Message framing and physical activity: One size fits all versus a tailored approach

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Message framing and physical activity: One size fits all versus a tailored approach

by

Konstantinos Mantis

A dissertation submitted to the graduate faculty

in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Kinesiology

Program of Study Committee:
Spyridoula Vazou, Major Professor
Panteleimon Ekkekakis
Gregory Welk
Douglas Gentile
Kenneth Koehler

The student author and the program of study committee are solely responsible for the content of this dissertation. The Graduate College will ensure this dissertation is globally accessible and will not permit alterations after a degree is conferred.

Iowa State University
Ames, Iowa
2017

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DEDICATION

One night I dreamed a dream. As I was walking along the beach with my Lord, across the dark, sky flashed scenes from my life. For each scene, I noticed two sets of footprints in the sand, one belonging to me and one to my Lord.

After the last scene of my life flashed before me, I looked back at the footprints in the sand. I noticed that at many times along the path of my life, especially at the very lowest and saddest times, there was only one set of footprints.

This really troubled me, so I asked the Lord about it. “Lord, you said once I decided to follow you, You’d walk with me all the way. But I noticed that during the saddest and most troublesome times of my life, there was only one set of footprints. I don’t understand why, when I needed You the most, You would leave me.”

He whispered, “My precious child, I love you and will never leave you

Never, ever, during your trials and testings. When you saw only one set of footprints, It was then that I carried you.”

- by Mary Stevenson

I dedicate this dissertation to God for His help during my studies.
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<tr>
<td>MFP</td>
<td>Message Framing Paradigm</td>
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<tr>
<td>MPA</td>
<td>Moderate-Intensity Physical Activity</td>
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<td>PA</td>
<td>Physical Activity</td>
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<td>RFQ</td>
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ABSTRACT

Message framing (i.e., emphasis on gains or losses) is a communication strategy that has been used to promote physical activity (PA). Previous research has led to inconsistent results regarding the persuasive effect of gains and losses. The purpose of this dissertation was to explore whether a fit between message content and individuals’ motivational orientation improves the effectiveness of messages. Undergraduate students participated in studies via the Department of Psychology SONA system. Study 1 \((n = 441)\) tested whether a fit between Frame (gains, losses), Regulatory Focus (promoters, preventers), and Message Valence (positive, negative, mixed) improves the persuasiveness of PA messages. Study 2 \((n = 449)\) explored the effect of gains / losses by using different probability sizes.

Study 1 revealed a three-way interaction on attitude, \(F(2, 428) = 5.25, p = .006,\) partial \(\eta^2 = .024\). Gains / losses worked better for promoters / preventers, respectively, when exposed to mixed content. Study 2 disclosed a main effect for Frame, \(F(1, 436) = 6.57, p = .011,\) partial \(\eta^2 = .015\), with losses being more effective on vigorous-intensity PA (VPA) intention; a main effect for Magnitude on moderate-intensity PA intention scores, \(F(2, 436) = 4.27, p = .015,\) partial \(\eta^2 = .019\), with an emphasis on 10 vs. 15% being more persuasive, followed by 5 vs. 10%, and 15 vs. 20%; and a Focus x Magnitude x Frame interaction on VPA intention, \(F(2, 436) = 4.13, p = .017,\) partial \(\eta^2 = .019\), with losses being more effective for promoters when exposed to small (5 vs. 10%) and big probabilities (15 vs. 20%), and more effective for preventers when exposed to medium (10 vs. 15%) and big probabilities (15 vs. 20%). These results indicate that customized messages can improve the effectiveness of mass media campaigns that disseminate the PA guidelines, which in turn can improve other sectors of the National Physical Activity Plan (e.g., Healthcare, etc.).
CHAPTER 1
GENERAL INTRODUCTION

Background of the Study

Health communication is an important scientific field because it helps in preparing and delivering appropriate messages that can improve various aspects of people’s lives (e.g., physical activity, healthy diet, no smoking, etc.). Regarding physical activity (PA), there are several organizations (American College of Sports Medicine, American Heart Association, Surgeon General, etc.) that establish the content of such messages. They recommend specific amounts of PA that can help individuals experience a series of benefits that might result from it (e.g., positive mood, bone strengthening, decreased risk of cardiovascular problems, etc.). The PA guidelines for Americans, for example, recommend at least 150 minutes of moderate-intensity PA, 75 minutes of vigorous-intensity PA, or any combination of them on a weekly basis for adults; and 60 minutes or more of PA each day for children and adolescents aged 6–17 years (U.S. Department of Health and Human Services, 2008).

Besides the establishment of official recommendations, there is an organization, Healthy People 2020, which provides a comprehensive set of national goals and objectives, and monitors the progress of states across 10 year-periods. The sources of information that help the development of these objectives include national surveillance systems such as the Behavioral Risk Factor Surveillance System (BRFSS; a state-based system that conducts telephone surveys to collect data on health risk behaviors, preventive health practices, etc.), the National Health Interview Survey (NHIS), the National Health and Nutrition Examination Survey (NHANES) III, and so forth. For instance, the first objective is to reduce the proportion of adults who perform no leisure-
time PA from 36.2 in 2008 to 32.6 by 2020 (see Table 1). Another objective is to increase the proportion of adults who spend at least 150 minutes / week in doing aerobic physical activities of at least moderate-intensity, or 75 minutes / week of vigorous-intensity, or an equivalent combination, from 43.5 in 2008 targeting to 47.9 by 2020 (Office of Disease Prevention and Health Promotion [ODPHP], 2016).

It is important to consider, however, that the self-report measures, which are preferred in surveillance research for various reasons (e.g., low cost, more appropriate for large samples, etc.) are susceptible to bias (i.e., people tend to misinterpret the questions resulting in overestimating their PA levels; Banda et al., 2010). Even the data that come from surveillance systems that use accelerometry-based monitors such as the National Health and Nutrition Examination Survey (NHANES) 2003-2004 (Troiano, Berrigan, Dodd, Masse, Tilert, & McDowell, 2008), should be treated with caution, though, for device-based methods are also susceptible to some limitations (e.g., different processing guidelines, different count cut points, etc.; Banda et al., 2010). No matter how accurate these data are, it can be assumed with enough confidence that the real data are not more optimistic than those shown in Table 1, which means that there is still room for improving existing communication strategies to motivate individuals to engage in PA.

Table 1

<table>
<thead>
<tr>
<th>Year</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA-1</td>
<td>36.2</td>
<td>32.3</td>
<td>32.4</td>
<td>31.6</td>
<td>29.6</td>
<td>30.3</td>
<td>30.0</td>
</tr>
<tr>
<td>PA-2</td>
<td>43.5</td>
<td>47.2</td>
<td>47.1</td>
<td>48.8</td>
<td>50.0</td>
<td>49.9</td>
<td>49.9</td>
</tr>
</tbody>
</table>

*Note. Source of data: Office of Disease Prevention and Health Promotion [ODPHP], 2016.*
Indeed, people get exposed to various messages that invite them to meet the PA guidelines by using different opportunities that are available around them. For instance, many campaigns have been developed throughout the years (e.g., VERB campaign, Exercise is Medicine, etc.) trying to help individuals meet the official PA recommendations and live a healthier life. In addition, a lot of companies develop more and more PA monitors (e.g., Apple watch, Fitbit, Jawbone Up, etc.) that allow consumers to monitor their activity levels and stay active. There are also plenty of recreation centers, gyms, and exercise programs in many regions that offer a great variety of workouts. Parks provide another opportunity that individuals can use to improve their activity levels. At various work sites, employers provide facilities so that their employees can take activity breaks and relax. Moreover, many school programs have been established to help children cultivate an active lifestyle from an early age and some of them integrate PA into the school curriculum (e.g., Take 10!, Brain Breaks, Energizer, Move4Thought, GoNoodle etc.) through various activities and movement skills. In general, individuals get exposed to such a great number of PA messages every day that they should be adequately active and meet the official recommendations.

**Statement of Problem**

Despite the wealth of opportunities for PA and the progress toward the established objectives, the rates of obesity and subsequent related diseases that result—at least partially from a sedentary or inactive lifestyle—remain high. At least half of U.S. adults are expected to be obese by 2013 (Wang, McPherson, Marsh, Gortmaker, & Brown, 2011); overweight adolescents have a 70% chance of becoming overweight or obese when they become adults (Hedley, Ogden, Johnson, Carroll, Curtin, & Flegal, 2004;
Flegal, Carroll, Kuczmarski, and Johnson, 1998); and the obesity rates also tend to be 38% and 57% higher for children and adults with disabilities compared to those without disabilities (Centers for Disease and Prevention, 2016). Evidently, obesity has been a great problem for many decades and PA has been suggested as a potential solution (Ladabaum, Mannalithara, Myer, & Singh, 2014; Lakka & Bouchard, 2005). Although people realize the benefits of PA, many of them still do not meet the PA guidelines. The current rates of inactivity imply that the means for communicating the benefits of PA can be further improved to convince more individuals to adopt an active lifestyle.

**Rationale and Theoretical Framework**

During the present author’s graduate studies, a comparison of the perception of PA between the modern and the old era was conducted by one of the professors in Exercise Psychology courses. A quote of Charles Dickens had been used mentioning his satisfaction that thieves and vagrants were punished by sweating on a treadmill considering this as an appropriate punishment. In that old period, treadmill was perceived as punishment while today individuals use treadmill for pleasure, which indicates that things are perceived differently depending on various factors such as the era, and so forth.

In a similar way, whether individuals meet the PA guidelines or not might depend on how they perceive them. Researchers need to explore individual differences and whether customization renders PA messages more effective or not. It is possible that presenting PA as medicine works for some individuals while presenting it as entertainment works better for others. Based on this rationale, an investigation of previous studies was conducted (see Chapter 3) to identify the theoretical basis of PA messages (see Chapter 2), with the potential to explore the effect of individual differences.
on the effectiveness of messages. The most common theory that has been used in constructing PA messages is prospect theory (Kahneman & Tversky, 1979), which supports that emphasizing losses instead of gains has a greater effect on human behavior. Rothman and Salovey (1997), however, applied this theory to the health domain and developed the message framing paradigm (MFP), which states that losses are more effective for promoting detection behaviors (e.g., PAP smear, etc.) while gains are more effective for promoting prevention ones (e.g., PA, sunscreen, etc.).

Latimer (2010) reviewed studies on message framing and PA, and found that although gains, overall, are more effective than losses, there are many inconsistencies across studies, and she suggested that several moderators might account, at least partially, for such mixed results. One potential moderator that has not been investigated thoroughly in promoting PA is known as regulatory focus, which refers to the motivational orientation of people. Some individuals, known as promoters, try to achieve positive outcomes (e.g., experiencing happiness) while others, known as preventers, try to avoid negative ones (e.g., avoiding depression). This variable comes from regulatory focus theory (Higgins, 1997, 1998), which is described in detail in Chapter 2. If the regulatory focus really influences the effectiveness of messages, then, this is consistent with the rationale that customized messages might be more effective for promoting PA. Therefore, two dissertation studies were conducted to explore this hypothesis. An overview of these studies is presented in Table 2 through a logic model.
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<th>What We Invest</th>
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<th>Who we reach</th>
<th>Study Design</th>
<th>Short to Medium Term Goals</th>
<th>Long Term Goals</th>
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<tr>
<td>Study 1</td>
<td>Messages, Qualtrics, SONA system, Regulatory Focus questionnaire (RFQ), measures of attitude (AT) and intention (INT)</td>
<td>Test whether a fit between message content and individuals’ motivational orientation improves the persuasiveness of messages (fit hypothesis).</td>
<td>College students</td>
<td>2 x 2 x 3 (Regulatory Focus [promoters, preventers] x Frame [gains, losses] x 3 Message Valence [positive, negative, mixed]) full factorial</td>
<td>Change students’ AT and INT toward physical activity (PA)</td>
<td>Be physically active, live a longer and healthier life</td>
</tr>
<tr>
<td>Study 2</td>
<td>Messages; Qualtrics; SONA system; RFQ; International Physical Activity Questionnaire; measures of AT, subjective norm (SN), perceived behavioral control (PBC), INT, behavior (B), and decision-making (DM)</td>
<td>Explore the fit hypothesis, as well as whether using different probability sizes to present the same amounts of gains and losses leads to different persuasive outcomes.</td>
<td>College students</td>
<td>2 x 2 x 3 (Regulatory Focus [promoters, preventers] x Frame [gains, losses] x Magnitude of Change [5 vs. 10%, 10 vs. 15%, 15 vs. 20%]) full factorial</td>
<td>Change students’ AT, SN, PBC, INT, B, and DM toward PA</td>
<td>Be physically active, live a longer and healthier life</td>
</tr>
</tbody>
</table>

*Table 2*

*Logic Model of Experimental Studies on Message Framing and Physical Activity*
Purpose and Research Questions of the Study

The main purpose of this dissertation was to explore whether (a) a fit between message content and individuals’ motivational orientation; and (b) presenting the amount of gains or losses by using different probability sizes leads to different persuasive outcomes. This dissertation was an attempt to answer the following research questions:

1. Does a fit between message framing (i.e., emphasis on gains or losses) and individuals’ motivational orientation (i.e., promoters vs. preventers) affect PA outcomes differently? (Studies 1, 2)
2. Are messages more persuasive if gains / losses are presented by using bigger probabilities in their content? (Study 2)
3. Is message framing paradigm an application of prospect- or operant conditioning theory to the health domain? (Study 2)

Significance of the Study

Constructing theoretically sound and effective PA messages can:

1. Help individuals meet the official recommendations and experience many PA benefits such as healthy body weight, mental and physical health, and so forth.
2. Better health can lead to less money spent on health care since many diseases result from physical inactivity (e.g., obesity, cardiovascular problems, etc.).
3. Governments can save money in that way, and they can invest it to develop other services that can further promote social wellness. For example, they can use part of these savings to develop edutainment programs, increase opportunities that consider people with disabilities such as road diets or inclusive playgrounds in more regions, and so forth.
It becomes obvious that the positive outcomes that might result from improving PA levels both at an individual and a population level are interconnected. Likewise, failing to improve the effectiveness of PA messages, leads to a vicious circle of negative consequences (i.e., inactivity leads to obesity, which leads to cardiovascular problems, higher health care cost, etc.). So, it is necessary to identify what undermines the effectiveness of health communication in the domain of PA to break this vicious circle and free people allowing them to live a longer, healthier, and happier life.

**Definitions of Terms**

The following terms are provided for use in this study:

*Exercise:* “A subset of physical activity that is planned, structured, and repetitive and has as a final or intermediate objective the improvement or maintenance or physical fitness” (p. 126, Caspersen, Powell, & Christenson, 1985).

*Inactive:* “Performing insufficient amounts of MVPA (i.e., not meeting specified physical activity guidelines)” (p. 540, Tremblay, 2012).

*MET:* The metabolic equivalent task (MET) refers to the amount on energy (3.5 ml/kg/min of oxygen) that individuals consume while they are at rest. (Coelho-Ravagnani, Melo, Ravagnani, Burini, F. H. P. & Burini, R. C., 2013).

*Physical activity:* “Any bodily movement produced by the skeletal muscles that results in energy expenditure” (p. 126, Caspersen et al., 1985).

*Regulatory focus:* A type of motivational orientation with two foci: a) promotion; and b) prevention (Higgins, 1997, 1998).


*Promoters:* Individuals who try to avoid negative outcomes (Higgins, 1997, 1998).
Sedentary behavior: “Any waking behavior characterized by an energy expenditure ≤1.5 METs while in a sitting or reclining posture” (p. 540, Tremblay, 2012).

Thesis Organization

Chapter 1 discusses the background, problem, rationale, and provides a brief theoretical background, and research questions. Chapter 2 provides a thorough theoretical background of the dissertation and tries to integrate various psychological theories that researchers can use to construct PA messages. Chapter 3 reports some variables that have moderated the effect of message framing on PA outcomes in previous empirical studies. Chapter 4 describes an experimental study that explored whether a fit between message framing and regulatory focus renders PA messages more persuasive on PA attitudes and intention. Chapter 5 presents an experimental study that investigated different probability sizes of presenting gains and losses. Finally, Chapter 6 offers a general discussion based on the results of the two experimental studies, mentions the implications, offers suggestions for future research, and reaches some conclusions.
CHAPTER 2
THEORETICAL CONCEPTUALIZATION FOR THE CONSTRUCTION OF PHYSICAL ACTIVITY MESSAGES

Abstract

Obesity rates remain high in the US, which indicates that health communication strategies can be further improved to persuade individuals to be physically active. This study was an attempt to integrate various theories and provide a theoretical conceptualization that can help researchers improve the persuasiveness of PA messages. The following six theories were compared to identify potential similarities among them: person-centered theory, self-discrepancy theory, regulatory focus theory, operant conditioning theory, prospect theory, and regulatory fit theory. These theories have a common theme: they distinguish individuals based on approach and avoidance motivation. Messages that consider and sustain the motivational orientations of message recipients might be more persuasive, and therefore, message customization can be a potential solution to obesity and hypokinetic diseases.

Keywords:

Approach, avoidance, physical activity, regulatory focus, promoters, preventers, message framing.

Almost 6% of deaths throughout the world per year result from physical inactivity (World Health Organization, 2009), which highlights the importance of improving health communication and helping individuals adopt various healthy behaviors (e.g., physical activity, no smoking, etc.) that can enrich the quality of their lives. To persuade individuals to adopt such behaviors presupposes the construction of theoretically sound messages. Due to the similarities among some theories that have been used to develop
health communication messages, it seems interesting to explore whether these theories really differ from each other or describe the same concepts.

By looking at the PA guidelines for Americans (U.S. Department of Health and Human Services, 2008), it can easily be recognized that they focus on the medical model, for they adopt a dose-response relationship and try to prescribe PA as a form of medicine. Using the medical model sounds reasonable to some extent if the target population consists of people who already suffer from diseases. Considering healthy people, however, as patients (real or potential ones) is not very appropriate unless inactivity gets equated to a disease. So, interventions mentioning the health benefits that result from PA might be more effective for people who have cultivated a worldview that revolves around health and disease issues. Conversely, interventions that present PA as a route to entertainment might be more effective for people who need a distance from such issues.

The rationale of presenting PA differently depending on individuals’ motivational orientation originates in the ancient times when Greek philosophers such as Democritus and Aristippus supported that people approach pleasure and avoid pain, which is known as the principle of hedonism (Marks, 2011). The distinction between approach and avoidance has also specific neural pathways in the human brain. In particular, Cannon (1929) was the first scientist who talked about the fight-or-flight response, which is a physiological reaction that arises when people perceive themselves in danger. The perception of danger activates the sympathetic nervous system of the brain (e.g., sweat secretion, pupil and bronchioles’ dilation, increased heart rate, etc.) preparing the human organism to fight-or-flight to survive. When the perception of danger disappears, then, the parasympathetic system gets activated, leading to the opposite symptoms, and
allowing the organism to relax. Considering these two fundamental forces, it is worth exploring whether medicalizing PA is a better way of persuading “avoiders” or “fleers” to engage in PA, while presenting PA as a game is a better way of persuading “approachers” or “fighters” to get active. Indeed, approach and avoidance systems seem to play such a critical role in individuals’ lives that many psychological theories that have been used or could be used to promote PA revolve around these two basic concepts. A model that integrates these forces is the model of optimal health (Corbin, C., Welk, G., Corbin, W., & Welk, K., 2015), which considers health as the middle point of a continuum with disease at the left extreme and wellness at the right one.

