $F(1,163) < 1$, $p = .36$, $\eta^2 < .01$. These findings suggest that participants found the positivity of the health message to be the same across conditions.

Manipulation Check

Manipulation checks were initially included in the study to determine which participants to exclude from the statistical analyses for failing to properly read the health pamphlet text. Given the low response rate to the second part of the study, the experimenters decided not to use the manipulation checks to exclude participants from statistical analyses to prevent the further loss of participants who responded to the second part of the study.

DISCUSSION

This study is the first to investigate how changes to the health status of the message source impacts the effectiveness of health message designs used to promote regular physical activity. Our study is unique because the two message sources are represented as equally fit, despite different health backgrounds. Contrary to our predictions, exercise intentions and behaviors were not highest amongst those who received the health message presented by a lifetime healthy source in a gain frame. Instead, the results indicate that framing differentially impacts one weak indicator of persuasion as a function of message-source—specifically, the loss frame increases confidence in plans for future exercise only among participants receiving a health message from the unhealthy reformed source.

The present study was designed to examine the persuasive influence of prospect theory (Tversky and Kahneman, 1981) and the health status of the message source on exercise intentions, confidence ratings, perceived characteristics of the message source, message evaluation, and actual exercise behavior at follow-up. Although, our findings did not correspond with our predictions, the data revealed interesting and useful information that adds to the existing literature on health message research.

Exercise Intentions and Exercise Behavior at Follow Up

There were no significant effects found for exercise intentions. However, the descriptive statistics revealed that the reformed unhealthy/loss frame condition had the

highest reported exercise intentions. Surprisingly, the lowest reported exercise intentions came from the lifetime healthy/gain frame condition. These findings are the complete opposite of our third hypothesis prediction. Previous research by Siu (2007) revealed that the most persuasive message design was a combination of a healthy message source and gain frame. However, she speculated that a loss frame message could be more persuasive if recipients were asked to think about the consequences of a sedentary lifestyle before reading the health message. In our study, participants in the reformed unhealthy/loss frame condition were given background information about a message source who had experienced a health scare promoting a healthy lifestyle change. Participants in the loss frame then read four strongly worded arguments detailing the consequences of a sedentary lifestyle followed by CDC exercise recommendations. Our findings lend some support to the speculations regarding loss framing by Siu (2007).

The results revealed that a strong positive relationship existed between exercise intentions and actual behavior even after a two-week follow up period. Despite this relationship, participants did not engage in more physical activity during the two-week period following the completion of the study. Taking these two findings into consideration together, it is plausible that a larger sample size in the follow up study may have revealed a trend or significant effect for exercise. In other words, the experimenters speculate that retaining participants between phase one and two of the study may have provided enough data to support the relationship between exercise intentions and actual follow through with those intentions. Additional research is needed to tease apart the factors that contribute to the relationship between exercise intentions and actual exercise behavior following a health intervention.

There were no statistically significant differences between conditions for satisfaction ratings in meeting exercise goals. The researchers hope that future research will have a larger sample size when measuring actual follow-up behavior to determine if underlying differences in satisfaction ratings may exist.

Exercise Intentions and Previous Exercise Behaviors

Participants spent the majority of their time performing light physical activity, but reported intentions to engage in mostly moderate physical activity in their future plans. These findings indicate that participants planned to engage in exercise that caused more physical exertion than their typical routine after reading the health pamphlet. It is possible that the health message was found to be persuasive, hence influencing readers to make plans to spend time engaged in exercise that provided health benefits. A second possible explanation for the increase in intentions to participate in more moderate physical activity is that many of the instructions in the study placed an emphasis upon moderate physical activity when responding to items.

Confidence ratings to carry out exercise intentions were greatest when the message was loss framed rather than gain framed. The effect appears to be function of the difference between the framing of the messages indicating that the loss frame messages were more influential in increasing confidence intentions than the gain framed messages. Despite this finding being contradictory to our hypotheses, the framing effect appears to be consistent for the two confidence ratings in the study.