The purpose of this study was to describe some psychological theories that can be used in sports, exercise, or PA, and explain how they are interconnected.

**Person-Centered Theory**

Carl Rogers (1959) developed a psychotherapeutic approach, known as person- or client-centered psychotherapy. Rogers supported that “The organism has one basic tendency and striving - to actualize, maintain, and enhance the experiencing organism” (Rogers, 1951, p. 487). He believed that individuals are motivated by an innate urge to use their full potential and reach the highest level of “human-beingness.” This tendency is known as “self-actualization” and Rogers believed that people can achieve self-actualization if they are in a state of congruence. This means that self-actualization occurs when a person’s “ideal self” (i.e. who they would like to be) is congruent with their actual behavior (self-image). Rogers described an individual who is self-actualizing as a fully functioning person, and considered that the main variable that determines which people will self-actualize is their childhood experience. Since everyone has gone through
different experiences during their childhood, it should be expected that not all individuals will fight for wellness, reach congruence, and achieve self-actualization.

**Self-Discrepancy Theory**

Self-discrepancy theory (Higgins, 1987) used a similar approach to explain how people get motivated to engage in specific behaviors. Based on this theory, there are six main self-state representations that depend on domains of the self and standpoints on the self. The domains of the self include: a) actual self, which is the current set of characteristics that an individual (self or other) believes that one possesses; b) ideal self, which is the set of characteristics that an individual (self or other) believes that one needs to acquire such as hopes or aspirations; and c) ought self, which is the set of characteristics that an individual (self or other) believes that one should possess such as duties or responsibilities.

The standpoint on the self refers to a set of attitudes and values based on which an individual is judged and comes from within (own standpoint) or from a significant other (other standpoint) such as one’s mother, father, or spouse. The combination of these domains and standpoints leads to six different self-state representations (see Table 3). The actual-self characteristics (especially the actual / own combination) represent the self-concept and the ideal- and ought-self characteristics represent two different self-guides. Discrepancies between self-concept and self-guides motivate individuals differently.
Table 3

Main Tenets of Self-Discrepancy Theory

<table>
<thead>
<tr>
<th>Domains of Self</th>
<th>Standpoints on Self</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Own</td>
</tr>
<tr>
<td><strong>Self-Concept</strong></td>
<td></td>
</tr>
<tr>
<td>Actual</td>
<td>Actual / Own</td>
</tr>
<tr>
<td><strong>Self-Guides</strong></td>
<td></td>
</tr>
<tr>
<td>Ideal</td>
<td>Ideal / Own</td>
</tr>
<tr>
<td>(e.g., personal aspiration)</td>
<td></td>
</tr>
<tr>
<td>Ought</td>
<td>Ought / Own</td>
</tr>
<tr>
<td>(e.g., choose to exercise to reduce the risk of disease)</td>
<td></td>
</tr>
</tbody>
</table>

Individuals who are predominantly motivated to decrease the discrepancy between their actual- and ideal selves might be more motivated to fight for wellness rather than fleeing away from potential diseases, which is also consistent with Rogers’ approach. On the other hand, individuals who are predominantly motivated to decrease the discrepancy between their actual- and ought selves might be motivated to flee from potential diseases rather than fighting for wellness.

If individuals really achieve congruence in different ways (i.e., fighters care about wellness while fleers care about disease prevention), then PA messages need to be tailored accordingly. For example, if some individuals care about decreasing the risk of osteoporosis, and PA is presented as a way of reaching wellness, it might not motivate them to be active. Likewise, if some healthy individuals strive for wellness and get exposed to messages mentioning that PA decreases the risk of cancer, they might not be effective either.
Regulatory Focus Theory

Based on self-discrepancy theory, Higgins (1997, 1998) developed regulatory focus theory (RFT) to explain that people with different motivational orientations follow different routes to pursue pleasure or avoid pain. Higgins classified individuals into two categories: (a) individuals with a promotion regulatory focus (i.e., promoters) who try to decrease an ideal self-discrepancy, and (b) individuals with a prevention regulatory focus who try to decrease an ought self-discrepancy (see Table 4). The main aspects that distinguish individuals between promoters and preventers are described below:

**Fundamental needs.** The two regulatory foci represent two ways through which the hedonic principle operates based on two human fundamental needs: nurturance (which refers to advancement, growth, accomplishments, hopes, and aspirations) and security (which refers to protection, safety, and responsibility).

**Goals / Standards.** Individuals who use a promotion regulatory focus try to achieve goals or standards such as hopes, wishes, and aspirations that satisfy the need for nurturance (e.g., overweight individuals exercise to lose weight and make a career as athletes). Conversely, individuals who use a prevention regulatory focus try to achieve goals or standards such as duties, obligations, and responsibilities to satisfy the need for security (e.g., individuals exercise because their doctor advised them to do so).

**Sensitivity to psychological outcomes.** When there is a high mismatch between the actual and ideal selves (ideal discrepancy), this reflects the absence of positive outcomes (i.e., desires and goals are not achieved), and promoters tend to be more sensitive toward positive outcomes (e.g., overweight individuals on diet check if they have lost weight). On the contrary, a mismatch between the actual and ought selves
(ought discrepancy) arises due to the presence of negative outcomes (i.e., duties or obligations are not done and punishment is expected), and preventers tend to be more sensitive toward negative outcomes (e.g., cardiac patients who ignore their doctor’s advice and smoke, will be alert to any signs of heart attack).

**Strategies.** Promoters follow an approach strategy or eagerness to increase the congruence between the actual and ideal selves (e.g., overweight individuals buy a pedometer to motivate themselves to get active). Similarly, preventers follow an avoidance strategy or vigilance to decrease the discrepancy between the actual and ought selves (e.g., cardiac patients do not buy cigarettes to avoid exposure to negative stimuli).

**Emotions.** Promoters who experience a high mismatch between their actual and ideal selves (ideal discrepancy), feel dejection-related emotions (e.g., disappointment, shame, etc.) because their desires and goals are not achieved (absence of positive outcomes) while promoters who experience a low mismatch between actual and ideal selves (ideal congruence), experience cheerfulness-related emotions because their desires and goals are achieved (presence of positive outcomes). Contrarily, preventers who experience a high mismatch between their actual and ought selves (ought discrepancy) feel agitation-related emotions (e.g., guilt, fear, etc.) because their duties or obligations are not completed and punishment is expected (presence of negative outcomes) while preventers who experience a low mismatch between actual and ought selves (ought congruence), experience quiescence-related emotions, for their duties or obligations are fulfilled and no punishment is expected (absence of negative outcomes).
### Main Tenets of Regulatory Focus Theory

<table>
<thead>
<tr>
<th>Regulatory Focus</th>
<th>Fundamental Needs</th>
<th>Goals / Standards</th>
<th>Sensitivity to Psychological Outcomes</th>
<th>Goal-Pursuit Strategic Means</th>
<th>Emotions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promotion</td>
<td>Nurturance</td>
<td>Hopes or aspirations</td>
<td>Presence or absence of positive outcomes</td>
<td>Eagerness (ensures the presence of positive outcomes, ensures against the absence of positive outcomes)</td>
<td>Cheerfulness-related; dejection-related</td>
</tr>
<tr>
<td>Prevention</td>
<td>Security</td>
<td>Duties or obligations</td>
<td>Absence or presence of negative outcomes</td>
<td>Vigilance (ensures the absence of negative outcomes, ensures against the presence of negative outcomes)</td>
<td>Quiescence-related; agitation-related</td>
</tr>
</tbody>
</table>
In sum, each regulatory focus influences thoughts, feelings, and behaviors differently, which is independent of the hedonic principle (pursuit of pleasure, pain avoidance). When individuals experience self-discrepancy, they experience a different kind of pain when they fail to decrease the discrepancy as well as a different kind of pleasure when they manage to reach congruence (Higgins, 1997, 1998). Therefore, it seems reasonable that the content of PA messages should be tailored to individuals’ motivational orientations, for they follow different routes to experience hedonism.

**Operant-Conditioning Theory**

It was mentioned earlier that one of the main tenets of regulatory focus theory is the sensitivity to psychological outcomes. Higgins (1997, 1998) distinguished these outcomes between positive and negatives ones. In the present author’s opinion, however, positive and negative outcomes refer to the concepts of reinforcement and punishment, respectively, that Skinner (1938) described in operant conditioning theory. In line with this theory, human behavior depends on the principles of (a) positive reinforcement (i.e., giving something positive), (b) negative reinforcement (i.e., removing something negative), (c) positive punishment (i.e., giving something negative), and (d) negative punishment (i.e., removing something positive). Based on these principles, individuals tend to repeat a specific behavior if they experience reinforcement, and they avoid repeating this behavior if they experience punishment.

A brief look at the PA benefits as the Centers for Disease Control and Prevention (CDC, 2015a) describes them can easily disclose the application of operant conditioning principles (in parentheses) to their content:
1. “Control your weight” (positive reinforcement)
2. “Reduce your risk of cardiovascular disease” (negative reinforcement)
3. “Reduce your risk for type 2 diabetes and metabolic syndrome” (negative reinforcement)
4. “Reduce your risk of some cancers” (negative reinforcement)
5. “Strengthen your bones and muscles” (positive reinforcement)
6. “Improve your mental health and mood” (positive reinforcement)
7. “Improve your ability to do daily activities (positive reinforcement) and prevent falls (negative reinforcement), if you're an older adult.”
8. “Increase your chances of living longer” (positive reinforcement)

All the benefits that these guidelines emphasize are based on reinforcement, half of them on positive- and the rest of them on negative reinforcement. In other words, the PA guidelines behave like parents who tell their kids “I will / will not give you ice-cream” depending on whether they do / do not what their parents (i.e., experts) say.

However, parents try different ways of making their kids follow their advice. For example, they might say:

-“If you eat your food, I will give you ice-cream.” (positive reinforcement)
-“If you eat your food, I will not slap you.” (negative reinforcement)
-“If you do not eat your food, I will slap you.” (positive punishment)
-“If you do not eat your food, I will not give you ice-cream.” (negative punishment)
In a similar way, PA guidelines can advise people in different ways:

- “If you are active, you will have good health.” (positive reinforcement)
- “If you are active, you will not get sick.” (negative reinforcement)
- “If you are not active, you will get sick.” (positive punishment)
- “If you are not active, you will not have good health.” (negative punishment)

The question that arises at this point is: Even if all parents apply the same method, do all kids respond similarly to that “golden” practice, or different kids comply better with parental requests depending on their personality? Likewise, it would be useful to identify methods that motivate individuals to be active, but it is hard to find an ideal method because everyone brings their own personal history that makes them respond differently to various health promotion strategies.

Considering that punishment is inappropriate, only the principles of positive and negative reinforcement should be applied to establish the content of PA guidelines and messages. Even so, however, reinforcement works if the reward satisfies the needs of the message recipients. It is not enough to give something to individuals but it is important to give them something that they really desire to change their behavior. This is also consistent with habit theory (Duhigg, 2012), which talks about identifying the right rewards to establish a new behavior as a habit through repetition. Numerous rewards might have a differential effect on individuals, of course, which indicates again the significance of considering individual differences when preparing messages.
Prospect Theory

Although the theories that have been described so far have not been clearly used in constructing PA messages, they were presented because they look similar to prospect theory (Kahneman & Tversky, 1979) that has been used more often to prepare PA messages. Based on this theory, individuals make riskier decisions when exposed to losses than gains, which is known as loss aversion. For instance, Tversky and Kahneman (1981) conducted a study where participants were informed that a rare disease was going to appear in the United States and it was expected to kill 600 people. So, the researchers presented them two alternative programs that could face this problem, and participants had to choose the best solution: (a) If they chose program A, 200 lives would be saved for sure, but if they chose program B, there was 1/3 probability that everybody would be saved and 2/3 probability that nobody would be saved (positive frame); and (b) If they chose program A, 400 lives would be lost for sure, but if they chose program B, there was 1/3 probability that nobody would die, but also there was a 2/3 probability that everybody would die (negative frame). The results showed that when they used positive framing, 72% of participants chose Program A, but when they used negative framing, only 22% of participants chose Program A.

Rothman and Salovey (1997) applied prospect theory to the health domain and developed the message framing paradigm, based on which message framing influences individuals differently depending on the nature of behavior that gets promoted. They argued that there are two types of behavior: (a) detection ones such as mammography or Pap smear that involve high risk, and (b) prevention ones such as PA or sunscreen that
involve low or no risk. They suggested that losses are more effective for promoting detection behaviors while gains are more effective for promoting prevention ones.

Considering the terms of gains and losses that Kahneman & Tversky (1979) mentioned in prospect theory, it is interesting to speculate about whether gains and losses refer to the respective concepts of reinforcement and punishment. To check the potential similarities between these concepts, an item that Li, Cheng, and Fung (2014) used in their own study will be presented. Explanatory comments are shown in parentheses.

-“If you participate in regular physical activity, you CAN enhance mental alertness”
  (positive reinforcement, gains)

-“If you do NOT participate in regular physical activity, you CANNOT enhance mental alertness”
  (non-positive reinforcement, non-gains)

Although the second statement is a non-gain, Li et al. (2014) classified the first statement as gain while the second one as loss. The second statement, however, does not refer to loss, but to non-gain. The statement “You CANNOT enhance mental alertness (i.e., positive thing)” is not positive reinforcement, for nothing positive is given; it is not negative reinforcement, for nothing negative is removed; it is not positive punishment, for nothing negative is given; and it is not negative punishment, for nothing positive is removed. It is just the reverse of positive reinforcement.

In other words, the concepts of reinforcement and punishment are not the same with gains and losses. Gains include positive reinforcement and positive punishment because individuals get something positive or negative, while losses include negative reinforcement and negative punishment because individuals lose something negative or positive (see Table 5). Therefore, it is not enough to ask whether gains or losses are more
effective in promoting PA. It is necessary to clarify whether gains in PA messages refer to getting something positive (e.g., strong bones) or something negative (e.g., injuries). In a similar way, it is necessary to clarify whether losses in PA messages refer to losing something positive or negative. In messages that have been used in the literature, however, positive and negative reinforcement have been used interchangeably to refer to gains, but not all of them are gains. Only positive reinforcement refers to gains, while negative reinforcement refers to losses. Likewise, positive and negative punishment have been used interchangeably to refer to losses, but only negative punishment refers to losses, while positive punishment refers to gains. It is very important to clarify these concepts and use a common language because researchers need to make sure that they refer to the same things when they do research about whether gains or losses are more effective in promoting PA (or any other behavior).

Table 5

*Distinction Between Gains-Losses and Reinforcement-Punishment*

<table>
<thead>
<tr>
<th>Reinforcement</th>
<th>Punishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Gain something positive</td>
<td>Lose something negative</td>
</tr>
<tr>
<td>e.g. “If you are active, you can strengthen your bones.”</td>
<td>e.g., “If you are active, you can decrease the risk of colon cancer.”</td>
</tr>
</tbody>
</table>

In a nutshell, gains and losses are not the same concepts as positive reinforcement and positive punishment. If prospect theory could be translated into the language of operant conditioning theory, then, the dilemma “gains” versus “losses” would be
equivalent to the dilemma “positive reinforcement (gain) and / or negative reinforcement (loss)” versus “positive punishment (gain) and / or negative punishment (loss).”

**Regulatory Fit Theory**

Among the theories that were presented earlier, the most explanatory one for tailoring messages seems to be the regulatory focus theory because it describes in detail the different routes that people follow to experience hedonism. This need to tailor messages to individuals’ motivational orientation was expressed through another theory that Higgins (2000, 2005) developed, which is known as regulatory fit theory. Based on this theory, if the framing of a message argument sustains or disrupts an individual’s regulatory focus, then it creates regulatory fit or nonfit, respectively, and therefore enhances or undermines the persuasive effect of the message. When there is a fit between individuals’ regulatory focus and their strategic mean, then they feel right and more engaged in pursuing their goal. On the contrary, when they do not experience the preferred mean, there is regulatory nonfit between their regulatory focus and their strategic mean, they do not feel right and are less willing to engage in their goal-pursuit activities. So, when constructing tailored PA messages, the content needs to indicate strategies that fit the recipients’ motivational orientation. For instance, a message saying “Physical activity helps you decrease your weight” should not be presented to a thin and depressed individual. In this case, the message should emphasize a different strategy such as “Physical activity improves mood.” If there is a fit between the message content and individuals’ motivational orientation, then, it might be more persuasive.
Conclusions

All the theories that were described earlier (see Table 6) are based on the approach and avoidance motivation systems. Depending on their motivational orientation, some individuals try to decrease the distance between their actual and ideal selves (i.e., promoters) while others try to decrease the distance between their actual and ought selves (i.e., preventers), but in opposite directions. Promoters who manage to decrease the distance, achieve self-actualization and have better mental health. Correspondingly, preventers who decrease the distance between their actual and ought selves are expected to have better mental health, too. Researchers, though, need to disconnect reaching wellness (or self-actualizing) from motivating individuals to get active. For example, they can motivate preventers to engage in PA by emphasizing the negative consequences that they can avoid. Even if individuals do not reach wellness, they can still get active for fear of losing what they already have (i.e., health).

Respectively, researchers can motivate promoters to get active by emphasizing the positive outcomes that they can achieve. So, both promoters and preventers can be active although only promoters can reach optimal health. In other words, reaching wellness presupposes being active. Being active, however, does not necessarily lead to wellness. This means that tailoring PA messages to individuals’ motivational orientations might render them more effective. For instance, medicalizing PA might work better for preventers while presenting PA as a game could be more persuasive for promoters.

Therefore, promoting PA in the same way to all individuals might explain to some extent the inconsistencies that appear in the research literature of message framing and PA because opposite forces tend to cancel each other out.
### Table 6

A Conceptual Integration of Person-Centered, Self-Discrepancy, Regulatory Focus, Operant Conditioning, Prospect, and Regulatory Fit Theories

<table>
<thead>
<tr>
<th>Self-Discrepancy Theory</th>
<th>Actual-Own</th>
<th>Actual-Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulatory Focus Theory</td>
<td>Promoters</td>
<td>Preventers</td>
</tr>
<tr>
<td>Person-Centered Theory</td>
<td>(actual → ideal)</td>
<td>(ought ← actual)</td>
</tr>
<tr>
<td></td>
<td>(actual – ideal)</td>
<td>(ought – actual)</td>
</tr>
<tr>
<td>Operant Conditioning Theory</td>
<td>PR</td>
<td>NP</td>
</tr>
<tr>
<td>Prospect Theory</td>
<td>G</td>
<td>L</td>
</tr>
<tr>
<td>Regulatory Fit Theory</td>
<td>F</td>
<td>NF</td>
</tr>
</tbody>
</table>

*Note. PR = positive reinforcement; NP = negative punishment; PP = positive punishment; NR = negative reinforcement; G = gains; NG = non-gains; L = losses; NL = non-losses; F = fit; NF = non-fit.*
CHAPTER 3
IDENTIFYING POTENTIAL MODERATORS OF MESSAGE FRAMING:
A SYSTEMATIC REVIEW

Abstract

Context: Although the physical activity (PA) guidelines are well known, many Americans remain inactive. Message framing (i.e., emphasis on gains or losses) has been used as a strategy of communicating the PA benefits, but research has shown inconsistent results. Objective: The main purpose of this study was to investigate the potential persuasiveness of gains or losses in promoting PA, and identify the most common moderators. Data Sources: A search of PsycINFO database along with reference lists of selected studies, written in the English language was conducted in July 2015. Study Selection: Twenty three studies were identified and included that have compared gains and losses on any PA outcomes among adults. Review Methods: The persuasiveness of gains or losses was evaluated based on their means, and a descriptive approach was used to present any patterns identified from the review of the studies. Results: Ten studies showed that gains were more effective than losses; four studies showed the opposite effect; and five studies showed mixed effects. The most common moderator was previous levels of physical activity. Conclusions: The results indicate that it might be better to investigate message framing along with moderators on specific outcome measures at different times rather than looking for a main effect.

Keywords: Message framing, physical activity, moderators, gains, losses.

As stated in the United States physical activity (PA) guidelines, adults need to engage in at least 150 minutes of moderate-intensity PA; 75 minutes of vigorous-intensity PA; or any combination of them on a weekly basis to achieve various benefits such as
reduced risk of cardiovascular diseases, weight control, and so forth (Centers for Disease Control and Prevention, 2015b). National surveillance systems show that almost 30% of adults meet these guidelines (Office of Disease Prevention and Health Promotion, 2016), which indicates the need to improve the health communication strategies.

Message framing has been explored as a potentially effective strategy for communicating the PA benefits (Latimer, Brawley, & Bassett, 2010; O’Keefe & Jensen, 2007). This strategy refers to an emphasis on gains or losses of a specific behavior. Kahneman and Tversky (1979) developed prospect theory according to which people demonstrate a loss aversion effect, which means that their desire to avoid negative consequences has a stronger impact on their behavior compared to their desire to achieve positive outcomes. A few years later, Rothman and Salovey (1997) developed the message framing paradigm, which is the application of prospect theory into the health domain and claimed that message framing has a differential effect depending on the function of behaviors. They supported that the loss aversion effect appears in promoting detection behaviors (i.e., involve high risk) such as mammography or PAP smear, while an emphasis on gains is more effective for the promotion of prevention behaviors (i.e., involve low risk) such as PA, sunscreen use, and so forth.

Although the research literature on message framing and PA shows that it might be better to emphasize gains instead of losses to promote PA, further research is needed because some results have been inconsistent (Gallagher & Updegraff, 2012; Latimer et al., 2010; O’ Keefe & Jensen, 2007, 2008). There are several reasons that might explain these inconsistencies such as inadequate statistical power or the presence of other variables that moderate the effectiveness of message framing (e.g., gains are more
effective than losses for specific outcome variables, or only when combined with age, lifestyle, source credibility, etc.).

The purpose of this study was to examine whether gains or losses are more effective for promoting PA, and identify any variables that can moderate the effect of gains and losses on any PA outcomes. This review might help researchers develop new studies to test the effectiveness of tailored PA messages in specific populations (e.g., gains work better than losses for inactive young people when they emphasize easy to imagine symptoms, etc.).

Method

Eligibility Criteria

Any studies that have investigated the effect of message framing on any PA or exercise outcomes (e.g., attitude, intention, behavior, etc.), with participants including healthy and non-healthy adults, were reviewed and included in this study.

Identification of Papers

The studies were identified by searching the PsycINFO as the main electronic database. The search was limited to journals and dissertations from 1980 until July 2015 that were written in English. All studies that included the following terms in their abstract: “physical activity’ OR ‘exercise’ AND ‘gains OR losses’ AND ‘message framing’” were searched. Reference lists of selected articles and previous relevant reviews, meta-analyses, master theses, and dissertations were also reviewed. The search was run between July and August of 2015. Figure 1 displays the steps that were taken to find studies that were considered relevant to the purpose of this paper.
Step 1:
A Psych Info search was conducted using the terms ab("physical activity" OR "exercise") AND ab((gains OR losses)) AND ab("message framing"). The search was limited to journals and dissertations from 1980 and later that were written in English.

Step#2:
Fifteen papers were found. Thirteen were kept as relevant:
(Eight empirical studies; two dissertations; one review; one metaanalysis; and one master thesis)

Step#3:
Nineteen additional articles were identified as relevant from the references of the previous step:
(Thirteen empirical studies; one dissertation; one review; and four metaanalyses)

Step#4:
A PumMed and MEDLINE Search were conducted by using the same terms and criteria that were used in step 1 but no additional studies were identified.

Step#5:
The 21 empirical studies that were found in the previous steps along with two additional empirical studies that were located through google search were selected as the final pool for the present review.

Figure 1. Flow chart.

Information was extracted from each trial on: (a) participants; (b) design; (c) covariates; (d) outcome measures; and (e) results (see Table 7). The variables that had a moderating effect on message framing were identified and grouped into message recipient moderators (e.g., previous levels of PA, age, body mass index, etc.), and message content moderators (e.g., type of PA outcomes such as health, self-esteem, etc.).
Results

The primary measure was the mean difference in gains and losses. The most common outcomes that were tested were intention, attitude, behavior, message quality, and cognitive processing. Thirteen studies assessed intention (see studies 1, 2, 4, 8, 10, 12, 13, 15, 18, 19, 21, 22, 23 in Table 7). Twelve studies assessed attitude (1, 4, 5, 6, 7, 9, 10, 12, 13, 18, 21, and 23). Eleven studies used a behavioral measure (4, 9, 12, 13, 14, 15, 16, 17, 18, 20, and 21). Nine studies assessed the message quality (6, 7, 10, 11, 12, 13, 19, 21, and 23). Six studies used cognitive measures (2, 3, 11, 12, 13, and 19).

The Effect of Message Framing

Ten studies (3, 4, 10, 12, 14, 15, 16, 18, 20, and 21) found a higher effect of gains over losses at least on one outcome measure (e.g., attitude, intention, or behavior). For example, Jones, Sinclair, and Courneya (2003) reported that gain-framed messages led to higher cognitive processing than loss-framed messages although the superiority of gains over losses did not appear in all the outcome measures. Four studies showed that losses were more effective than gains (1, 2, 8, and 23). Four studies showed no effect (5, 13, 17, and 22). Finally, five studies showed mixed effects (6, 7, 9, 11, and 19). For instance, Robberson and Rogers (1988) found that gains had a better effect on intention toward PA if the messages emphasized self-esteem, while losses had a higher effect if the messages emphasized health benefits. Regarding the master theses and dissertations,¹ Schwartz (2014) did not find any effects, Berenbaum (2012) found a greater effect of gains over losses, and Hsiao (2002) found mixed results.

¹ The dissertations and master thesis are not included in Table 7.
The interaction effect was moderately significant on intention \((p < .07)\) and significant on attitude \((p < .02)\). The negatively framed message had a greater effect on attitudes and intention to engage in exercise compared to the positively framed message when the message came from a highly credibly source. When the source of credibility was low, there was not a big difference.

### Table 7

**Summary of Reviewed Studies**

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Results</th>
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| 1. Arora et al. (2006) 136 residents (55%F, Age = 49% 24–34) | 2 x 2 (Framing [positive, negative] x Credibility [high, low]); Covariates: lifestyle, involvement | a) Participants who received information about disease risk reported greater vulnerability compared to the control group \(F(1, 74) = 11.72(.14), p < .01; \(t(74) = -7.06, p < .001\); Baseline \((n, M, SD)\): Control = 24, 3.07, 1.09; Experimental = 52, 3.57, 1.49; Post-intervention \((n, M, SD)\): Control = 24, 3.35, 1.35; Experimental = 52, 4.84, 1.21.  

b) Participants who received information about psychological health risk reported greater vulnerability compared to the control group \(F(1, 75) = 5.27(.07), p < .05; \(t(75) = -4.20, p < .001\); Baseline \((n, M, SD)\): Control = 24, 4.14, 1.44; Experimental = 53, 4.36, 1.23; Post-intervention \((n, M, SD)\): Control = 24, 4.19, 1.22; Experimental = 53, 4.94, 1.36.  

b) Participants who received risk information about psychological health problems and were exposed to loss-framed messages reported:

i) greater LTPA response efficacy \(F(1, 44) = 6.09 (.12), p < .02\), compared to the control group; \(F(1, 51) = 13.27 (.21), p < .02\), compared to the gain-framed group; Baseline \((n, M, SD)\): Control = 22, 3.45, .81; Gain-framed = 29, 3.82, .67; Loss-framed = 24, 3.66, .69; Post-intervention \((n, M, SD)\): Control = 22, 3.75, .86; Gain-framed = 29, 3.98, .57; Loss-framed = 24, 4.40, .48; and

ii) greater LTPA intentions \(F(1, 45) = 7.20 (.14), p < .02\), compared to the control group; \(F(1, 51) = 3.75 (.07), p < .02\), compared to the gain-framed group; Baseline \((n, M, SD)\): Control = 21, 3.90, 1.85; Gain-framed = 27, 3.89, 1.71; Loss-framed = 26, 3.52, 1.82; Post-intervention \((n, M, SD)\): Control = 21, 4.10, 1.27; Gain-framed = 27, 4.36, 1.29; Loss-framed = 26, 4.68, 1.37.  |
| 2. Bassett-Gunter et al. (2013) 94 community-dwelling individuals with spinal cord injury (37F); treatment = 66, control = 28; Age = 45±12 | 2 x 2 (Condition [risk information, control] x Time [baseline, post-risk information]) for testing changes in vulnerability; 3 x 2 (Condition [gain-framed, loss-framed, control] x Time [baseline, post-LTPA message]) for testing changes in response efficacy and intentions | a) Dwell time was significantly greater after exposure to gain- than loss-framed messages; \(F(1, 67) = 6.93, p = .01, \eta^2_p = .10\). \(M(gains) = 261.81\ ms/word, M(losses) = 219.69\ ms/word;  

b) Recall and message relevant thoughts did not differ between the two types of frame and they were also not related to dwell time.  |
| 3. Bassett-Gunter et al. (2014) 77 students, not regular exercisers (23M, Age = 23.04±7.40) | One-variable (Message Frame [gains, losses]) design only; Covariates: dwell time, post-risk information vulnerability, fear arousal, personal relevance, and sex | The gain-framed ads led to significantly more fixations per word, \(F(1, 57) = 5.228, p = .03\), and longer dwell times per word, \(F(1, 57) = 4.495, p = .04\); more positive attitudes \(F(1, 56) = 3.70, p = .06, d = 0.50\); higher recall percentage \(F(1, 51) = 14.21, p < .001\); higher sign-up percentage \([OR = 2.72, 95\% CI: 0.90–8.21, Wald = 3.14, p = .08]\); stronger intentions to engage in PA \(F = 1.61, d = 0.33, p = .21\); more METS-min/week of PA one week following message exposure, \(F(1, 40) = 5.60, p = .02\); and higher RPEs \(F(1, 57) = 4.27, p = .04\) at 10 min; \(p = 0.36\) at 20 min compared to the loss-framed ads. No mediating effects were found.  |
| 4. Berenbaum & Latimer-Cheung (2014); 60F students with low levels of PA; Age: Gain = 20.37±3.02; Loss = 19.83±1.78 | 2 x 2 (Group [gains, losses]) x Time [pre, post]); Covariates: attitudes, intentions, and MET-min/week at Time 1; speed |  |

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n: number of participants; M: mean; SD: standard deviation; df: degrees of freedom; p: p-value; CI: confidence interval; OR: odds ratio; Wald: Wald statistic; RPE: rated perceived exertion; LTPA: leisure-time physical activity; MET: metabolic equivalent; min/week: minutes per week; \(\eta^2_p\): partial eta squared; \(d\): effect size; \(R^2\): proportion of variance explained; \(\beta\): standardized coefficient; \(\text{FWL}\): false word length; \(\text{FWR}\): false word ratio; \(\text{PA}\): physical activity; \(\text{LTPA}\): leisure-time physical activity; \(\text{METs}\): metabolic equivalents; \(\text{RPEs}\): rated perceived exertion; \(\text{CI}\): confidence interval; \(\text{OR}\): odds ratio; \(\text{Wald}\): Wald statistic; \(\text{df}\): degrees of freedom; \(p\): p-value; \(\eta^2_p\): partial eta squared; \(\beta\): standardized coefficient; \(\text{FWL}\): false word length; \(\text{FWR}\): false word ratio.
Table 7 (continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Results</th>
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175 students (45M); n1 = 118, Age: M = 19.7, SD = 2.67, 26.3%; n2 = 57, M = 72.0, SD = 8.07, 24.6%M | A 2 x 2 (Condition [easy-, hard to imagine symptoms] x Message frame [gains, losses]) Solomon square design | There was neither main effect of message framing (Model 2: β = .065, t = .596, p = .55; Model 3: β = .025, t = .250, p = .80; Model 4: β = .025, t = .256, p = .80) nor interaction between message framing and ease of imagination (Model 2: β = -.152., t = 1.13, p = .26; Model 3: β = -.082, t = 1.062, p = .28; Model 4: β = -.096, t = - .779, p = .44) [Model 1 = Age, Gender; Model 2 = Model 1, Ease of imagination, Framing, Imagination x Frame; Model 3 = Model 2, Exercise Frequency, Symptom Seriousness, Convincingness; Model 4 = Model 3, Exercise Frequency x Ease of Imagination]. |
80M students, Age: M = 24.4, SD = 3.89 | 2 x 2 (Message frame [gains, losses] x Ambivalence [high, low]) | a) Attitudes and Intention: Cronbach’s alpha = 0.76; Interaction, F(1, 76) = 5.01, p < 0.05; Gain-Low (M, SD) = 18.5, 5.06, 1.28; Gain-High = 22, 3.84, 1.57; Loss-Low = 20, 4.59, 1.50; Loss-High = 20, 4.89, 1.47; Highly ambivalent participants responded more positively to the loss- than gain-framed messages: F(1, 76) = 3.94, p < 0.06; Low ambivalent participants responded more positively to the gain- than loss-framed messages: F(1, 76) = 1.35, ns; Highly and low ambivalent participants differed significantly when exposed to the gain-framed message: F(1, 76) = 7.03, p < 0.02;  
b) Evaluation of the message: Main effect of Message Frame: F(1, 76) = 17.45, p < 0.001; M (gains) = 5.21 vs. M (losses) = 4.12; Main effect of Ambivalence: F(1, 76) = 5.92, p < 0.05; M (high) = 4.35 vs. M (low) = 4.98. |
| 7. Broemer (2004), Study 1  
60M students; Age: M = 23.5 | 2 x 2 (Ease of imagination [easy, hard] x Framing [positive, negative]); Covariate: perceived severity of symptoms | a) Ease of imagination x Message frame: F(1, 56) = 10.19, p < .01; Losses led to more positive attitudes when imagination was easy, F(1, 56) = 7.83, p < .05; Easy (M = 5.83, SD = 1.05), Hard (M = 4.63, SD = 1.33); Gains led to more positive attitudes when imagination was hard, F(1,56) = 3.22, p < .10; Easy (M = 4.67, SD = 1.06), Hard (M = 5.40, SD = 1.23); Attitude and severity: r = .27, p < .05; Ease of imagination x Message frame (with perceived severity as covariate): F(1, 55) = 8.25, p < .01;  
b) Congruent conditions (gains/hard, losses/easy) led to more positive attitudes, F(58) = 3.22, p < .01; and were more convincing than incongruent conditions (gains/easy, losses/hard): t(58) = 2.75, p < .01; M (congruent) = 5.37 vs. M (incongruent) = 4.26;  
c) Mediation analyses: Congruency predicted attitudes (β = .39, p < .01) and convincingness (β = .31, p < .05). Perceived convincingness predicted attitudes (β = .38, p < .01); When attitudes were regressed on congruency and convincingness, the impact of congruency was reduced (β = .30, p < .05) while the impact of convincingness remained significant (β = .28, p < .05); R²_change = .07, F_change (1, 57) = 5.29, p < .05. |
| 8. de Bruijn et al. (2014)  
317 (61.7% F, Age: M = 32.38, SD = 13.22) | 2 x 2 x 2 (Kernel State [attained, avoided] x Message Frame [gains, losses] x Exercise adherence [no, yes]) post-test study. Covariates: age, gender, time on leaflet (in seconds), and risk perception | a) There was a small effect of type of frame, F(1, 297) = 4.48, p = .035, η² = .02, with those in the loss-framed condition reporting higher scores on resolve, M = .75, SE = .10, 95% CI (0.55; 0.95) than those in the gain-framed condition, M = .45, SE = .10, 95% CI (0.26, 0.64);  
b) There was a small effect of Frame x Kernel State x Guideline Adherence, F (1, 297) = 5.97, p = .015, η² = .02, with those who did not adhere to the PA guidelines and were exposed to the loss-framed messages that mentioned attained outcomes reporting higher resolve than others. The difference between those who were exposed to the gain- and loss-framed messages that mentioned attained outcomes and did not adhere to the PA guidelines was: M_difference = .87, SE = .27, p = .043, d = .64. |
Table 7 (continued)

| 9. Gallagher & Updegraff (2011) | 2 x 2 (Message Frame [gains, losses] x Exercise Outcome [intrinsic, extrinsic]; Covariates: past exercise, need for cognition | a) NC x MF x EO interaction ($\beta = .24, p = .001$); Fit x NC ($\beta = .20, p = .003$, without attitudes; $\beta = .21, p < .01$ with attitudes) on overall PA; Fit x NC ($\beta = .17, t = 2.26, p = .02$) on attitudes only: i) Among participants with high [vs. low] NC, fit messages (gain-framed/intrinsic, loss-framed/extrinsic; $M = 37.19, SE = 3.50$) led to higher [vs. lower] PA than non-fit messages (gain-framed/extrinsic, loss-framed/intrinsic; $M = 30.73, SE = 3.80, t = 1.25, p = .21$ [vs. $t = 3.15, p < .01$]. With regard to attitudes, the respective results were: $M = 5.68, SE = .11$ vs. $M = 5.28, SE = .12, t = 2.50, p = .01$ [vs. $t = 2.15, p = .03$]; ii) Among participants with low [vs. high] NC, however, non-fit messages ($M = 37.61, SE = 3.86$) led to higher [vs. lower] PA than fit messages ($M = 21.59, SE = 3.55, t = -3.05, p < .01$ [vs. $t = 1.24, p = .22$]). With regard to attitudes, the respective results were: $M = 5.48, SE = .12$ vs. $M = 5.35, SE = .11, t = -1.76, p = .45$ [vs. $t = 1.12, p = .27$]).