A deeper look into confidence ratings to exercise in the future revealed that the confidence ratings for the lifetime healthy message sources were similar, regardless of

framing. However, the confidence ratings were drastically different between the gain and loss frame condition amongst the unhealthy reformed source. There is a possibility that participants are reacting more strongly to the reformed unhealthy/loss frame condition out of fear. More specifically, this condition may be fear inducing due to the emphasis placed on the potential health consequences for failing to exercise. Further research should be conducted to determine the factors that are contributing to these findings. Lastly, the researchers can rule out the speculation by Arora and Arora (2006) that the loss frame condition was more attention grabbing than the gain frame condition. There were no significant differences between conditions on the ratings of an item in the message evaluation asking how attention grabbing the health pamphlet was.

Although these results suggest a potential increase in confidence to exercise in the future, it is important to remember that confidence ratings are a weak indicator of participants' goals to exercise. Furthermore, the experimenters suggest that future research studies conduct analyses to determine if participants who seldom exercise have higher confidence and intentions ratings than those who exercise frequently. The researchers speculate that the health message may be most effective in changing exercise intentions, confidence, and behaviors amongst those who do not practice regular physical activity.

Message Source

The reformed unhealthy and lifetime healthy sources were both perceived as credible and likeable sources who competently delivered a health message. Although, the experimenters wanted the two message sources to be perceived as similar across all

source characteristics, the reformed unhealthy source was perceived as being more knowledgeable and intelligent than the lifetime healthy source.

One explanation for these findings is that the reformed unhealthy source may be perceived as more knowledgeable and intelligent due to her varied health background. The participants may view the reformed unhealthy source with a varied background as having had experience with the consequences of a sedentary lifestyle. Conversely, the lifetime healthy source may be viewed as only having had the experience of the health benefits from living a very active lifestyle. These findings lend support to the effectiveness of using a spokesperson like Jared Fogle to promote health products, since he has a varied health background similar to the reformed unhealthy source. A second explanation for the difference between message sources could stem from perceived trustworthiness. Trustworthiness is an important component in determining the perceived level of credibility (Hovland & Weiss, 1951; Pornpitakpan, 2004). The experimenters failed to inquire about trustworthiness, but future research should include an item characteristic on trustworthiness to determine any potential difference amongst message sources. It is important to note, that the two message sources did not vary on any of the seven other characteristics, which suggests that the two sources were perceived as equivalent with the exception of knowledge level and intelligence.

Message Evaluation

The text of the pamphlet was perceived as similar regardless of the message source and message frame. These results suggest that participants across conditions did not significantly differ in their evaluation of the message. The researchers speculate that

the mirroring of the health pamphlet across conditions and the focus on encouraging physical activity resulted in similar message evaluations despite manipulation changes.

Participants rated the overall positivity of the health pamphlet and the data revealed that there were no significant differences between the four conditions. There was no main effect found for frame on positivity ratings. This finding is surprising considering the negative nature of the language in the loss frame conditions. One explanation for the lack of differences between positivity ratings may be the fact that the health pamphlet focused on and encouraged physical activity in both framing conditions.

CONCLUSIONS

It is important to address the limitations of the current study. The present study was targeted at encouraging undergraduate students to engage in more exercise, therefore the experimenters used a homogenous sample of undergraduate students. The convenience sample of undergraduate students may limit the generalizability of the findings in this study. Future research should replicate the current study with a more diverse sample that is representative of the population.

Our study used self-report measures of exercise, rather than objective measures of exercise such as maximum oxygen intake (VO₂ max). Previous research has revealed that self-report is a practical method used the health message research literature to determine fitness. Research by Godin and Shepard (1985) reveals that exercise self-report measures have demonstrated consistent validity. Future studies should use objective measures of exercise behavior to determine a more accurate measure of actual exercise behavior.

The low response rate of participants in the second phase is a major shortcoming of the study. The low response rate may be due to the fact that the study was online and participants received study reminders through email rather than another form of communication. The low response rate was unlikely due to lack of incentives, since participants were offered both credit and a monetary gift card drawing incentives. Future studies should consider having students meet in a laboratory setting to take the study and sending reminders through text-message, since individuals of all ages respond to that particular form of communication.