Attitudes-overall PA: $r = .20, p < .001$. The effect of fit x NC was not significantly mediated by attitudes on overall PA (B = .43, SE = .36, n/s);

b) Fit x NC ($\beta = .17, p = .002$, without attitudes; $\beta = .23, p < .01$, with attitudes) on strenuous PA: i) Among participants with high NC, fit messages ($M = 1.52, SE = .23$) led to higher PA than non-fit messages ($M = 0.90, SE = .25$), $t = 1.84, p = .07$; ii) Among participants with low NC, non-fit messages led to higher PA ($M = 1.12, SE = .25$) than fit messages ($M = .60, SE = .23, t = -1.52, p = .13$); Attitudes-strenuous PA: $r = .26, p < .001$; The effect of fit x NC was significantly mediated by attitudes on strenuous PA ($B = .05, SE = .03, 95\% CI = .01-.13$, accounted for 20% of variance). |

| 10. Gray & Harrington (2011) | 2 x 2 (Message Frame [gains, losses] x Evidence [Narrative, Statistical]) posttest-only randomized control design. A control group was also included; Covariates: past exercise behavior | a) Attitudes: Message frame: $F(1, 339) = .072, p = .79$; Evidence: $F(1, 339) = .465, p = .50$; Interaction: $F(1, 339) = .649, p = .42$;

b) Perceived behavioral control: Gain-framed messages ($M = 5.28, SE = .04$); Loss-framed messages ($M = 4.96, SE = .04$); $F(1, 339) = 32.69, p < .0001$, partial $\eta^2 = .09$; Narrative ($M = 5.08, SE = .04$); Statistical ($M = 5.15, SE = .03$); $F(1, 339) = 1.63, p = .20$; Gain/narrative ($M = 5.23, SE = .05$) vs. loss/narrative ($M = 4.94, SE = .05$; $p = .003$), loss/statistical ($M = 4.99, SE = .05; p = .011$), and gain/statistical ($M = 5.32, SE = .05; p = 1$); $F(1, 339) = 4.41, p = .03$;

c) Intention: Gain-framed messages ($M = 5.46, SE = .03$); Loss-framed messages ($M = 5.17, SE = .03$); $F(1, 339) = 37.76, p < .0001$, partial $\eta^2 = .10$; Narrative ($M = 5.35, SE = .04$); Statistical ($M = 5.27, SE = .03$); $F(1, 339) = 1.92, p = .16$; Gain/narrative ($M = 5.47, SE = .05$) vs. loss/narrative ($M = 5.23, SE = .04; p = .007$), loss/statistical ($M = 5.11, SE = .05; p < .0001$), and gain/statistical ($M = 5.45, SE = .05; p = 1$); $F(1, 339) = 11.87, p = .001$, partial $\eta^2 = .03$;

d) Perceived message effectiveness: Gain-framed ($M = 3.83, SE = .03$); Loss-framed ($M = 3.51, SE = .03$); $F(1, 339) = 55.61, p < .0001$, partial $\eta^2 = .14$; Narrative ($M = 3.65, SE = .04$); Statistical ($M = 3.68, SE = .03$); $F(1, 339) = .39, p = .53$; Gain/narrative ($M = 3.81, SE = .05$) vs. loss/narrative ($M = 3.51, SE = .05; p < .0001$), loss/statistical ($M = 3.50, SE = .04; p < .0001$), and gain/statistical ($M = 3.87, SE = .04; p = 1$);

e) Past exercise behavior; attitude, $F(4, 339) = 50.76, p < .0001$, partial $\eta^2 = .13$; perceived behavioral control, $F(4, 339) = 33.17, p < .0001$, partial $\eta^2 = .08$; perceived message effectiveness, $F(4, 339) = 15.10, p < .0001$, partial $\eta^2 = .04$; intention, $F(4, 339) = .96, p = .32$. Levene’s test was significant for all but attitude measures. |
### Table 7 (continued)

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<th>Study</th>
<th>Design</th>
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<th>Results</th>
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<tr>
<td>11. Jacks &amp; Lancaster (2015) 106 students (40M; Age: M = 29.65, SD = 12.38)</td>
<td>2 x 2 x2 (Delivery style [eager, vigilant] x Message Frame [gains, losses] x Gender [males, females]; Covariates: Personal importance, ease of processing)</td>
<td>a) Source credibility, Message Frame: F(1, 97) = 4.83, p = .03, η² = .05; Gains (M = 5.52, SD = 1.14); Losses (M = 4.93, SD = 1.41); Message Frame x Delivery style: F(1, 97) = 4.96, p = .028, η² = .05; Eager-Gains (M = 5.37, SD = 1.04); Eager-Losses: (M = 5.21, SD = 1.21); Vigilant-Gains (M = 5.67, SD = 1.24); Vigilant-Losses (M = 4.65, SD = 1.55); b) Cognitive responses, Message Frame x Delivery style: F(1, 98) = 6.14, p = .015, η² = .06; Eager-Gains (M = 1.69, SD = 2.65); Eager-Losses (M = 1.93, SD = 3.01); Vigilant-Gains (M = 2.62, SD = 3.30); Vigilant-Losses (M = 0.11, SD = 3.00); c) Perceived message effectiveness: F(1, 97) = 34.28, p &lt; .001, η² = .26; Message Frame x Delivery style: F &lt; 1. However, Gain-framed messages were perceived as more effective when delivered in an eager style while loss-framed messages were perceived as more effective when delivered in a vigilant style: F(1, 96) = 4.88, p = .03, β = .15; d) Mood, Message Frame x Delivery style x Gender: F(1, 97) = 6.30, p = .014, η² = .06; Gains-Men-Eager (M = 4.62, SD = 2.15); Gains-Men-Vigilant (M = 5.00, SD = 1.69); Gains-Women-Eager (M = 4.90, SD = 1.61); Gains-Women-Vigilant (M = 3.94, SD = 2.87); Losses-Men-Eager (M = 4.95, SD = 1.27); Losses-Men-Vigilant (M = 2.56, SD = 3.22); Losses-Women-Eager (M = 2.91, SD = 3.13), p = .08; Losses-Women-Vigilant: (M = 4.58, SD = 2.85), p = .48.</td>
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<td>12. Jones et al. (2003) 192 students (139F; Age: M = 19.81, SD = 4.05)</td>
<td>2 x 2 x2 (Message Frame [positive, negative] x Source Credibility [high, low] x Time [Immediate, Delayed]; Covariates: pretest exercise behavior)</td>
<td>a) Attitude: No effects; b) Intention: Source Credibility x Frame: F(1, 177) = 4.82, p &lt; .03; Credible/Positive Frame (M = 4.66, SD = 1.38); Noncredible/Positive Frame (M = 3.79, SD = 1.55); Credible/Negative Frame (M = 4.36, SD = 1.36); Noncredible/Negative (M = 4.33, SD = 1.37); c) Behavior (at post-test): Source Credibility x Frame: F(1, 173) = 3.90, p &lt; .05; Credible/Positive Frame (M = 2.22, SD = 1.67); Noncredible/Positive Frame (M = 1.90, SD = 1.62); Credible/Negative Frame (M = 1.86, SD = 1.85); Noncredible/Negative (M = 2.11, SD = 1.46); d) Elaboration / Cognitive Responses: i) Though valence (positive-negative thoughts), Source x Frame: F(1, 183) = 8.91, p &lt; .004; Credible/Positive Frame: (M = 3.08, SD = 2.86); Noncredible/Positive Frame (M = 0.37, SD = 4.15); Credible/Negative Frame (M = 0.36, SD = 4.26); Noncredible/Negative (M = 0.97, SD = 3.74); ii) Thought recall, Source x Frame: F(1, 185) = 4.15, p &lt; .05; Credible/Positive Frame (M = 4.32, SD = 2.47); Noncredible/Positive Frame (M = 3.80, SD = 1.83); Credible/Negative Frame (M = 3.54, SD = 1.62); Noncredible/Negative (M = 4.20, SD = 2.10); e) Source expertise, Frame: F(1, 152) = 5.29, p &lt; .03; Positive Frame (M = 5.05, SD = 0.91); Negative Frame (M = 4.63, SD = 0.92).</td>
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<tr>
<th>Study</th>
<th>Design/Participants</th>
<th>Outcome Measure</th>
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<tr>
<td>13. Jones et al. (2004)</td>
<td>450 students (314M, Age: M = 20.02, SD = 3.94)</td>
<td>a) Behavioral beliefs, Frame (Belief 1: “feel better and improve my well-being”); F(1, 407) = 4.10, p = .044; Positive Frame: M = 6.20, SD = .91; Negative Frame: M = 6.00, SD = 1.05; Frame (Belief 4: “maintain my optimal weight”): F(1, 407) = 5.57, p = .019; Positive Frame (M = 5.93, SD = 1.13); Negative Frame (M = 5.68, SD = 1.32); b) Attitudes: No effects; c) Subjective norm: No effects; d) Perceived behavioral control: No effects; e) Intention: No effects; f) Behavior: No effects; g) Elaboration/Cognitive Responses: i) Thought valence (positive-negative thoughts) Source x Frame: F(2, 443) = 2.85, p &lt; .06; Frame: F(1, 443) = 22.80, p &lt; .001; Positive Frame (M = 1.53, SD = 2.47); Negative Frame (M = .36, SD = 2.74); ii) Thought recall: No effects; h) Source expertise; i) Credibility, Frame: F(1, 443) = 5.64, p &lt; .02; Positive Frame (M = 5.20, SD = .78); Negative Frame (M = 5.02, SD = .84); ii) Liking, Frame: F(1, 441) = 29.40, p &lt; .001, Positive Frame (M = 4.89, SD = .95); Negative Frame (M = 4.38, SD = 1.10).</td>
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<tr>
<td>14. Kozak et al. (2013)</td>
<td>64 adult students (82.7% F, 75% White)</td>
<td>Overweight/obese participants who were exposed to gain-framed messages increased their exercise behaviors between the baseline and the post-tests: fitness center use (p = .038), total cardiorespiratory activity (p = .005), and strength training (p = .037). Normal weight participants who were exposed to gain- and loss-framed messages increased only their strength training levels from baseline to posttest (p = .008 and p = .041, respectively).</td>
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<td>15. Latimer et al. (2008)</td>
<td>N (baseline) = 322 sedentary healthy callers to the US NCICIS (76.1% F, 67.4% White, Age: M = 47.40, SD = 12.03); Gain = 101, Loss = 106, Mixed = 115; N(week 2) = 56.2%, N(week 9) = 51.6%</td>
<td>a) Gain-framed messages were associated with greater intention, [M (gain) = 2.08, SD = .26; M (loss) = 1.87, SD = .26; d = .82] and self-efficacy [M (gain) = 4.18, SD (gain) = .33; M (loss) = 3.72, SD (loss) = .36; d = 1.34] than loss-framed messages at week 2 follow-up; Week 2 (Intention, Self-efficacy): R²change = .03, F(2, 175) = 3.48, p = .03; R²change = .03, F(2, 174) = 3.46, p = .03; β (gain vs. loss) = .20, p ≤ .01, -2.3 ≥ CI ≥ -2.75. b) Gain-framed messages were associated with greater levels of MVPA at week 9 than loss- or mixed-framed messages [Gain (M = 1,399.78, SD = 648.41); Loss (M = 947.25, SD = 624.85); d (gain vs. loss) = .71; Mixed (M = 842.50, SD = 722.20), d (gain vs. mixed) = .81]; Week 9 (MVPA): R²change = .03, F(2, 162) = 3.06, p = .05; β (gain vs. loss) = -.15, p = .05, CI = -.14 to -.12; β (gain vs. mixed) = -.17, p = .02, CI = -.108 to -.139. c) Physical activity behavior at week 7 was not mediated by intention or self-efficacy at week 2; Intention: z (gain vs. loss) = -.50, z (gain vs. mixed) = .51; Self-efficacy: z (gain vs. loss) = -.29, z (gain vs. mixed) = -.22.</td>
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<td>Study</td>
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<td>Sample Details</td>
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<td>16. Li et al. (2014)</td>
<td>2014</td>
<td>Hong Kong; Younger = 111, Age: M = 22.31, SD = 3.04; Older = 100, Age: M = 71.66, SD = 7.48</td>
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<td>17. McCall &amp; Martin-Ginis (2004)</td>
<td>2004</td>
<td>49 cardiac patients (Age: M = 63, based on initial N = 60); Gain = 16, 15M; Loss = 13, 12M; Control = 20, 19M</td>
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<td>18. Parrott et al. (2008)</td>
<td>2008</td>
<td>170 sedentary students (65F, Age: 20.2±9 years); PFM = 57, 23F; Age: M = 20.4; NFM = 57, 22F; Age: M = 20.2; CG = 56, 20F; Age: M = 20.0</td>
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Table 7 (continued)

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<th>19. Robberson &amp; Rogers (1988) 84F nonexercising adult students.</th>
<th>2 x 3 (Type of appeal [health, self-esteem] x Valence [positive, negative, mixed]).</th>
<th>a) Credibility: No difference; b) Beliefs (Severity): $F(2, 66) = 3.24, p &lt; .05$; Negative health message: $M = 10.4$; Positive health message: $M = 9.7$; c) Intention, Appeal x Valence: $F(2, 66) = 3.77, p &lt; .03$; i) positive/self-esteem &gt; negative/self-esteem ($p &lt; .05$); ii) positive &amp; negative/health &gt; negative/self-esteem ($p &lt; .05$); iii) negative/health &gt; negative/self-esteem ($p &lt; .10$); iv) positive/self-esteem &gt; positive/health ($p &lt; .10$); Positive / Health: $M = 10.1, SD = 2.6$; Positive/Self-esteem: $M = 11.8, SD = 2.2$; $t(22) = 2.81, p &lt; .01$; Negative/Health: $M = 11.0, SD = 2.0$; $t(22) = 2.05, p &lt; .05$; Negative/Self-esteem: $M = 9.3, SD = 1.7$; Positive &amp; negative/Health: $M = 11.5, SD = 2.3$; $t(22) = 2.50, p &lt; .05$; Positive/Health/self-esteem: $M = 10.8, SD = 3.2$; $t(22) = 1.53, p &lt; .10$; Control/Health: $M = 9.2, SD = 2.6$.</th>
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<td>20. Sweet et al. (2014), Study 2 227 (80% F; 81% White; Age: $M = 31.74, SD = 13.71$); 239 (80% F; 81% White; Age: $M = 29.9, SD = 13.71$); Gain = 100; Loss = 127</td>
<td>2 x 2 (Message Frame [gains, losses] x Time [week 1, week 2])</td>
<td>a) Action plan creation rates, Week 1: $x^2(1) = .12, p = .67$; Week 2: $x^2(1) = 60.1, p = .01$. Message frame (week 2), Gains &gt; losses: $x^2(1) = 5.29, p = .02$. Time (week 2), Gains: McNemar $x^2(1) = 2.44, p = .12$. Losses (decrease): McNemar $x^2(1) = 21.12, p &lt; .001$ b) Quality of action plans, Week 1: $t(102) = .29, p = .77, d = .05$; Week 2: $t(51) = -.29, p = .77, d = -.08$ c) Number of action plans, Week 1: $t(102) = -.25, p = .80$; Week 2: $t(51) = -.45, p = .65$ d) Highest quality/number of plans, Week 1: $t(42) = 1.48, p = .15, d = .45$ [Gain ($M = 81.00, SD = 27.77$); Loss ($M = 67.72, SD = 30.60$)]; Week 2: $t(13) = .35, p = .97, d = .02$.</td>
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<td>21. van’t Riet et al. (2010) 787 (434F, Age: $M = 46.3, SD = 14.0$); 299/787 completed all measures</td>
<td>One-factorial (frame: gain versus loss) between participants design; Covariates: baseline PA, baseline intention</td>
<td>a) Affect, positive (gains &gt; losses); $\beta = .13, t(515) = 3.19, p &lt; .01, sr = .13$; negative (gains &lt; losses); $\beta = -.20, t(515) = -4.79, p &lt; .001, sr = .20$; b) Information acceptance; $\beta = .08, t(473) = 1.72, p = .09, sr = .08$; c) Attitude, $\beta = .06, t(488) = 1.37, p = .17, sr = .06$; d) Intention, $\beta = -.09, t(507) = 2.66, p &lt; .01, sr = .09$. gains &gt; losses; e) Behavior, MVPA, $\beta = .09, t(283) = 1.70, p = .09, sr = .09$; walking, $\beta = .07, t(239) = 1.12, p = .26, sr = .07$; MVPA and walking, $\beta = .03, t(237) = .55, p = .58, sr = .03$.</td>
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<td>22. van’t Riet et al. (2014), Study 3; 672 (99.4% F, Age: $M = 44.7, SD = 14.6$); Gain = 332, Loss = 326</td>
<td>2 x 2 (Message frame [gains, losses] x Risk [low, high])</td>
<td>Perceived risk (low risk &gt; high risk); $F(1, 654) = 49.23, p &lt; .001, \eta^2_p = .07$; Framing, $F(1, 654) = .07, p = .80, \eta^2_p = .00$; Gain ($M = 5.76, SD = .06$); Loss ($M = 5.73, SD = .06$); Risk x Framing, $F(1, 654) = 2.72, p = .10, \eta^2_p = .00$.</td>
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<td>23. Wirtz &amp; Kulilvavarnopas (2014) 72 Hispanic adults (47F, Age: $M = 40.6$)</td>
<td>2 x 2 (Message type [narrative, non-narrative] x Message frame [gains, losses]) between-subjects, posttest-only experimental design.</td>
<td>a) Message type: Message engagement, message relevance, attitude: $ps &gt; .40$; Behavioral intention (multivariate): $F(2, 67) = 20.01, p = .01, Pillai’s trace$; b) Message frame: Message engagement: $F(1, 68) = 5.51, p = .02$; Gain ($M = 6.6, SD = 2.93$); Loss ($M = 1.9, SD = 1.37$); Attitude: $F(1, 68) = 4.30, p = .03$; Gain ($M = 5.8, SD = 1.29$); Loss ($M = 5.0, SD = 1.61$); Behavioral intention (multivariate): $F(2, 67) = 5.50, p = .01, Pillai’s trace$; PA Behavioral intention (univariate): $F(1, 68) = 9.13, p = .003$; Gain ($M = 5.2, SD = 1.26$); Loss ($M = 6.0, SD = .82$).</td>
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**Note.** M = Males; F = Females; LTPA = leisure-time physical activity; MET = metabolic equivalent; RPE = rated perceived exertion; PE = past exercise; NC = need for cognition; HBM = health belief model; US NCICIS = US National Cancer Institute’s Cancer Information Service; MVPA = moderate-to-vigorous physical activity; MF = message frame; EO = exercise outcome; PFM = positively framed message; NFM = negatively framed message; CG = control group.
Message Recipient Moderators

Eleven studies (2, 5, 6, 7, 8, 9, 10, 14, 16, 17, and 18) explored the effect of different individual factors along with message framing. Berry and Carson (2010) used 118 young ($M_{age} = 19.7$) and 57 old people ($M_{age} = 72.0$); assessed attitudes; and found no effects. De Bruijin, Out, and Rhodes (2014) used 317 young women ($M_{age} = 32.38$); assessed intention and resolve; and found a higher effect of losses than gains. Gray and Harrington (2011) used 345 young people (18–29 years old); assessed attitude and intention; and found that gains were more effective than losses. Parrott, Tennant, Olejnik, and Poudevigne (2008) used 170 sedentary adult students; assessed attitude, intention, and behavior; and found that gains were more effective than losses. Bassett-Gunter, Martin Ginis, and Latimer-Cheung (2013) used middle-aged people (45±12) with spinal problems; assessed intention; and found that losses were more effective than gains, while Broemer (2004) used young students ($M_{age} = 23.5$); assessed attitudes; and found mixed results. Gallagher and Updegraff (2011) used 176 young sedentary adults ($M_{age} = 19.0$); assessed attitudes and behavior; and found mixed results. Broemer (2002) used 80 male students ($M_{age} = 24.4$), assessed attitudes and intention, and found mixed results. McCall and Martin Ginis (2004) used 49 cardiac patients; assessed behavior; and found no difference between gains and losses. Kozak, Nguyen, Yanos, and Fought (2013) used 64 normal-weight and overweight / obese adult students; assessed behavior; and found that gains were more effective than losses. Li, Cheng, and Fung (2014) used 111 young adults ($M_{age} = 22.31$) and 100 older adults ($M_{age} = 71.66$) in Hong Kong; tested behavior; and found that gains had a higher effect compared to losses. The main moderators that were identified in these studies are described below.
Prior levels of physical activity. Broemer (2004) found that losses were more effective when symptoms were easy to imagine, but Berry and Carson (2010) mentioned that such effects also depend on individuals’ past PA habits. Berry and Carson found that participants with the lowest prior levels of PA who were placed in the hard to imagine condition reported the worst attitudes toward PA. These results are consistent with Broemer’s (2004) findings, which means that researchers need to consider the type of symptoms that they emphasize in the messages. If symptoms are easy to imagine, they might lead to deeper information processing and greater persuasiveness, at least if they are presented in loss-framed messages. These effects, however, might appear only in inactive people.