In short, the present study appears to indicate that there is a relationship between intentions and actual exercise behavior. Additionally, the reformed unhealthy message source has a greater effect on confidence ratings to exercise only when the message is loss framed. These results add information to the overall health message research, while also building a foundation for research on the health status of message sources. Furthermore, our research demonstrates the need for further research to examine the persuasive influence of a message source with a varied health background. The experimenters hope that this research will stimulate interest in manipulating the health status of the source to determine if this message design could potentially result in the prevention of preventable chronic diseases.

REFERENCES

- Andreoli, V., & Worchel, S. (1978). Effects of media, communicator, and message position on attitude change. *Public opinion quarterly*, 42(1), 59-70. doi:10.1086/268429
- Arora, R., Stoner, C., & Arora, A. (2006). Using framing and credibility to incorporate exercise and fitness in individuals' lifestyle. *Journal of consumer marketing*, 23(4), 199-207. doi:10.1108/07363760610674329
- Banks, S. M., Salovey, P., Greener, S., Rothman, A. J., Moyer, A., Beauvais, J., & Epel, E. (1995). The effects of message framing on mammography utilization. *Health Psychology*, 14, 178-184. doi:10.1037/0278-6133.14.2.178
- Centers for Disease Control and Prevention. (2014, May 23). Facts about physical activity. Retrieved from <http://www.cdc.gov/physicalactivity/data/facts.htm>
- Centers for Disease Control and Prevention. (2015, June 4). Physical activity and health. Retrieved from <http://www.cdc.gov/physicalactivity/basics/pa-health/index.htm>
- Detweiler, J. B., Bedell, B. T., Salovey, P., Pronin, E., & Rothman, A. J. (1999). Message framing and sunscreen use: Gain-framed messages motivate beach-goers. *Health Psychology*, 18(2), 189-196. doi:10.1037/0278-6133.18.2.189
- Falomir-Pichastor, J. M., Butera, F., & Mugny, G. (2002). Persuasive constraint and expert versus non-expert influence in intention to quit smoking. *European Journal of Social Psychology*, 32(2), 209-222. doi:10.1002/ejsp.67
- Falomir-Pichastor, J. M., Mugny, G., & Invernizzi, F. (2006). Smokers' (dis)satisfaction, persuasive constraint, and influence of expert and non-expert sources. *Swiss Journal of Psychology / Schweizerische Zeitschrift Für Psychologie / Revue Suisse De Psychologie*, 65(1), 7-14. doi:10.1024/1421-0185.65.1.7
- Gallagher, K. M., & Updegraff, J. A. (2012). Health message framing effects on attitudes, intentions, and behavior: A meta-analytic review. *Annals of Behavioral Medicine*, 43(1), 101-116. doi:10.1007/s12160-011-9308-7
- Gallagher, K. M., Updegraff, J. A., Rothman, A. J., & Sims, L. (2011). Perceived susceptibility to breast cancer moderates the effect of gain- and loss-framed messages on use of screening mammography. *Health Psychology*, 30(2), 145-152. doi:10.1037/a0022264
- Godin, G., & Shephard, R. J. (1985). A simple method to assess exercise behavior in the community. *Can J Appl Sport Sci*, 10(3), 141-146.