The effect of prior levels of PA was also supported by Gray and Harrington (2011) who found that past exercise behavior affected significantly attitude, perceived behavioral control, and perceived message effectiveness, but not intention, indicating a differential effect of prior PA levels on outcome variables. This differential effect also appeared in the study of de Bruijn and Rhodes (2014), in which participants who were exposed to loss-framed messages reported higher resolve scores than those who were exposed to gain-framed messages. However, participants who did not adhere to the PA guidelines and were exposed to loss-framed messages that emphasized attained outcomes\(^2\) reported higher resolve scores than participants who were exposed to loss-framed messages that emphasized avoided outcomes,\(^3\) and participants who were exposed

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\(^2\) Example: “Not engaging in sufficient exercise decreases your chance of maintaining a healthy weight” (de Bruijn and Rhodes, 2014, p. 881).

\(^3\) Example: “Insufficient exercise decreases your chance to have a healthy body weight” (de Bruijn and Rhodes, 2014, p. 876).
to the respective gain-framed messages\(^4\). Both effects were small and appeared only in the resolve scores, but not on the intention ones. On the other hand, Parrott et al. (2008) found that positively-framed messages had a greater effect on exercise behavior compared to negatively-framed ones and control group, but the two types of framed messages did not differ on the rest of outcome variables. Some of these effects, however, were stronger for participants with low baseline scores, which is consistent with the previously mentioned studies.

**Negative mindset.** Bassett-Gunter et al. (2013) said that participants who were exposed to risk information about psychological problems along with loss-framed messages reported higher vulnerability, response leisure time physical activity (LTPA) efficacy (i.e., LTPA can prevent these problems), LTPA intentions, and cognitive processing than other participants. The researchers concluded that the higher effectiveness of loss-framed messages arose because the risk information created a negative mindset in participants that was congruent with the loss-framed messages. The negative mindset was also supported by Broemer (2004) who asked participants to read information about serious heart diseases; imagine three symptoms that varied in difficulty to imagine (easy versus difficult); and then read gain- or loss-framed messages. The results showed that congruent messages (gains / difficult to imagine, losses / easy to imagine symptoms) were more persuasive than incongruent messages (gains / easy to imagine, losses / difficult to imagine) on PA attitudes although this effect was partially mediated by message convincingness.

\(^4\) The gain-framed messages included the same examples but replaced some key words (i.e., “engaging” instead of “not engaging,” “increases” instead of “decreases,” and “sufficient” instead of “insufficient”).
These findings indicate that individuals with a negative mindset (e.g., concerned about the consequences of a behavior) might be more persuaded by losses than gains when it is easy to imagine the symptoms, while individuals with a positive mindset (e.g., care about the benefits of a behavior) might be more persuaded by gains than losses when it is difficult to imagine the symptoms. Broemer (2004) concluded that messages can be more effective when messages emphasize strong arguments that match with the mindset of the recipients. This is consistent with the conclusion of Bussett-Gunter et al. (2013) that fit matters in relation to message framing when researchers try to promote PA. However, it is not consistent with van’t Riet et al. (2014, Study 3) who used 672 adults ($M_{age} = 44.7$) and found no effect of message framing on intention toward PA irrespective of the degree of perceived risk.

**Need for cognition.** Gallagher and Updegraff (2011) used the need for cognition (i.e., people’s desire to think thoroughly about something) as a covariate while exploring the effect of message framing in relation to the type of exercise outcome (i.e., intrinsic such as being active for fun versus extrinsic such as being active for disease prevention). The results showed that participants with low need for cognition (NC) that were exposed to fit messages (gain-framed / intrinsic outcomes or loss-framed / extrinsic outcomes) reported significantly lower levels of PA and more negative attitudes compared to participants who were high in NC. On the other hand, participants with low NC who were exposed to non-fit messages (gain-framed / extrinsic outcomes or loss-framed / intrinsic outcomes) reported significantly higher levels of PA and better attitudes.
**Health status.** McCall and Martin-Ginis (2004) reported that cardiac patients who were exposed to gain-framed messages demonstrated higher levels of exercise adherence compared to the control group, but not compared to those who were exposed to loss-framed messages. Both gain- and loss-framed messages led to higher levels of perceived susceptibility compared to the control group, but loss-framed messages also led to higher levels of perceived barriers than the other two groups, which might have undermined their effectiveness of exercise adherence. Kozak et al. (2013) found that overweight / obese students who were exposed to gain-framed messages increased all three exercise behaviors (fitness center use, total cardiorespiratory activity, strength training) from baseline to 14 day-posttest, compared to those who were exposed to loss-framed messages. Normal-weight participants, however, who were exposed to gain- or loss-framed messages increased only the levels of their strength training.

**Age.** Li et al. (2014) found that gains were more effective than losses only among older men on self-reported and accelerometry-assessed PA. The differences in the variance explained for subjectively- and objectively-assessed PA were 18 and 45%, respectively, which indicates that younger people tend to underreport their PA due to its sporadic nature, and therefore it might be better to use objective measures of PA such as accelerometry-based monitors. The lack of significant framing effects among younger adults is also consistent with the findings of Jones et al. (2003, 2004).

**Ambivalence.** Broemer (2002) explored the effect of ambivalence (i.e., the extent to which an individual reacts positively and negatively to a specific object or behavior) and message framing on PA outcome variables, and found that loss-framed messages improved significantly the attitudes and intentions toward exercise of highly ambivalent...
participants while gain-framed messages improved (not significantly) the attitudes and intentions of low ambivalent participants.

**Message Content Moderators**

Ten studies (1, 2, 7, 8, 9, 11, 12, 13, 9, and 10) explored the effect of different types of messages along with message framing. Arora et al. (2006) used 136 residents (Age = 40% 24–34); assessed attitude and intention; and found that losses were more effective than gains. Bassett-Gunter et al. (2013) used 94 community-dwelling individuals with spinal cord injury (Age = 45±12); assessed intention; and found that losses were more effective than gains. Gallagher and Updegraff (2011) used 176 young sedentary adults ($M_{age} = 19.0$); assessed attitudes and behavior; and found mixed results. Jacks and Lancaster (2015) used 106 students ($M_{age} = 29.65$); assessed cognitive responses and message effectiveness; and found mixed results. Jones et al. (2003) used 192 students ($M_{age} = 19.81$); assessed attitude, intention, and behavior; and found that gains were more effective than losses, but Jones et al. (2004) did not replicate these results. Robberson and Rogers (1988) used 84 nonexercising female adult students; assessed beliefs and intention; and found mixed results. Van’t Riet et al. (2010) used 787 adults ($M_{age} = 46.3$); assessed attitude, intention, and behavior; and found that gains were more effective than losses on intention. Based on these studies, PA outcomes can be distinguished between:

**Easy versus difficult to imagine symptoms.** Broemer (2004) found that gains were more effective than losses on attitudes when symptoms were hard to imagine while losses were more effective than gains when symptoms were easy to imagine.
Attained versus avoided outcomes. De Bruijn et al. (2014) exposed participants to leaflets that included messages emphasizing gains or losses along with attained (i.e., desirable) or avoided (i.e., undesirable outcomes). The results showed that losses were more effective than gains on resolve scores when they emphasized desirable outcomes, but this effect was evident only in participants who did not adhere to the PA guidelines.

Intrinsic versus extrinsic exercise outcomes. Gallagher and Updegraff (2011) found that fit messages (gain-framed / intrinsic outcomes, or loss-framed / extrinsic outcomes) led to higher levels of PA for participants with high NC while non-fit messages (gain-framed / extrinsic outcomes, or loss-framed / intrinsic outcomes) led to significantly higher levels of PA for participants with low NC.

Health versus self-esteem. Robberson and Rogers (1988) reported that negatively framed messages that emphasized health; positively framed messages that emphasized self-esteem; and mixed messages that emphasized either health or self-esteem led to higher scores in behavioral intention toward exercise, compared to the control group. So, the negative appeal to health (e.g., lack of exercise decreases one’s physical stamina) was more effective than the positive appeal to health (i.e., exercise increases one’s physical stamina), which is consistent with prospect theory (Kahneman & Tversky, 1979), but inconsistent with the message framing paradigm (Rothman & Salovey, 1997). On the contrary, an emphasis on a different benefit of exercise (i.e., self-esteem) was more effective in a positive frame, which does not support prospect theory, but supports the message framing paradigm.
Novel versus familiar. Bassett-Gunter et al. (2013) found that losses were more effective than gains when participants were exposed to risk information about psychological problems (i.e., novel) that might result from inactivity. This superiority of losses over gains, however, did not appear when participants were exposed to risk information about physical diseases (i.e., familiar) that might result from inactivity. Trying to explain these findings, the researchers suggested that the risk information might need to be novel to motivate participants to engage in processing the information.

The above variables describe the nature of outcomes that can moderate the strength of the message arguments and lead to different effects. However, it is also important to consider the peripheral cues of message communication (Petty & Cacioppo, 1986), such as the way that messages are delivered that might moderate their persuasive effect. The following three variables were identified in this category:

Eagerness- versus vigilance-focused. Jacks and Lancaster (2015) reported that messages seem to be more effective when there is a fit between message framing and delivery style (i.e., gains delivered by an eager style and losses delivered by a vigilant style) rather than when such a fit does not exist (i.e., gains-vigilant and losses-eager). This effect appeared, though, only after accounting for variance due to gender differences in source credibility. Participants who were exposed to a loss-framed message with a vigilant delivery style evaluated the speaker more negatively (i.e., less credible), and came up with more negative thoughts regarding the message. The lack of respective results in the opposite direction for gains, however, did not support the fit hypothesis.
Credible versus non-credible. Jones et al. (2003) found that positively-framed messages led to higher exercise intention and behavior scores when the message came from a highly credible source compared to the rest of the conditions (i.e., positive frame / non-credible, negative frame / credible, negative frame / non-credible). Participants in the positive frame / credible source condition also came up with more positive than negative thoughts and recalled a greater amount of message information, indicating more elaborated processing. Although similar findings regarding thoughts and recall were found in a subsequent study by the same researchers along with perceiving the source of the message as more credible and likeable (Jones et al., 2004), the greater effect of gains over losses on intention and behavior was not replicated. Moreover, Jones et al. (2003) did not find an effect on the theory of planned behavior variables (e.g., attitudes, intentions, etc.). The results of Jones et al. (2003) were contradictory to those of Arora et al. (2006) who found that negatively framed messages had a greater effect on attitude and intention to exercise if the message came from a highly credible source. When the source of credibility was low, the type of messages did not make a big difference although the positively framed message had a better effect.

Computerized versus face-to-face. Van’t Riet et al. (2010) found that individuals who received computer tailored feedback regarding their PA levels and were exposed to gain-framed messages reported more positive affect and higher intention to engage in PA compared to those who were exposed to loss-framed messages. The small effect size along with the lack of effect on attitude and PA behavior, however, led van’t Riet to conclude that message framing alone is not enough to be considered as an effective strategy of promoting health information such as PA.
Timing

In the previous sections, information was provided about variables related to message recipients (who) and message content (what) that might affect message framing. Even if researchers consider these variables, it might still not be enough, however. There is another aspect that researchers need to be aware of, that is, the time points (when) at which the effectiveness of message framing appears.

Four studies reported differential effects of message framing depending on timing (15, 17, 18, and 20). Latimer et al. (2008) used 322 sedentary healthy callers to the US National Cancer Institute’s Cancer Information Service (US NCICIS); assessed intention and behavior; and found that gains were more effective than losses. McCall and Martin Ginis (2004) used 49 cardiac patients; assessed behavior; and did not find any differences between gains and losses. Parrott et al. (2008) used 170 sedentary students; assessed attitude, intention, and behavior; and found that gains were more effective than losses. Sweet et al. (2014) used 227 adults ($M_{\text{age}} = 31.74$); assessed number and quality of action plans and the rate of their creation; and found that gains were more effective than losses.

In detail, Latimer et al. (2008) found that gain-framed messages were associated with higher intention and self-efficacy at Week 2 compared to loss-framed messages. Although these effects were not maintained at Week 9, greater levels of PA were reported by participants who had been exposed to gain- than loss- or mixed-framed messages. Therefore, it is possible that repeated exposure to messages is necessary to allow for the higher persuasiveness of gain-framed messages to appear because it probably facilitates deeper cognitive processing. The authors suggested that cognitive changes precede and mediate behavior changes. However, intention and self-efficacy were not significant
mediators, similarly to the study by McCall & Martin Ginis (2004) indicating alternative explanations.

McCall and Martin Ginis (2004) found that exercise adherence levels were higher only during the first month, which shows that researchers might need to investigate both the underlying mechanisms of message framing and its duration across the time. Parrott et al. (2008) reported that the positively framed message had a better effect on subjective norm (i.e., perceived social pressure to adopt a specific behavior) compared to the negatively framed and the control group. They argued, however, that the positively framed message had a better effect on intention compared to the negatively framed message, only during the retention phase, which indicates that it might take some time for the effect to appear. Finally, Sweet et al. (2014) conducted a two-week intervention and found that gain-framed messages, compared to loss-framed messages, led significantly more participants to create action plans during the second week. Gain-framed messages also showed a trend toward a greater number of highest quality action plans compared to loss-framed messages during the first week. These results indicated that if researchers provide gain-framed messages that include instructions about creating action plans, they might have a greater long-term persuasive effect on promoting PA considering that action planning is a self-regulatory mediator of PA.

The results of these studies support the argument that timing should be considered when researchers investigate the effectiveness of message framing. Otherwise, they might reach wrong conclusions. For example, it is possible that message framing works alone or in combination with other variables, but needs some time to appear; gets stronger if it gets repeated a specific number of times; fades away; and so forth.
**Strengths and Limitations**

Berry and Carson (2010) used a large sample size and different age groups; Gallagher and Updegraff (2011) assessed exercise behavior instead of intentions; Jones et al. (2004) used a well-established design, large sample size, and random assignment; Sweet et al. (2014) used a behavioral outcome (i.e., action plan) that was theoretically based (i.e., health action process approach, message framing), and they used a prospective design that allowed them to examine the long-term effect of message framing; van’t Riet et al. (2010) used a 3-month follow-up and assessed behavior as an outcome measure; and van’t Riet et al. (2014) used a non-student sample.

The most common limitations of the reviewed studies included: small sample size (see studies 5, 14, 17, 19, and 23 in Table 7); limited generalizability (e.g., only spinal cord injury patients in Bassett-Gunter et al., 2013; only females in Berenbaum & Latimer-Cheung, 2014; the majority of participants were well-educated, less older than younger people in Berry and Carson, 2010; Li, Cheng, and Fung, 2014); no pretest (8, 10, 17, and 23); non-behavior outcome measures (2, 8, 10, and 23); no control group (8, 14, and 23); self-reports (5, 9, 12, 13, 14, and 18); short follow-up (4, 14); measurement issues (i.e., potential susceptibility of International Physical Activity Questionnaire to over-reporting in 15, 21); ceiling effect (Jones et al., 2004); and prior levels of PA (i.e., inactive participants preferred to change their PA levels in the long- rather than in the short-term in Sweet et al., 2014; and 57.4% participants were already active in van’t Riet et al., 2010).
Discussion

The results of the present review are consistent with Updegraff and Rothman (2013) that a message is more convincing when it is congruent or fits with specific characteristics of the message recipients, for it enhances the extent of personal relevance. They are also consistent with Covey (2014) who claimed that dispositional factors such as ambivalence, approach-avoidance motivation, regulatory focus, need for cognition, and self-efficacy beliefs that fit with the content of health-related messages can enhance the persuasive effect of message-framing. When such a fit, congruency, or personal relevance takes place, then gains or losses might be more effective depending on the individuals’ characteristics.

Therefore, it seems that it might be better to tailor messages to message recipient characteristics, and consider the timing, and the type of outcome variables, too. It would be useful if specific profiles could be created for target populations and provide them with tailored messages and feedback to help them meet the general PA guidelines. To achieve this goal, most of the modifying variables that have been reported so far in the research literature of message framing and PA, along with the main statistics, were compiled in this study to use as a guide for the development of customized message framing interventions, and improve the effectiveness of health communication strategies.
CHAPTER 4
THE EFFECT OF REGULATORY FOCUS AND MESSAGE FRAMING ON CONSTRUCTING PHYSICAL ACTIVITY MESSAGES

Abstract

According to literature, gains are more effective than losses on promoting physical activity (PA). This study explored whether a fit between message content and individuals’ motivational orientation improves PA attitude and intention scores. The sample included 441 university students (263 women; \( M_{\text{age}} = 19.57, \) \( SD_{\text{age}} = 1.98 \)). The design was 2 x 2 x 3 (Regulatory Focus [promoters, preventers] x Frame [gains, losses] x 3 Message Valence [positive, negative, mixed]) full factorial. Participants read messages emphasizing gains or losses that included positive, negative, or mixed words. Analysis of covariance on the attitude scores revealed a three-way interaction, \( F(2, 428) = 5.25, p < .01, \) partial \( \eta^2 = .024 \). The results showed that gains were more effective for preventers and losses were more effective for promoters when only positive or negative words were used in the message content. Although the differences were not in the expected directions, these results indicate that individual differences influence the message framing results, and therefore, experts in the Mass Media sector of the National Physical Activity Plan could prepare and test the effectiveness of customized messages in various media campaigns to promote PA and health.