- Hovland, C. I., & Weiss, W. (1951). The influence of source credibility on communication effectiveness. *Public Opinion Quarterly*, 15635-650. doi:10.1086/266350
- Jones, L. W., Sinclair, R. C., & Courneya, K. S. (2003). The effects of source credibility and message framing on exercise intentions, behaviors, and attitudes: An integration of the elaboration likelihood model and prospect theory. *Journal of Applied Social Psychology*, 33(1), 179-196. doi:10.1111/j.1559-1816.2003.tb02078.x
- Kareklas, I., Muehling, D. D., & Weber, T. J. (2015). Reexamining health messages in the digital age: A fresh look at source credibility effects. *Journal of Advertising*, 44(2), 88-104. doi:10.1080/00913367.2015.1018461
- Levine, B. A., Moss, K. C., Ramsey, P. H., & Fleishman, R. A. (1978). Patient compliance with advice as a function of communicator expertise. *The Journal of Social Psychology*, 104(2), 309-310. doi:10.1080/00224545.1978.9924079
- Maddux, J. E., & Rogers, R. W. (1980). Effects of source expertness, physical attractiveness, and supporting arguments on persuasion: A case of brains over beauty. *Journal of Personality and Social Psychology*, 39(2), 235-244. doi:10.1037/0022-3514.39.2.235
- McNeil, B. J., Pauker, S. G., Sox, H. C., Jr., & Tversky, A. (1982). On the elicitation of preferences for alternative therapies. *New England journal of medicine*, 306(21), 1259-1262.
- Meyerowitz, B. E., & Chaiken, S. (1987). The effect of message framing on breast self-examination attitudes, intentions, and behavior. *Journal of Personality and Social Psychology*, 52, 500-510. doi:10.1037/0022-3514.52.3.500
- Pornpitakpan, C. (2004). The persuasiveness of source credibility: A critical review of five decades' evidence. *Journal of Applied Social Psychology*, 34(2), 243-281. doi:10.1111/j.1559-1816.2004.tb02547.x
- Rothman, A. J., & Salovey, P. (1997). Shaping perceptions to motivate healthy behavior: The role of message framing. *Psychological Bulletin*, 121(1), 3-19. doi:10.1037/0033-2909.121.1.3
- Siu, W. L. W. (2007). Prime, frame, and source factors: Semantic valence in message judgment. *Journal Of Applied Social Psychology*, 37(10), 2364-2375. doi:10.1111/j.1559-1816.2007.00262.x
- Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, 211(4481), 453-458. doi:10.1126/science.7455683

Updegraff, J. A., Brick, C., Emanuel, A. S., Mintzer, R. E., & Sherman, D. K. (2015).
Message framing for health: Moderation by perceived susceptibility and
motivational orientation in a diverse sample of Americans. *Health
Psychology, 34*(1), 20-29. doi:10.1037/hea0000101

Table 1. Summary of Three-Way Mixed ANOVA on Intentions to Engage in Light, Moderate, and Vigorous Activity

Effect	df_n, df_d	F	p	η^2
Source	1, 167	< 1	1.0	<. 001
Frame	1, 167	< 1	1.0	<. 01
Activity Type	2, 234	11.06	<. 001***	<. 06
Source: Frame	1, 167	< 1	1.0	<. 001
Source: Activity Type	2, 334	< 1	.68	<. 002
Frame: Activity Type	2, 334	1.31	.27	<. 01
Source: Frame: Activity Type	2, 334	1.05	.35	<. 01

Note. ***= $p < .001$.

Table 2. Summary of Three-Way Mixed ANOVA on Previous Exercise Behaviors and Exercise at Follow Up

Effect	df_n, df_d	F	p	η^2
Source	1, 50	< 1	.89	<. 001
Frame	1, 50	< 1	.41	<. 01
Exercise	1, 50	1.51	.22	<. 01
Source: Frame	1, 50	< 1	.76	<. 001
Source: Exercise	1, 50	< 1	.93	<. 001
Frame: Exercise	1, 50	< 1	.98	<. 001
Source: Frame: Exercise	1, 50	< 1	.47	<. 01

Table 3. Summary of Three-Way Mixed ANOVA on Percentage of Time Spent Engaging in Light, Moderate, and Vigorous Activity Prior to the Study

Effect	df_n, df_d	F	p	η^2
Source	1, 167	< 1	1.0	<. 001
Frame	1, 167	< 1	1.0	<. 001
Activity Type	2, 334	12.72	<. 001***	<. 01
Source: Frame	1, 167	< 1	1.0	<. 001
Source: Activity Type	2, 334	< 1	.91	.001
Frame: Activity Type	2, 334	< 1	.39	.01
Source: Frame: Activity Type	2, 334	< 1	.54	.001

Note. ***= $p < .001$.