*Keywords*: Message framing, physical activity, regulatory focus, gains, losses.

Physical activity (PA) can lead to various benefits such as weight control, psychological well-being, or decreased risk of several diseases (Centers for Disease Control and Prevention, 2015b; National Heart, Lung, and Blood Institute, 2015). Despite
the benefits, however, attempts to promote PA have not been very successful (Cavill & Bauman, 2004; Hillsdon, Cavill, Nanchahal, Diamond, & White, 2001), and less than one fourth of American adults engage in the recommended 150 minutes of moderate-intensity PA per week (Office of Disease Prevention and Health Promotion, 2016).

The physical inactivity crisis indicates that health communication strategies can be further improved to convince people to start a physically active lifestyle and adhere to it in the long run. Identifying the optimal content of PA messages is, therefore, necessary to improve their persuasiveness. Based on Latimer (2010), two fundamental ways of constructing messages include: a) message framing, which refers to whether messages emphasize the benefits of adopting (gain-framed) or the costs of not adopting (loss-framed) a specific behavior; and b) message tailoring, which refers to whether messages are presented in a way that considers the individual differences of the recipients. For example, message content should be tailored to the recipients’ stage of change (Prochaska, DiClement, & Norcross, 1992). In other words, a message like “Be active!” should not be presented to individuals who have been active for at least six months because in that case the goal is to help them maintain an active lifestyle.

Most studies that Latimer reviewed (2010) on message framing and PA were based on prospect theory, which describes how framing the content of a message in terms of gains or losses can lead to different results (Kahneman & Tversky, 1979). In particular, people tend to be risk-seeking when they consider the negative consequences (losses) of a choice, but they tend to be risk-averse when they consider the positive ones (gains). Rothman and Salovey (1997) applied prospect theory to health-related behaviors and developed the message framing paradigm, which states that messages emphasizing
the possible losses are more effective when detection behaviors are promoted (e.g., Pap smear, HIV testing, mammography, etc.) because they involve high risk due to the potential presence of a disease. On the other hand, gains are more effective than losses when prevention behaviors are promoted (e.g., sunscreen use, smoking cessation, dental hygiene, etc.) because the only risk associated with these behaviors is the lack of engagement in them. Various research studies have supported the greater effect of gains over losses in prevention behaviors (Detweiler, Bedell, Salovey, Pronin, & Rothman, 1999; Rothman, Martino, Bedell, Detweiler, & Salovey, 1999) and the greater effect of losses over gains in detection ones (Apanovitch, McCarthy, & Salovey, 2003; Rivers, Salovey, Pizarro, D. A., Pizarro, J., & Schneider, 2005). Physical activity is considered a prevention behavior and this probably explains why most studies that Latimer reviewed show that gains might be the most appropriate way of framing PA messages.

Although gains seem to be slightly more effective than losses to promote PA, various inconsistent findings have been reported across the literature (Jones, Sinclair, & Courneya, 2003; Latimer et al., 2008; McCall & Martin Ginis, 2004; van’t Riet, Ruiter, Werrij, & de Vries, 2010). Therefore, it is necessary to identify and explore the effect of all possible moderators on message framing in PA and use this knowledge to construct optimal PA messages. One of the possible moderators on the association between message framing and PA that has been reported is the regulatory focus (Cesario, Higgins, and Scholer, 2008; Gallagher & Updegraff, 2012; Higgins, 1998), which refers to people’s motivational orientation and led Higgins (1997, 1998) to develop regulatory focus theory. Since the role of regulatory focus as a moderator in message framing and
PA has not been investigated extensively, it might account to some extent for the inconsistent findings that appear in the literature.

By examining the role of regulatory focus in the interplay between message framing and PA can help health promotion specialists better understand the psychological mechanisms in promoting PA, and design more successful messages that could impact PA behavior. Mass media personnel could also prepare tailored feedback that apply to individuals displaying specific personality profiles. For instance, by knowing that an individual is an introvert, they could provide initial feedback via an online system that does not strongly encourage them to visit a gym, but rather recommends them to start exercising gradually at home before they visit a gym otherwise they might feel overwhelmed and give up. To the contrary, for those who are sociable, they could suggest more challenging options to increase or sustain their interest in exercising. Personality profiles are constellations of various aspects, and therefore, any research on identifying how they respond to PA promotion strategies can further enlighten the area of message framing and PA. The present study focused on exploring the effect of regulatory focus, which is described in detail in regulatory focus theory.

**Regulatory Focus Theory**

According to regulatory focus theory (Higgins, 1997, 1998) people are motivated by using two different hedonic self-regulatory systems, one emphasizing a promotion focus and the other emphasizing a prevention focus. Individuals who have a promotion regulatory focus are known as promoters, and they try to decrease an ideal self-discrepancy, which refers to the distance between their self-concept (i.e., who they are) and their ideal self-guide (i.e., who they would ideally like to be). Conversely, individuals
who have a prevention regulatory focus are known as preventers, and they try to decrease an *ought self-discrepancy*, which refers to the distance between their self-concept and their ought self-guide (i.e., who they think they should be). Both promoters and preventers try to decrease a distance between two different self-domains, but in opposite directions (see Figure 2). Depending on their regulatory focus, people (a) have different fundamental needs; (b) set different goals and standards; (c) are sensitive to different psychological outcomes; (d) follow different strategies; and (e) experience different emotions (Higgins, 1997, 1998; Cesario et al., 2008).

![Figure 2. Motivational routes of preventers and promoters.](image)

Specifically, promoters try to achieve advancement and growth, and satisfy the fundamental need of nurturance by setting *goals or standards* such as hopes, accomplishments, wishes, and aspirations. For example, individuals who exercise regularly to obtain physical strength are guided by the fundamental need of nurturance because they try to satisfy a personal accomplishment. Promoters follow an *approach* or *eagerness strategy* to decrease this discrepancy, which means that they try to increase the match between their self-concept and their ideal self-guide. When there is a high
mismatch between these self states, promoters tend to be more sensitive to the presence or absence of positive outcomes (match approach, mismatch avoidance). For instance, overweight individuals (i.e., actual self) who exercise to lose weight (i.e., ideal self) will be more sensitive to any signs indicating that they have lost weight (i.e., desires and goals are achieved). When promoters experience a low mismatch between their actual and ideal self states, they experience *cheerfulness-related emotions* (e.g., happiness, satisfaction, pride, etc.) because their desires and goals are achieved (presence of positive outcomes).

In reverse, when promoters experience a high mismatch between their actual and ideal self states, they feel *dejection-related emotions* (e.g., disappointment, dissatisfaction, shame, etc.), for their desires and goals are not achieved (absence of positive outcomes).

On the other hand, preventers try to achieve protection and safety, and satisfy the fundamental need of *security* by setting goals or standards such as duties, obligations, and responsibilities. For example, individuals who exercise because their doctor advised them to do so, are guided by the fundamental need of security because they exercise to protect themselves against any diseases. Preventers follow an *avoidance strategy* or *vigilance* to decrease this discrepancy, which means that they try to decrease the mismatch between their self-concept and ought self-guide (i.e., ought self-discrepancy). So, when there is a high mismatch between these self states, preventers tend to be more sensitive toward the absence or presence of *negative outcomes* (i.e., duties or obligations are not done and punishment is expected). For instance, cardiac patients who have a prevention focus and do not follow the advice of the doctor for daily PA will be more sensitive to any symptoms that indicate a heart attack. When preventers experience a low mismatch between their self-concept and ought self-guide, they experience *quiescence-related*
emotions (e.g., calmness, relaxation, etc.) because their duties or obligations are fulfilled and no punishment is expected (absence of negative outcomes). To the contrary, when preventers experience a high mismatch between their self-concept and ought-self-guide, they feel agitation-related emotions (e.g., guilt, fear, threat, etc.) because their duties or obligations are not fulfilled and punishment is expected (presence of negative outcomes). In the previous example, patients who ignore the doctor’s advice, might experience fear that the doctor will scold them.

Regarding message framing and PA, therefore, it should be expected that people who have a promotion focus will be more sensitive to messages that emphasize the presence or absence of PA benefits and they will be more willing to engage in PA if they read positively-framed messages. To the contrary, people who have a prevention focus will be more sensitive to messages that emphasize the absence or presence of costs that arise from a sedentary or inactive lifestyle and they will be more willing to engage in PA if they are exposed to negatively-framed messages. The different effects of regulatory foci on people led Higgins (2000, 2005) to develop regulatory fit theory.

**Regulatory Fit Theory**

As stated in regulatory fit theory (Higgins, 2000, 2005), the motivational orientation (promotion or prevention) determines the preferred strategy (eagerness or vigilance) that sustains or disrupts an individual’s orientation. When individuals experience the preferred strategy, there is regulatory fit between the regulatory focus and the strategy, and the individuals feel right and more engaged in pursuing their goals. On the contrary, when individuals do not experience the preferred mean, there is regulatory nonfit between the regulatory focus and the strategy, and they do not feel right and,
therefore, they are less willing to pursue their goals. Based on this theory, if there is a fit between the content of PA messages and the message recipients’ motivational orientation, then, the messages might be more persuasive.

In particular, if researchers construct a message in a way that ensures the presence of positive outcomes (eager framing) such as “If you are active, you can increase the chances of having a good health,” this might have a higher persuasive effect on individuals who have a promotion regulatory focus. These individuals follow a strategy of eagerness, which means that they tend to be more alert to positive outcomes. Therefore, they will experience a fit between their regulatory focus and the message content, which might make them feel right and the persuasive effect of the message will be higher. In a similar way, a message that ensures against the negative outcomes (vigilant framing) like “If you are active, you can decrease the risk of developing cancer,” will have a greater persuasive effect on individuals who have a prevention regulatory focus because they follow a strategy of vigilance and they tend to be more alert to negative outcomes. If these individuals are exposed to a message that has an eager framing, however, they will experience nonfit between their regulatory focus and the framing of the message. This nonfit will not make them feel right and the persuasive effect of the message will be low.

For instance, untrained individuals who start exercising to develop physical strength are motivated by an ideal self-discrepancy if physical strength represents a personal aspiration. If individuals exercise, however, to comply with their doctor’s advice to exercise to be healthy, then the motivational force comes from an ought self-discrepancy because the individuals’ behavior is guided by a desire to satisfy duties or
obligations (i.e., doctor’s advice). So, if researchers emphasize the improvement in health, strength or appearance that can result from PA, they might persuade individuals who strive to decrease an ideal self-discrepancy. Conversely, if researchers promote PA by emphasizing that it can decrease the risk of diseases, they might persuade individuals who try to decrease an ought self-discrepancy.

Based on the aforementioned motivation theories, it becomes evident that researchers should not take for granted that an emphasis on gains or losses in messages will have the same effect on all individuals (Cesario et al., 2008). If so, then, health promotion specialists should tailor messages to such individual differences to improve their persuasiveness. For instance, presenting PA as medicine might not be very effective for everyone but primarily for those who have a prevention regulatory focus because prescribing specific amounts and frequency of PA has a tone of duty that individuals need to follow to experience the various benefits of PA. The regulatory focus of individuals is a way of distinguishing individuals based on their motivational orientations that should be considered by mass media personnel to help them customize PA messages to these different orientations. This variable has not been tested in message framing and PA extensively and this study was an attempt to improve knowledge in that research area. Cesario et al. (2008) reported various ways of studying the regulatory focus of people such as measuring, inducing, or priming it. For instance, if gains can prime the promotion focus while losses can prime the prevention focus, then, this might explain to some extent the inconsistent findings that appear in the literature of message framing and PA. In other words, PA is a prevention behavior and gains are more effective when messages promote prevention behaviors but this phenomenon might appear primarily among individuals
who have a promotion regulatory focus by using words that prime the promotion regulatory focus. On the other hand, individuals who have a prevention focus could be more persuaded by messages that emphasize losses rather than gains because losses fit with their regulatory focus. However, PA is a prevention behavior that is expected to be promoted better when messages emphasize gains than losses. In that case, it is not clear what works better for preventers, which reflects a gap in the literature review.

**Purpose and Hypotheses**

The purpose of this study was to identify the optimal content of messages that promote PA considering individuals’ motivational orientation. It was hypothesized that gains would be more persuasive for promoters, and losses would be more persuasive for preventers because promoters are more alert to positive outcomes while preventers are more alert to negative outcomes. In addition, it was predicted that the effect of messages would be greater when PA messages consisted of words that further primed participants’ regulatory focus. For the sake of better understanding, the terms “positive-, negative-, and mixed words” will be used in the rest of the document to indicate words that primed the promotion-, prevention-, or both regulatory foci, respectively.

For example, it was expected that promoters would be more persuaded when exposed to a message that emphasized PA as a useful way to strengthen bones rather than when exposed to a message that emphasized PA as a useful way to decrease the risk of osteoporosis. By using positive words such as “bone strengthening,” it was predicted that they would prime the promotion regulatory focus, which in turn would further increase the effect of gains on promoters. Conversely, by using negative words such as “risk of osteoporosis,” it was expected that they would prime the prevention regulatory focus,
which in turn would further increase the effect of losses on preventers. Overall, a three-way interaction effect on attitudes and intention was hypothesized according to which a fit between message framing, message priming, and regulatory focus (e.g., emphasis on gains by using positive words and presented to promoters) would increase the persuasive effect of messages.

**Method**

**Participants and Design**

Based on SamplePower, 444 participants were needed to detect a potential three-way interaction with a small effect size ($d = 0.15$) and 80% power. A small effect size was targeted due to the inconsistencies in literature. The total sample included 454 students, but 13 of them were removed from analysis because they did not answer almost any questions. The sample included 441 undergraduate students (263 women, one student did not report sex, $M_{\text{age}} = 19.57$, $SD_{\text{age}} = 1.98$) who were enrolled in introductory psychology and communication studies courses at Iowa State University and took one course credit for their participation. The sample included 76% Non-Hispanic White, 14.7% Asian or Asian American, 4.5% Black or African American, 3.9% Hispanic or Latino, and 0.9% American Indian or Alaska Native individuals. The study was prepared by using the Qualtrics platform and students participated through the Department of Psychology SONA system. The treatment design was $2 \times 2 \times 3$ (Regulatory Focus [promoters, preventers] x Frame [gains, losses] x Message Valence [positive, negative, mixed]) full factorial. Institutional review board approval was obtained for this study (see Appendix C).
Procedure

After participants expressed their willingness to participate, they checked a link that took them to the Qualtrics online survey. The first page included the consent form. After consenting they responded to a few demographic questions (i.e., age, sex, and ethnicity) and the Regulatory Focus Questionnaire, which is a measure that assesses individuals’ regulatory focus and is described later in more detail. A pretest assessed two of the basic concepts that come from the theory of planned behavior (TPB; Ajzen, 1991): their attitude toward PA and intention to engage in PA. These TPB measures were selected based on Rhodes, de Bruijn, and Matheson (2010). After the pretest, they were randomly exposed to a specific message. There were six different possible messages (see Appendix A) and participants were randomly exposed to one of them. Finally, participants were asked to respond to a last set of questions (posttest) that assessed their attitudes toward PA and intention to engage in PA. These items were the same that were used in the respective pretest measures. Each message started with the following stem,

“According to the 2008 Physical Activity Guidelines for Americans:

For substantial health benefits, adults should do at least 150 minutes (2 hours and 30 minutes) a week of moderate-intensity, or 75 minutes (1 hour and 15 minutes) a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity.”

This stem was followed by a message that described: a) the benefits that result from PA and help an individual improve (e.g., PA strengthens bones); b) the benefits that result from PA and help an individual prevent negative consequences from happening
(e.g., PA decreases the risk of cancer); or c) a combination of them. Half participants
were intended to read that they would gain these benefits if they participate in PA, and
the rest of them that would lose these benefits if they do not participate in PA. Examples:

a) If you PARTICIPATE in regular physical activity,
   • you INCREASE the chances of having a healthy body weight; or
   • you DECREASE the chances of developing obesity.

b) If you DON’T PARTICIPATE in regular physical activity,
   • you DECREASE the chances of having a healthy body weight; or
   • you INCREASE the chances of developing obesity.

Measures

   Demographics. Participants reported their age by using an open-ended question;
   their sex (i.e., male or female); and ethnicity by using six options (i.e., American Indian
   or Alaska Native, Hawaiian or Other Pacific Islander, Asian or Asian American, Black or
   African American, Hispanic or Latino, and Non-Hispanic White).

   Regulatory Focus Questionnaire. Participants’ chronic regulatory focus was
   assessed by using the Regulatory Focus Questionnaire (Higgins, Friedman, Harlow,
   Idson, Ayduk, and Taylor, 2001). This questionnaire includes 11 items rated on a 5-point
   Likert scale asking how frequently some events take place or have occurred in
   individuals’ lives. For example, one item asks, “How often did you obey rules and
   regulations that were established by your parents?” and the potential answers range from
   never or seldom to very often. The measure and the scoring instructions are available at
Higgins Lab (Higgins, n.d.) where this measure brings the name “Event Reaction Questionnaire.”

**Attitude.** Participants completed the statement “For me, being physically active next week would be . . .” by using these bipolar items: useless-useful, unenjoyable-enjoyable, unwise-wise, unpleasant-pleasant, harmful-beneficial, and boring-exciting on a 7-point Likert scale.

**Intention.** Participants answered to the following three questions: “I intend to engage in regular physical activity _____ times per week over the next 2 weeks;” “I am motivated to engage in regular physical activity over the next 2 weeks,” and “I am determined to engage in regular physical activity over the next 2 weeks.” For the last two questions, they reported their answers on a 7-point Likert scale (1 = completely unmotivated or undetermined and 7 = completely motivated or determined).

The selection of attitude and intention measures was based on the theory of planned behavior (TPB; Ajzen, 1991), according to which, attitude, subjective norm (i.e., the social pressure to engage in PA), and perceived behavioral control (i.e., whether an individual believes that he or she can engage in PA) determine intention, which in turn determines behavior. So, if any effects appeared on attitudes and intention, then, similar effects could be expected on the rest of the variables based on this theory, encouraging testing all the TPB variables in a future study. For this study, only two measures were used to reduce the questions’ burden on participants.
Results

Analysis of covariance (ANCOVA) on the attitude and intention scores was conducted by using the Statistical Package for the Social Sciences (SPSS, version 23). The pretest scores were added as covariates. The median value (i.e., 3.00) of participants’ responses to the Event Reaction Questionnaire was used to classify them between promoters and preventers. This method has been used successfully before (e.g., Cesario, Grant, and Higgins, 2004). Based on the scoring instructions (Higgins, n.d.), two scores were calculated per individual:

Promotion = \( (6 - \text{resp}_1) + \text{resp}_3 + \text{resp}_7 + (6 - \text{resp}_9) + \text{resp}_10 + (6 - \text{resp}_11). \)

Prevention = \( (6 - \text{resp}_2) + (6 - \text{resp}_4) + \text{resp}_5 + (6 - \text{resp}_6) + (6 - \text{resp}_8). \)

Then, the difference between the two scores (Promotion-Prevention) was taken, and participants were classified as promoters and preventers based on the median split. For preventers \((n = 223)\), their Promotion mean and standard deviation were 20.32 and 2.77, while their Prevention mean and standard deviation were 19.70 and 2.82. For promoters \((n = 218)\), their Promotion mean and standard deviation were 23.05 and 2.95, while their Prevention mean and standard deviation were 15.92 and 3.38. So, promoters had a higher promotion and a lower prevention score compared to preventers. Figure 3 also displays the distribution of participants’ scores on the Regulatory Focus Questionnaire. This figure shows that most participants were closer to the promotion regulatory focus, and therefore this study actually tested potential differences between participants with stronger promotion regulatory focus (promoters) and participants with weaker promotion regulatory focus (preventers). If any differences were detected between participants
whose regulatory focus belongs to the same side, then, it would be reasonable to expect even greater differences between participants with greater differences in their motivational orientations although this should be tested in future studies.

Cronbach's alpha for attitude was .861 at pretest and .869 at posttest, which indicates high internal consistency for this scale with this sample. About intention items, the first one was open-ended while the other two were rated on a 7-point Likert scale. So, they were first standardized and averaged together to create a composite score. Cronbach's alpha for intention was .836 at pretest and .827 at posttest, which indicates high internal consistency for this scale, too, with this sample.

Figure 3. Regulatory focus distribution.

The results showed a significant three-way interaction on attitude scores, $F(2, 428) = 5.25$, $p = .006$, partial $\eta^2 = .024$. The means, standard errors, and 95% confidence intervals of attitude scores are shown in Table 8. Figures 4 and 5 show that gains worked
better for preventers while losses worked better for promoters when messages included only positive or negative words. These effects were reversed, however, when mixed words were used. Participants’ pretest attitude scores as a covariate significantly predicted posttest attitude scores, $F(1, 428) = 1,772.165, p < .01$, partial $\eta^2 = .805$.

Table 8
Means, Standard Errors, and 95% Confidence Intervals of Attitude

<table>
<thead>
<tr>
<th></th>
<th>Preventers</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Message</td>
<td>Positive ($n = 71$)</td>
<td>Negative ($n = 64$)</td>
<td>Mixed ($n = 88$)</td>
</tr>
<tr>
<td>Valence</td>
<td>Message</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Framing</td>
<td>Gains ($n = 37$)</td>
<td>Losses ($n = 34$)</td>
<td>Gains ($n = 32$)</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>6.12</td>
<td>6.07</td>
<td>6.04</td>
</tr>
<tr>
<td></td>
<td>Standard</td>
<td>0.07</td>
<td>0.07</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>95% CI</td>
<td>5.98–6.26</td>
<td>5.92–6.21</td>
<td>5.89–6.19</td>
</tr>
</tbody>
</table>

|                  | Promoters  |                  |                  |                  |
|                  | Message    | Positive ($n = 77$) | Negative ($n = 83$) | Mixed ($n = 58$) |
| Valence          | Message    |                  |                  |                  |
|                  | Framing    | Gains ($n = 38$) | Losses ($n = 39$) | Gains ($n = 42$) | Losses ($n = 41$) | Gains ($n = 27$) | Losses ($n = 31$) |
|                  | Mean       | 6.08             | 6.13             | 5.99             | 6.18             | 6.16             | 5.93             |
|                  | Standard   | .07              | .07              | .07              | .07              | .08              | .08              |
|                  | 95% CI     | 5.94–6.22        | 6.00–6.27        | 5.86–6.12        | 6.04–6.31        | 5.99–6.32        | 5.78–6.08        |

*Note. CI = confidence interval.*
No significant differences were found on intention standardized scores. Table 9 shows the means, standard errors, and 95% confidence intervals, and Figures 6 and 7 display the respective patterns. Preventers reported a greater intention when exposed to gains that were presented by using positive or mixed words, while promoters reported a greater intention when exposed to losses that were presented via negative or mixed words.

Table 9
*Means, Standard Errors, and 95% Confidence Intervals of Intention (Standardized)*

<table>
<thead>
<tr>
<th>Preventers</th>
<th>Positive (n = 71)</th>
<th>Negative (n = 64)</th>
<th>Mixed (n = 88)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message Valence</td>
<td>Gains (n = 37)</td>
<td>Losses (n = 34)</td>
<td>Gains (n = 32)</td>
</tr>
<tr>
<td>Mean</td>
<td>0.05</td>
<td>-0.04</td>
<td>-0.02</td>
</tr>
<tr>
<td>Standard Error</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>95% CI</td>
<td>-0.06–0.16</td>
<td>-0.16–0.07</td>
<td>-0.14–0.10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Promoters</th>
<th>Positive (n = 77)</th>
<th>Negative (n = 83)</th>
<th>Mixed (n = 58)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message Valence</td>
<td>Gains (n = 38)</td>
<td>Losses (n = 39)</td>
<td>Gains (n = 42)</td>
</tr>
<tr>
<td>Mean</td>
<td>0.03</td>
<td>0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>Standard Error</td>
<td>0.06</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>95% CI</td>
<td>-0.07–0.14</td>
<td>-0.09–0.13</td>
<td>-0.10–0.10</td>
</tr>
</tbody>
</table>

Note. CI = confidence interval.
Figure 4. Means and standard errors of attitudes for preventers.

Figure 5. Means and standard errors of attitudes for promoters. *p < .05.
Figure 6. Means and standard errors of intention (standardized) for preventers.

Figure 7. Means and standard errors of intention (standardized) for promoters.
Discussion

This study tested whether messages emphasizing gains by using positive words work better for promoters while those that emphasize losses by using negative words work better for preventers due to a fit between message framing, participants’ motivational orientation, and priming. The fit was based on the rationale that positive words prime the promotion regulatory focus, negative words prime the prevention regulatory focus, while mixed words cancel each other out. The results on attitude scores showed that gains were more effective for preventers while losses were more effective for promoters when messages consisted of only positive or negative words. However, when messages included both positive and negative words, the effects were reversed.

The results provide partial support to the message framing paradigm (Rothman & Salovey, 1997) based on which gains are expected to be more effective than losses to promote prevention behaviors such as PA since gains were more effective than losses for preventers only. On the other hand, the results provide partial support to prospect theory (Kahneman & Tversky, 1979) based on which losses are expected to be more effective than gains since losses were more effective than gains for promoters only. These results appeared when only positive or negative words were used in the message content, which indicates that how the content is expressed might moderate the persuasiveness of messages. If new studies replicate the findings for the conditions where only positive or negative words were used, this will further validate the need to tailor messages to individuals’ motivational orientation to improve their persuasive effect.
Although the present study showed that individual differences lead to different persuasive outcomes, they did not support that a fit between message content and motivational orientation renders messages more persuasive. This is inconsistent with regulatory fit theory (Higgins, 1998) as well as with Gallagher & Updegraff (2011), Updegraff and Rothman (2013) and Covey (2014), who argued that a fit between messages and individual differences should be considered when preparing messages. Besides the limitations of the present study (e.g., testing acute effects, no behavior measures), some alternative explanations that explain the lack of a fit are shown below.

A closer look at the content of the messages that were used in this study shows that a different combination of positive / negative / mixed words with gains and losses is actually an application of operant conditioning theory (Skinner, 1938). Based on this theory, the principles of reinforcement and punishment determine human behavior. Skinner subdivided these principles between positive and negative. Positive gains refer to positive reinforcement because individuals get something positive (e.g., “If you are active, you can strengthen your bones”). Negative losses refer to negative reinforcement because individuals lose something negative (e.g., “If you are active, you decrease the risk of diseases”). Negative gains refer to positive punishment (e.g., “If you are not active, you increase the risk of osteoporosis”). Positive losses refer to negative punishment (e.g., “If you are not active, you can decrease your fitness”).

Based on this interpretation, positive and negative reinforcement seems to work better for promoters, while positive and negative punishment seems to work better for preventers, which indicates the existence of a fit between regulatory focus and principles of reinforcement. Specifically, promoters try to achieve positive outcomes, and
reinforcement leads individuals to repeat positive behaviors (e.g., PA, dental hygiene). Conversely, preventers try to avoid negative outcomes, and punishment leads individuals to not repeat negative behaviors. So, a fit seems to exist between motivational orientation and the consequences that result from behaviors.

An alternative expectation would be that positive gains (i.e., getting something positive) and positive losses (i.e., losing something positive) would be more effective for promoters because they are sensitive to the presence / absence of positive outcomes according to regulatory focus theory (Higgins, 1997, 1998). In a similar way, negative losses (i.e., losing something negative) and negative gains (i.e., getting something negative) would be expected to be more effective for preventers because they are sensitive to the absence / presence of negative outcomes. Although this explanation seems reasonable, too, the results of the present study tend to support the explanation that was presented in the previous paragraph.

These alternative explanations indicate that there are different ways of viewing a fit between regulatory focus and message content. They reveal the art of human language and how it can lead to different responses depending on how ideas get articulated. So, health promotion experts could prepare messages by using different wording depending on message recipients' orientations. For instance, they could invite individuals to join an online platform, ask them to answer a few brief questions like the ones in the Regulatory Focus Questionnaire, and based on their answers, tailored messages would be displayed to them. If some groups of individuals chose products being phrased in a specific way, while others chose products following different phrasing, this would help mass media experts identify personality patterns that respond positively or negatively to buying
specific products (e.g., PA monitors). Mass media experts could also use this information to help consumers make better choices such as buying specific PA monitors, help them set goals and achieve health benefits, prepare plans for meeting these goals, and so forth. Considering that online platforms are used very often nowadays for advertising strategies based on interactive messages, they could prove useful for both sellers and consumers.

Moreover, mass media personnel could prepare alternative versions of advertisements where they will disseminate the same information to people by using different human models. For instance, in one case a young and strong athlete with a promotion regulatory focus could exercise saying that this helps her improve her strength, speed, and other aspects to achieve her aspirations (e.g., get a golden medal). In another case, they could display a cardiac patient with a prevention regulatory focus that would exercise saying that this helps him feel better and decrease the risk of heart attacks. By displaying different models and using different language, health promotion experts could help message recipients meet the guidelines via identification with their favorite models.

In addition, mass media specialists could prepare edutainment programs where cartoon characters displaying different regulatory foci could transmit health promotion messages by using different wording. By doing so, these messages could resonate better with youth who identify with their favorite cartoon characters, which in turn could motivate them to do what these characters suggest. Identification might help them remember health messages, and research has shown that youth who were aware of health campaigns (e.g., the VERB campaign) were physically active more often than those who did not (Huhman & Berkowitz, 2014).
The strengths of the present study included a large sample size, the assessment of customized PA messages, and the investigation of a fit between message content and message recipients’ motivational orientation. In terms of operant conditioning theory, it also tested the effect of reinforcement and punishment on promoting PA to young individuals. The limitations included using undergraduate students, which limits the generalizability of the results; the lack of behavioral measures; the use of median split in grouping participants; and the exploration of acute effects.

The results of the present study show that subtle changes in message content can lead to different results. Although the effect size was small, it can be further increased through repeated exposure of participants to message content. For example, when people are exposed to advertisements, they do not change habits immediately but their initial exposure to different messages might have a minor effect on them, which can be built upon through repetitive exposures until it reaches a specific magnitude, big enough to persuade them to change habits. Future research is needed to investigate this hypothesis.

In sum, expecting a greater effect of gains over losses (or vice versa) throughout the whole population is very optimistic. If the present study had looked for such a main effect, it would not have detected it, and the conclusion would be that message framing does not work. This study, however, revealed that the distinction between gains versus losses influences responses differently if messages are tailored to individuals’ motivational orientation. Therefore, further research should focus on identifying different sets of characteristics that work or do not work in relation to message framing and tailoring messages to their profiles is a more complicated, but also more promising approach that can lead to higher levels of PA, less obesity, and a healthier lifestyle.
CHAPTER 5
INVESTIGATING THE OPTIMAL WAYS OF PRESENTING GAINS AND LOSSES IN PHYSICAL ACTIVITY MESSAGES

Abstract

In line with prospect theory (PT) losses work better than gains for promoting behaviors, but based on the message framing paradigm (MFP), gains work better for promoting prevention behaviors (i.e., involve low risk) such as physical activity (PA). The purpose of this study was to apply PT to the health domain in a more accurate way, and identify the optimal ways of presenting gains and losses. The sample included 449 undergraduate students. The treatment design was 2 x 2 x 3 (Regulatory Focus [promoters, preventers] x Frame [gains, losses] x Magnitude of Change [5 vs. 10%, 10 vs. 15%, 15 vs. 20%]) full factorial. Participants were exposed to a message emphasizing gains or losses and responded to PA outcome measures. The results showed a main effect of Frame, $F(1, 436) = 6.57, p = .011$, partial $\eta^2 = .015$, with losses being more effective than gains. The results also revealed a Focus x Magnitude x Frame interaction on vigorous-intensity PA intention, $F(2, 436) = 4.13, p = .017$, partial $\eta^2 = .019$, with losses being more effective for promoters when exposed to small and big probabilities of achieving PA benefits; while losses were more effective for preventers when exposed to medium and big probabilities. These findings support the hypothesis that messages should be tailored to individual differences. This information can be used by experts working in various sectors of the National Physical Activity Plan (e.g., Mass Media) to further contribute to improving each sector separately, and public health in general.

Keywords: Regulatory focus, physical activity, message framing, prospect theory.
Physical activity (PA) guidelines have been revised many times trying to provide individuals with accurate information about the benefits that they can experience depending on the amount, intensity, and frequency of activities they engage in (Blair, LaMonte, & Nichaman, 2004). Despite the exposure of individuals to messages on the PA guidelines and the expected benefits that might result from an active lifestyle, many Americans remain inactive (Office of Disease Prevention and Health Promotion, 2016). In addition, more than two-thirds of American adults are overweight or obese, which leads to various diseases such as cardiovascular problems and diabetes (National Institute of Diabetes and Digestive and Kidney Diseases, 2012). The problem of physical inactivity highlights the need to improve the content of PA messages and make them more effective in motivating individuals to get active. Message framing (i.e., emphasis on gains or losses) is a communication strategy that has been used to promote PA. This strategy is based on the message framing paradigm (Rothman & Salovey, 1997), which is the application of prospect theory (Kahneman & Tversky, 1979) to the health domain.

**Prospect Theory**

As stated in prospect theory (Kahneman & Tversky, 1979), people tend to make riskier decisions when exposed to losses than gains (loss aversion). For instance, Tversky and Kahneman (1981) asked participants to imagine that an unusual disease was going to appear in the United States, and it was expected to kill 600 people. They exposed participants to a couple of alternative programs to combat the disease and framed these messages in a positive or negative way: (a) By choosing program A, they could save 200 lives, while by choosing program B, there was 1/3 probability of saving everybody, and 2/3 probability of saving nobody (positive frame); or (b) By choosing program A, 400
people would die, while by choosing program B, there was 1/3 probability that nobody would die, but there was also a 2/3 probability that everybody would die. In both cases, the consequences were the same, but framed differently. When positive framing was used, 72% of participants chose Program A, but when negative framing was used only 22% of participants chose Program A. Based on these results, the researchers supported that under conditions of uncertainty, individuals display risk-seeking behavior when exposed to losses, and risk-averse behavior when exposed to gains. In other words, the pain of losing affects individuals more than the pleasure of gaining something.

**Message Framing Paradigm**

A few years later, Rothman and Salovey (1997) developed the message framing paradigm (MFP), which refers to the application of prospect theory to the health domain. Specifically, they supported that behaviors can be distinguished into two types, depending on their function: (a) detection behaviors, such as HIV testing or mammography that involve high risk, and (b) prevention behaviors, such as PA, smoking cessation, or reducing weight that involve low or no risk. They suggested that losses are more effective for promoting detection behaviors while gains are more effective for promoting prevention ones.

However, the application of prospect theory in the health area that led to the MFP did not include probabilities or risk perception information in the message content. To the contrary, most studies that have used the MFP in the development of their messages, adopted a descriptive approach. For example, Bassett-Gunter, Martin Ginis, and Latimer-Cheung (2013) exposed participants to messages emphasizing psychological health or chronic disease risk information combined with gains or losses and found that an
emphasis on losses along with psychological risk information had a better effect on leisure-time PA and intentions and led to greater cognitive processing. In this study, they used messages such as “Leisure time physical activity reduces your risk of Type 2 diabetes!” (gain-framed message, p. 1198) and “Physical inactivity increases your risk of Type 2 diabetes!” (loss-framed message, p. 1198). Berenbaum & Latimer-Cheung (2014) tested the effect of message framing on various outcome variables such as attention, attitudes, or decisions to be active, and found that gains were more effective than losses. In this study, they used messages such as “On the right track? Staying active reduces your risk of heart disease” (gain-framed message, p. 274) and “Not on the right track? Failing to stay active increases your risk of heart disease” (loss-framed message, p. 274).

Although the MFP is considered as the application of prospect theory in the health domain, the messages that have been used in studies that used this paradigm show that there is no information regarding probabilities and the risk was inherent in the behaviors. While investigating the effect of message framing on promoting health behaviors, an interesting question that also arises is whether the concepts of gains and losses from prospect theory and the concepts of reinforcement and punishment from operant conditioning theory (Skinner, 1938) refer to the same things. So, a brief description of this theory is given below to clarify these concepts, and show that without risk perception information, the message framing paradigm is an application of operant conditioning theory to health promotion.
Operant Conditioning Theory

In line with operant conditioning theory (Skinner, 1938), human behavior depends on the principles of reinforcement and punishment. Specifically, positive reinforcement (i.e., giving something positive) and negative reinforcement (i.e., removing something negative) motivate individuals to repeat a specific behavior. Conversely, positive punishment (i.e., giving something negative) and negative punishment (i.e., removing something positive) motivate individuals to refrain from a specific behavior. In other words, some studies that have used the MFP actually compared whether negative reinforcement ("If you are active, you can reduce the risk of disease A") or positive punishment ("If you are not active, you increase the risk of cancer") is more effective for promoting PA. Therefore, the way that the MFP has been used in the past reflects more an application of operant conditioning theory and less an application of prospect theory to the health domain.

If so, then, the PA guidelines are based on the principles of reinforcement and punishment that Skinner (1938) described in operant conditioning theory. For instance, a mother telling her kid "If you are not quiet, you will go for time-out," uses positive punishment because she gives something negative to her kid. In a similar way, PA guidelines telling "If you are sedentary, you will increase the risk of depression / osteoporosis," use positive punishment, too. Alternatively, by saying that "If you are sedentary, you will lose your strength and good mood," they use negative punishment because they remove something positive. The same message can also be expressed in two more ways: (a) "If you are active, you will decrease the risk of depression / osteoporosis" (negative reinforcement; removing something negative); and (b) "If you are active, you
will improve your mood / strengthen your bones” (positive reinforcement; giving something positive).