Table 4. Summary of Two-Way ANOVAs for Message Source Characteristic Items

Measured Variable	Effect	df_n, df_d	F	p	η^2
Item 1	Source	1, 167	6.21	.013*	.04
	Frame	1, 167	2.10	.15	.01
	Source: Frame	1, 167	< 1	.99	< .001
Item 2	Source	1, 167	8.32	< .01**	.05
	Frame	1, 167	3.20	.08	.02
	Source: Frame	1, 167	< 1	.56	.002
Item 3	Source	1, 167	2.73	.10	.02
	Frame	1, 167	< 1	.38	.004
	Source: Frame	1, 167	< 1	.68	.001
Item 4	Source	1, 167	1.86	.17	.01
	Frame	1, 167	< 1	.76	< .01
	Source: Frame	1, 167	< 1	.89	< .001
Item 5	Source	1, 167	1.47	.23	< .01
	Frame	1, 167	< 1	.59	.002
	Source: Frame	1, 167	1.82	.18	.01
Item 6	Source	1, 167	< 1	.49	.003
	Frame	1, 167	1.35	.25	.008
	Source: Frame	1, 167	< 1	.33	.006
Item 7	Source	1, 167	< 1	.41	.004
	Frame	1, 167	< 1	.63	.001
	Source: Frame	1, 167	< 1	.50	.003
Item 8	Source	1, 167	< 1	.89	< .001
	Frame	1, 167	< 1	.38	.005
	Source: Frame	1, 167	<1.25	.27	.007
Item 9	Source	1, 167	< 1	.89	< .001
	Frame	1, 167	< 1	.66	.001
	Source: Frame	1, 167	< 1	.64	.001

Note. * = $p < .05$, ** $p < .01$.

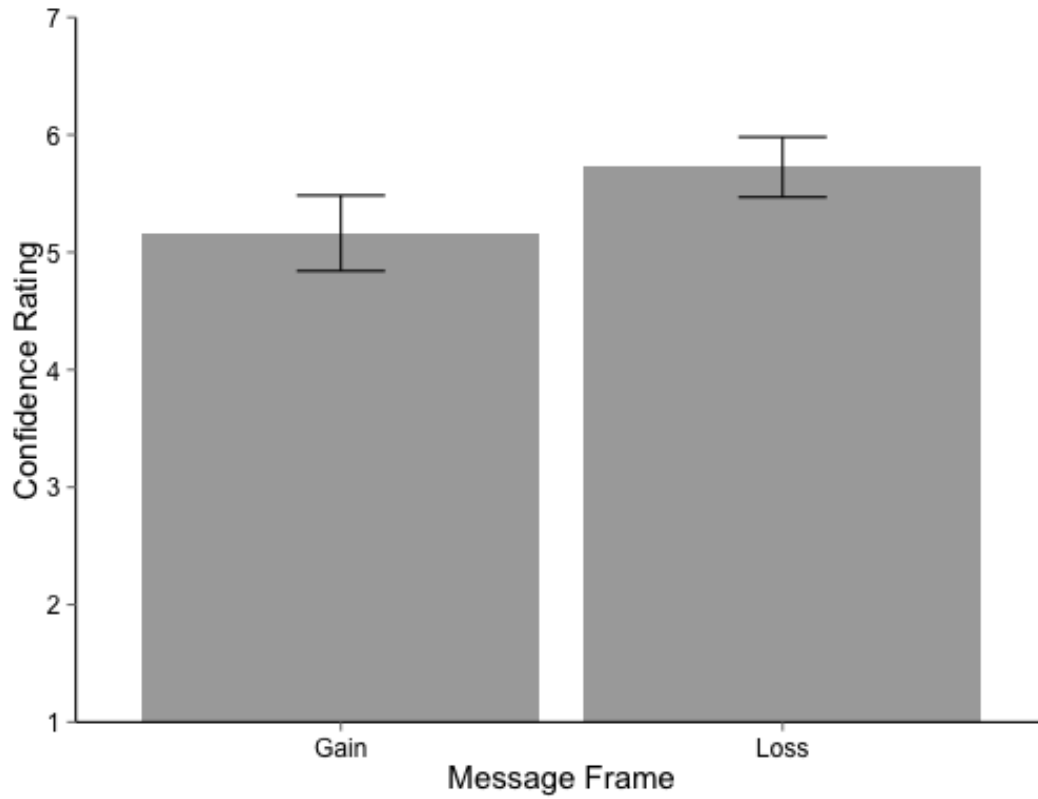


Figure 1. Confidence ratings to follow through with exercise intentions are higher in the loss frame condition than the gain frame condition. Error bars represent a 95% confidence interval.

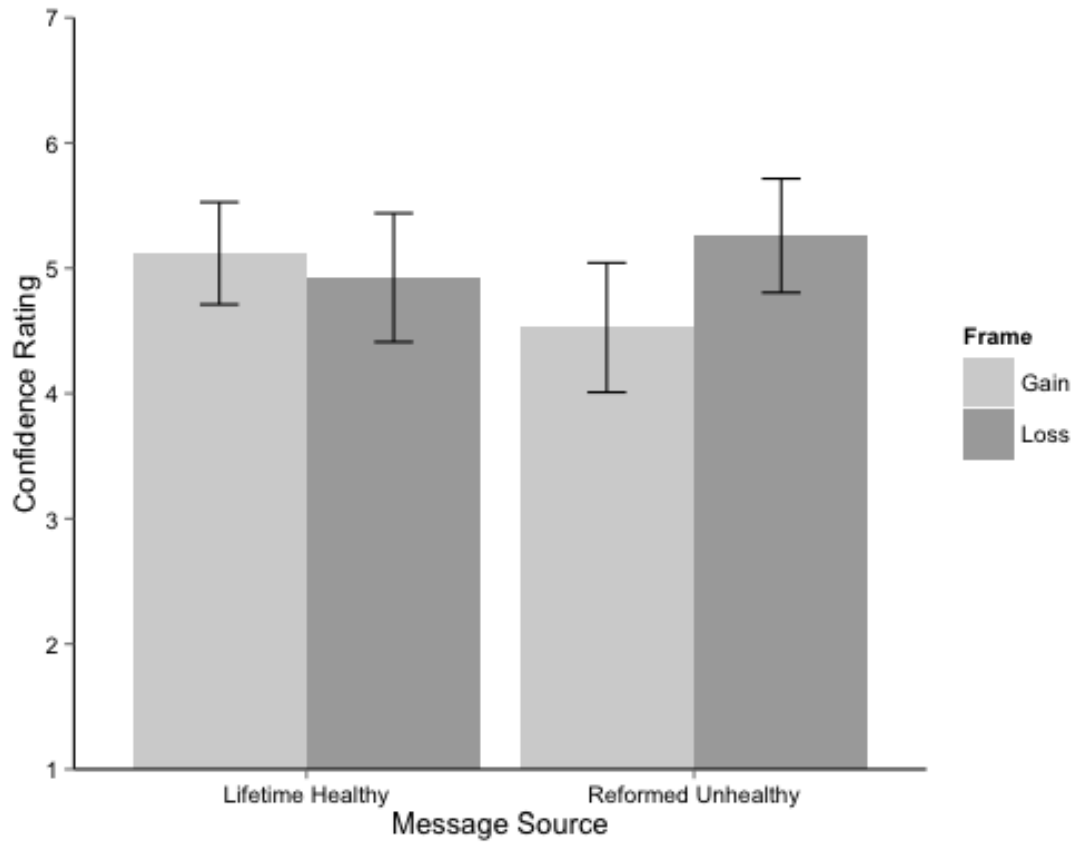


Figure 2. Confidence ratings to exercise more in the future are significantly different for only those in the loss frame when receiving a message from the unhealthy reformed source. Error bars represent a 95% confidence interval.

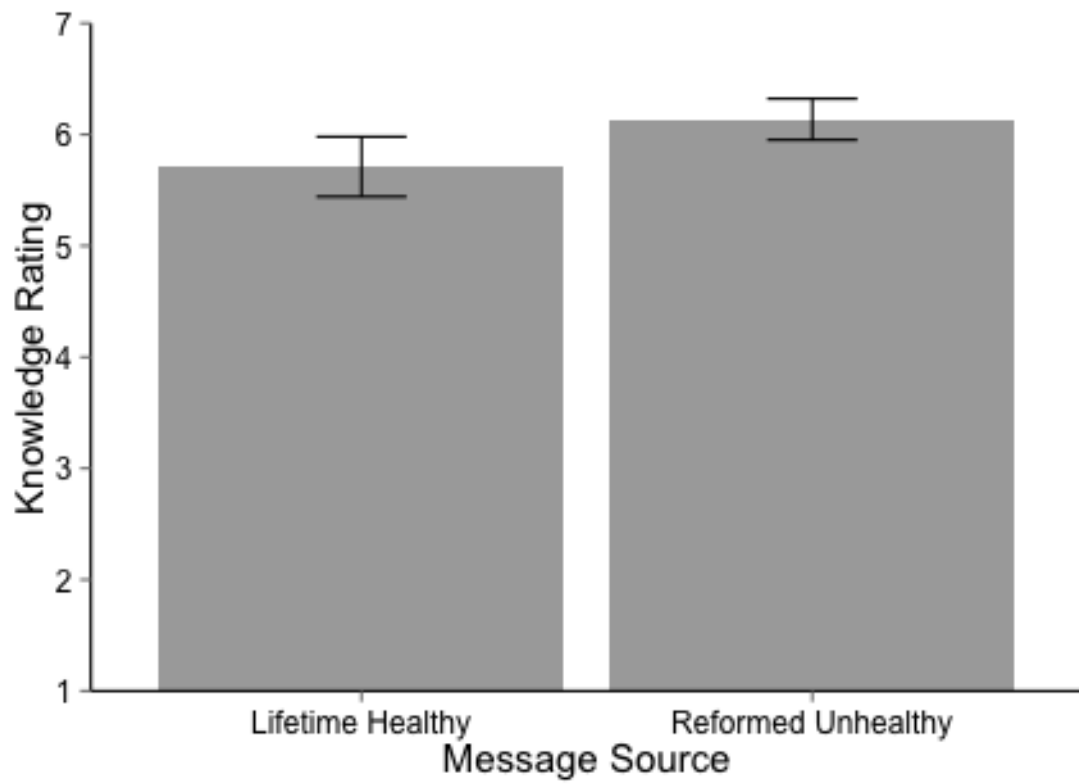


Figure 3. Intelligence ratings for the unhealthy reformed message source were rated significantly higher than the lifetime healthy message source. Error bars represent a 95% confidence interval.

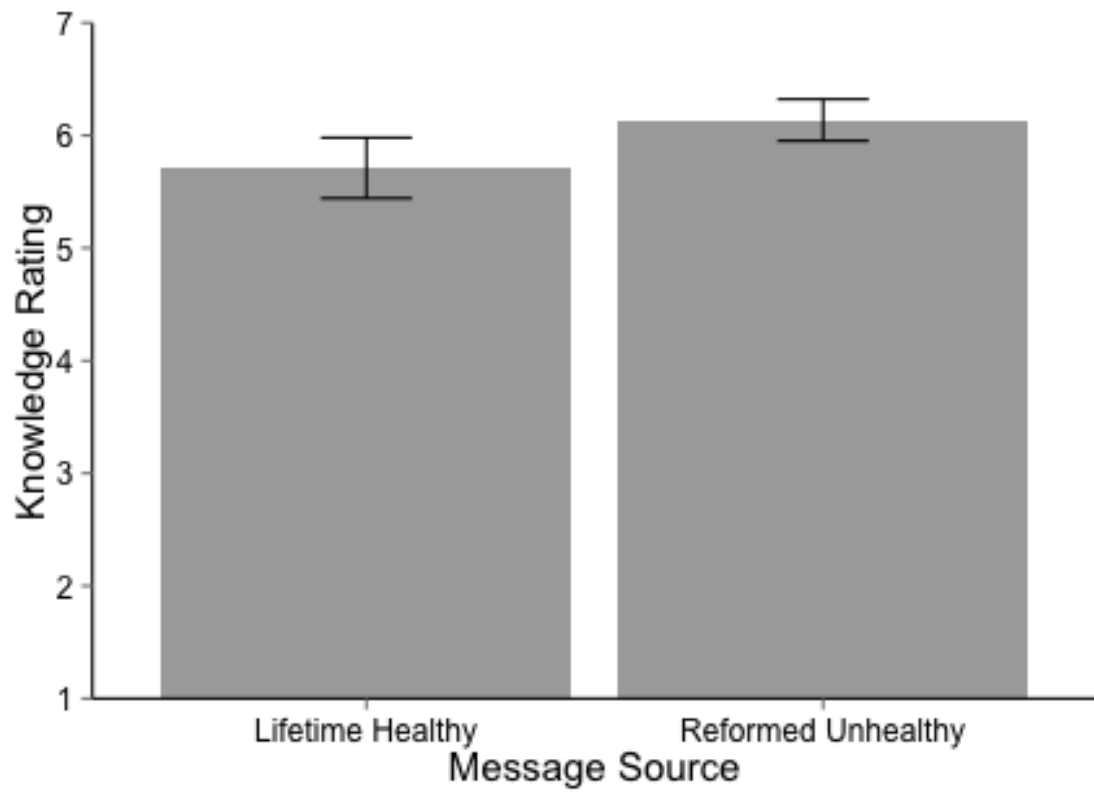


Figure 4. Knowledge ratings for the unhealthy reformed message source were rated significantly higher than the lifetime healthy message source. Error bars represent a 95% confidence interval.

APPENDIX

Gain Frame Condition

Chronic diseases such as heart disease, stroke, cancer, diabetes, and obesity are among the most common and preventable of all health problems in the United States. According to the Center for Disease Control and Prevention (CDC), over half of the adult population failed to meet recommendations for physical activity. Recent research has suggested that regular physical activity could prevent half of premature deaths and cases of chronic disability. Listed below are some of the well-documented **benefits of regular physical activity**:

- With regular physical exercise, you gain muscle mass, which speeds metabolism, leading to better weight management and increased stamina.
- Succeeding in getting enough regular physical activity improves your overall psychological well-being by decreasing anxiety and depression, while increasing self-esteem and confidence.
- Regular physical exercise decreases your risk of coronary heart disease and other chronic diseases, such as obstructive pulmonary disease, cancer, osteoporosis, obesity, and diabetes.
- Most importantly, an active lifestyle can lead to a long life by keeping one's heart healthy and reducing cancer risks.

By meeting the recommendation of 150 minutes of vigorous exercise (e.g., brisk walking) during the week, plus performing muscle strengthening activities twice a week, you stand to gain numerous health benefits, which may increase your overall life expectancy.

Loss Frame Condition

Chronic diseases such as heart disease, stroke, cancer, diabetes, and obesity are among the most common and preventable of all health problems in the United States. According to the Center for Disease Control and Prevention (CDC), over half of the adult population failed to meet recommendations for physical activity. Recent research has suggested that regular physical activity could prevent half of premature deaths and cases of chronic disability. Listed below are some of the well-documented **consequences of a sedentary lifestyle** (i.e., a lifestyle with irregular or no physical activity):

- With a sedentary lifestyle, you lose muscle mass, which slows metabolism, leading to weight gain and decreased stamina.
- Failing to get enough regular physical activity diminishes your overall psychological well-being by increasing anxiety and depression, while decreasing self-esteem and confidence.
- A sedentary lifestyle increases your risk of coronary heart disease and other chronic diseases, such as obstructive pulmonary disease, cancer, osteoporosis, obesity, and diabetes.
- Most importantly, a sedentary lifestyle can lead to a premature death by damaging the heart and increasing cancer risks.

By meeting the recommendation of 150 minutes of vigorous exercise (e.g., brisk walking) during the week, plus performing muscle strengthening activities twice a week, you stand to avoid numerous health consequences, which may decrease your overall life expectancy.