Looking at the PA benefits as the Centers for Disease Control and Prevention (2015a) describes them, an application of these two principles (in parentheses) can easily be recognized:

1. “Control your weight” (positive reinforcement)
2. “Reduce your risk of cardiovascular disease” (negative reinforcement)
3. “Reduce your risk for type 2 diabetes and metabolic syndrome” (negative reinforcement)
4. “Reduce your risk of some cancers” (negative reinforcement)
5. “Strengthen your bones and muscles” (positive reinforcement)
6. “Improve your mental health and mood” (positive reinforcement)
7. “Improve your ability to do daily activities (positive reinforcement) and prevent falls (negative reinforcement), if you're an older adult.”
8. “Increase your chances of living longer” (positive reinforcement)

These benefits are based on reinforcement, half of them on positive- and the rest of them on negative reinforcement. In other words, the PA guidelines behave like a mother who says “You will / will not learn a lot of things if you study / do not study your lessons” to her kids if they do / do not do what they mother says. In other words, gains refer to the principles of positive and negative reinforcement although negative reinforcement is a negative loss rather a gain (positive or negative). Similarly, losses refer to the principles of positive and negative punishment although positive punishment is a negative gain rather than a loss (positive or negative).
No matter whether the MFP reflects an application of operant conditioning or prospect theory, an overall effect of gains or losses on human behavior should not be expected due to individual differences. It is possible that a message might be more persuasive if its content is tailored to the message recipient traits. Indeed, Higgins (2000, 2005) developed the regulatory fit theory, positioning that a fit between message content and individuals’ motivational orientation increases the persuasive effect of messages.

**Regulatory Fit Theory**

Higgins (1997, 1998) supported that there are two main types of motivation (promotion- and prevention regulatory focus). Some individuals (promoters) try to achieve hopes or aspirations and improve themselves (e.g., individuals exercise to improve their health). Conversely, others (preventers) try to achieve duties or obligations and prevent negative consequences from happening (e.g., individuals exercise to decrease the risk of suffering from any diseases that result from inactivity). Higgins (2000, 2005) also supported that if a message sustains the motivational orientation of the recipient, its persuasive effect will be higher than when it disrupts it. For instance, a message such as “Being active improves physical appearance” might be more effective for promoters while a message such as “Being active reduces the risk of cardiovascular diseases” might be more persuasive for preventers. Based on this theory, when there is a fit between message content and the regulatory focus of the recipients (e.g., promoters are exposed to a message that emphasizes PA as useful to strengthen their bones), the message should be more persuasive compared to when such a fit does not exist (e.g., promoters are exposed to a message that emphasizes PA as useful to decrease the risk of cancer).
Theory of Planned Behavior

Based on the theory of planned behavior (TPB; Ajzen, 1991), attitudes, subjective norm (i.e., the social pressure to engage in PA), and perceived behavioral control (i.e., whether individuals believe that they can engage in PA) determine intention, which in turn determines behavior. The present study included measures assessing attitudes, subjective norms, perceived behavioral control, and intention as they have been used in previous studies (e.g., Rhodes, de Bruijn, & Matheson, 2010). This study, however, assessed behavior by using an optional self-report behavior measure because participants would be volunteers rather than individuals seeking assistance to change their behavior. So, the behavior measure was used for pilot purposes to test how many participants provide their PA behavior data willingly. Based on the TPB, however, if there was a potential effect on attitude, subjective norm, perceived behavioral control, and intention, it is possible that it would also lead to a change in behavior, too, if behavior was measured more effectively.

Finally, a decision-making was used to test whether promoters and preventers prefer specific amounts and intensity of PA. Six items were included (e.g., 150 MPA vs. 75 VPA) based on the options that were included in the message content. The messages mentioned 150 MPA, 75 VPA, 300 MPA, and 150 VPA. The six combinations resulting from these four options were used to test potential differences in individuals’ decisions.

Purpose and Hypotheses

The purpose of this study was to apply prospect theory to the messages in an alternative way compared to studies that have used the message framing paradigm. By including probabilities in the message content, individuals would be exposed to
conditions of uncertainty, which is an element that was missing in messages that have been used in other studies that were conducted on message framing and PA. If messages include such information, then, based on prospect theory, losses are expected to be more effective than gains and the loss aversion curve gets steeper as the losses increase. Another purpose of this study was to explore whether a fit between message framing (i.e., gains vs. losses) and regulatory focus (i.e., promoters vs. preventers) improves the persuasiveness of messages. As mentioned in regulatory fit theory (Higgins, 2000, 2005), promoters try to achieve positive outcomes and are more sensitive to the presence / absence of positive outcomes while preventers try to avoid negative outcomes and are more sensitive to the absence / presence of negative outcomes. In addition, the physical activity guidelines for Americans (2008) state that more PA leads to greater benefits. Based on all this information, the following hypotheses were formulated:

**Hypothesis 1**

It was expected that losses would lead to a higher score on PA outcomes (attitudes, subjective norms, perceived behavioral control, and intention) compared to gains. About decision-making, it was hypothesized that when participants were exposed to losses that included the following options: 150 MPA versus 300 MPA, 150 MPA versus 150 VPA, 75 VPA versus 300 MPA, or 75 VPA versus 150 VPA; they would choose significantly more often the second options because they involve a higher risk, and people are risk-seeking when exposed to losses according to prospect theory.

**Hypothesis 2**

Big losses (15 vs. 20%) were expected to be more effective than medium (10 vs. 15%) losses, which in turn would be more effective than small losses (5 vs. 10%).
Hypothesis 3

It was predicted that messages focusing on losses would have a better effect on PA outcomes (attitudes, subjective norms, perceived behavioral control, and intention) for preventers than promoters. Regarding decision-making, it was expected that promoters would choose significantly greater amounts of PA to achieve greater benefits because promoters try to achieve the best possible outcomes. For the pairs 150 MPA versus 300 MPA, 75 VPA versus 150 VPA, 150 MPA versus 150 VPA, and 75 VPA versus 300 MPA, it was expected to choose the second options; while for the options 150 MPA versus 75 VPA, and 300 MPA vs. 150 VPA, no difference was expected because these options are considered equivalent.

Method

Participants and Design

Based on a previous study (see Chapter 4), the effect size for a three-way interaction effect was $\eta^2 = 0.02$ (i.e., medium effect size), which along with the inconsistencies in literature indicated that this study should target for a small-to-medium effect size. SamplePower showed that a sample size between 168 ($d = .20$) to 972 participants ($d = .10$) was needed to detect such an effect size with 80% power. By using the SONA system, 200–300 students could be recruited per semester within the available timeframe (i.e., two semesters). So, this study targeted for a sample size of 444 participants to achieve a small-to-medium effect size ($d = 0.15$) and 80% power.

Four hundred and forty nine students enrolled in introductory psychology and communication studies courses at Iowa State University participated in this study (two parts) by using the Department of Psychology SONA system in exchange for credit.
awarded for participating in research projects (part A) and eligibility for a $20 gift card (part B). Institutional review board approval was obtained for this study (see Appendix C). All participants were required to be at least 18 years of age or older. The sample included 79.7% Non-Hispanic White, 10.0% Asian or Asian American, 4.9% Hispanic or Latino, 4.2% Black or African American, 0.4% American Indian or Alaska Native, and 0.4% Hawaiian or Other Pacific Islander individuals.

The treatment design was 2 x 2 x 3 (Regulatory Focus [promoters, preventers] x Frame [gains, losses] x Magnitude of Change [5 vs. 10%, 10 vs. 15%, 15 vs. 20%]) full factorial. Pretest scores were used as covariates. Institution review board approval was obtained. A description for the Magnitude of Change is provided below using Table 10 to help in understanding this variable clearly. In each condition, participants were exposed to two statements (Appendix B). For instance, in the Condition “Gains - 5 vs. 10%”, one statement mentioned that participants had a chance of experiencing specific PA benefits up to 5% while in the second statement they had a chance of experiencing these benefits up to 10%. In the Condition “Gains - 10 vs. 15%,” participants were told that they had a greater chance to experience these benefits compared to the Condition 1 although they performed the same PA amounts in the two conditions. This was not a dose-response manipulation because bigger probability sizes did not go along with greater amount / intensity of PA from condition to condition. The amount / intensity remained stable across conditions. So, this variable tested whether promising bigger gains / losses by investing the same amount of effort leads to a bigger effect rather than whether bigger gains / losses result from greater effort. The magnitude of expectations was manipulated and articulated in terms of probabilities. In addition, the proportion between the
probabilities in the two statements within each condition remained constant (see Rating A in Table 10). Otherwise, if the proportion of probabilities between the two statements was not constant (see Rating B), then, a greater effect could not be clearly attributed to promising the same gains / losses in terms of bigger probabilities. For instance, if a benefit was rated on a scale with a baseline value equal to 100 (see Rating A in Table 10), then, the gains / losses between the two options per condition would remain constant. So, only the expectations between conditions would differ due to using bigger probabilities to present the same amounts of gains and losses.

Table 10

Explanation of the “Magnitude of Change” Variable

<table>
<thead>
<tr>
<th>Rating</th>
<th>5%</th>
<th>10%</th>
<th>15%</th>
<th>20%</th>
<th>5 vs. 10%</th>
<th>10 vs. 15%</th>
<th>15 vs. 20%</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100</td>
<td>105</td>
<td>110</td>
<td>115</td>
<td>120</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>B</td>
<td>100</td>
<td>105</td>
<td>110</td>
<td>120</td>
<td>140</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

Procedure

Participants chose to view the study through the SONA system. If they were willing to participate, they checked the link that took them to a Qualtrics online survey. The first page included the consent form. After consent was obtained, age, gender (male, female, or other), and ethnicity (American Indian or Alaska Native, Hawaiian or Other Pacific Islander, Asian or Asian American, Black or African American, Hispanic or Latino, and Non-Hispanic White) were recorded. The International Physical Activity Questionnaire (IPAQ, 2002) that measures previous PA behavior, the Regulatory Focus Questionnaire that assessed the chronic regulatory focus of the participants (Higgins, n.d.), attitudes, subjective norm, perceived behavioral control, and intention regarding PA
(theory of planned behavior, TPB; Ajzen, 1991) were measured before participants were exposed to the messages (pretest).

During the next phase, participants were randomly exposed to a common stem that described the official PA guidelines along with a list of PA benefits, and they were asked to select the top three benefits that they wanted to improve through PA (see Appendix B). Their selected benefits appeared in the content of a message that followed up. Participants were exposed to one of the following three messages: (a) A message mentioning that participants’ chance to achieve their desired PA benefits can be equal up to 5% within the next 12 months if they participate in 150 minutes of PA on average per week, and this chance can be equal up to 10% if they participate in 300 minutes of PA on average per week, but in that case they also increase the risk of some kind of injury; (b) A message with the same content, but the probabilities were 10 vs. 15% instead of 5 vs. 10% in the first message; or c) a message with the same content, but the probabilities were 15 vs. 20% instead of 5 vs. 10% in the first message. The messages mentioned that the extent of PA benefits that an individual might experience depends on various variables (e.g., age, prior levels of PA, etc.). That is why the chance of experiencing PA benefits was presented as an approximate percentage (e.g., “up to 5%” within 12 months), which includes a chance equal to zero.

Half participants read that they might experience these benefits if they participated in PA (gain) and the rest of them that would miss the chance to experience these benefits if they did not participate in PA (loss). Therefore, there were six different messages (see Appendix B) and participants were randomly exposed to one of them. The
randomization was determined by using the “Advanced Randomization: Evenly Present Elements” of the Qualtrics system.

During the last phase, participants responded to a set of questions that assessed their decision-making as well as to the posttest that assessed attitudes, subjective norm, perceived behavioral control, and intentions regarding PA. Compensation for participation in part A was one course credit. The option to participate in Part B of the study was offered upon completion of part A. Part B included downloading a calendar and recording daily activity levels (i.e., number of minutes and intensity) for at least one day. Participants provided a code to match their answers in Parts A and B while keeping anonymity. Students who decided to participate in Part B were first asked whether they participated in Part A or not. If they chose “Yes,” they were prompted to enter their code before submitting their data for the days that they kept record. If they said “No,” they were prompted to exit the study.

Measures

**International Physical Activity Questionnaire.** The international physical activity questionnaire (IPAQ, 2002) was used to estimate participants’ baseline PA levels and use it as a covariate if there were any significant total PA score differences between promoters and preventers. The IPAQ included questions about the time (i.e., number of hours and minutes per day, number of days per week) individuals spent engaging in physical activities in five domains (i.e., job-related; transportation; housework, house maintenance, and caring for family; recreation, sport, and leisure-time; and sitting) throughout the last seven days. The long version that was used in this study included 27
questions, but participants could skip some of them depending on their answers to previous ones.

**Regulatory Focus Questionnaire.** The Regulatory Focus Questionnaire (Higgins et al., 2001) was used to determine the chronic regulatory focus of participants (i.e., promotion or prevention). This questionnaire includes 11 items (e.g., “How often did you obey rules and regulations that were established by your parents?”) assessing the frequency that some events really occur or have occurred in participants’ lives by using a 5-point Likert scale (e.g., 1 = *never or seldom* to 5 = *very often*). This questionnaire is available at Higgins Lab (Higgins, n.d.) and entitled as “Event Reaction Questionnaire.”

**Attitude.** Attitudes were measured with a response to the statement “For me, being physically active next week would be…,” (Rhodes, de Bruijn, & Matheson, 2010) and indicated their answers by using six bipolar items on a 7-point Likert scale (i.e., Useless-Useful, Enjoyable-Unenjoyable, Unwise-Wise, Pleasant-Unpleasant, Harmful-Beneficial, and Exciting-Boring).

**Subjective norm.** Three items that measure subjective norm (Rhodes, de Bruijn, & Matheson, 2010) were included. Responses were measured on a 7-point Likert scale with 1 representing low levels and 7 high levels of subjective norm. The questions were: “Most people who are important to me would want me to engage in regular physical activity over the next 2 weeks” (Strongly Disagree-Strongly Agree); (b) “Most people whose opinions I value would approve of me to engaging in regular physical activity over the next 2 weeks” (Completely Disapprove-Completely Approve); and (c) “Most people who are important to me will engage in regular physical activity over the next 2 weeks themselves” (Completely Untrue- Completely True).
**Perceived behavioral control.** Perceived behavioral control was assessed by using the following three items: “In the next 2 weeks, I have complete personal control over doing regular physical activity if I really wanted to do so” (Strongly Disagree-Strongly Agree); “Engaging in regular physical activity is mostly up to me in the next 2 weeks if I wanted to do so” (Strongly Disagree-Strongly Agree); and “Engaging in regular physical activity over the next 2 weeks if I wanted to do so would be. . .” (Extremely Difficult-Extremely Easy). Responses were recorded with a scale from 1 to 7 (Rhodes, de Bruijn, & Matheson, 2010).

**Intention.** Three items were used to assess intention (Rhodes, de Bruijn, & Matheson, 2010): “I intend to engage in (a) ____ minutes of moderate-intensity and (b) ____ minutes of vigorous-intensity physical activity per week over the next two weeks” (Participants were asked to move a slider to indicate their choices on a continuum from 0 to 300); “I am motivated to engage in 150 minutes of moderate-intensity (or 75 minutes of vigorous-intensity) physical activity per week on average over the next 2 weeks” (Completely Unmotivated-Complete Motivated); and “I am determined to engage in 150 minutes of moderate-intensity (or 75 minutes of vigorous-intensity) physical activity per week on average over the next 2 weeks” (Completely Undetermined-Completely Determined). The original intention items referred to “regular physical activity,” but were rephrased in this study to refer to moderate- and vigorous-intensity physical activity.

**Decision-making.** Six items assessing the amount and intensity of PA that participants would engage in were used to measure decision-making. These items resulted from combining the four options that were included in the message content (see Appendix B). Participants were asked to choose between the following options:
a) 150 of moderate-intensity PA versus 300 of moderate-intensity PA,  
b) 75 of vigorous-intensity PA versus 150 of vigorous-intensity PA,  
c) 150 of moderate-intensity PA versus 75 of vigorous-intensity PA,  
d) 150 of moderate-intensity PA versus 150 of vigorous-intensity PA,  
e) 300 minutes of moderate-intensity PA versus 75 minutes of vigorous-intensity PA, and  
f) 300 minutes of moderate-intensity PA versus 150 minutes of vigorous-intensity PA.

**Results**

A 2 x 2 x 3 (Regulatory Focus [promoters, preventers] x Frame [gains, losses] x Magnitude of Change [5 vs. 10%, 10 vs. 15%, 15 vs. 20%]) analysis of covariance was conducted on attitudes, subjective norm, perceived behavioral control, and intention. The chi-square test of association was done to test if there was a relationship between regulatory focus and decision-making. Based on participants’ scores on the Regulatory Focus Questionnaire (RFQ), two scores were calculated per individual by using the following instructions (Higgins, n.d.):  

Promotion = (6 - resp_1) + resp_3 + resp_7 + (6 - resp_9) + resp_10 + (6 - resp_11). 
Prevention = (6 - resp_2) + (6 - resp_4) + resp_5 + (6 - resp_6) + (6 - resp_8).

For preventers ($n = 211$), their Promotion mean and standard deviation were 19.73 and 3.19, while their Prevention mean and standard deviation were 19.63 and 3.02. For promoters ($n = 238$), their Promotion mean and standard deviation were 23.39 and 3.05, while their Prevention mean and standard deviation were 15.68 and 3.75. So, promoters had a higher promotion and a lower prevention score compared to preventers. Then, the difference between the promotion and prevention scores was taken and they were classified as promoters or preventers. The median split (value = 4.00) was used to classify
participants between promoters and preventers as has been used in the past (Cesario, Grant, and Higgins, 2004). As Figure 8 shows, most participants had positive scores. In other words, preventers refer to individuals with a weaker promotion regulatory focus, while promoters refer to those with a stronger promotion regulatory focus.

Cronbach's alpha for attitude was .835 at pretest and .816 at posttest; for intention, it was .810 at pretest and .809 at posttest; for subjective norm, it was .601 at pretest and .657 at posttest; and for perceived behavioral control, it was .675 at pretest and .756 at posttest. These results indicate high internal consistency for the attitude, intention, and perceived behavioral control scales, and moderate internal consistency for the subjective norm scale with this specific sample.

Figure 8. Regulatory focus distribution.

There were not significant differences on IPAQ scores between promoters and preventers (see Table 11, Figure 9), and therefore IPAQ was not used as a covariate.
Participants who reported a total PA score (Walking, Moderate and Vigorous) greater than 960 minutes were excluded from this analysis following the questionnaire instructions (IPAQ, 2002).

Table 11

IPAQ Scores (METS/week) and 95% Confidence Intervals

<table>
<thead>
<tr>
<th>Category</th>
<th>Preventers (n = 187)</th>
<th>Promoters (n = 203)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>Lower Bound</td>
</tr>
<tr>
<td>Work</td>
<td>1,305.00</td>
<td>909.46</td>
</tr>
<tr>
<td>Active Transportation</td>
<td>1,531.94</td>
<td>1,337.41</td>
</tr>
<tr>
<td>Domestic and Gardening</td>
<td>888.06</td>
<td>663.42</td>
</tr>
<tr>
<td>Leisure-Time</td>
<td>1,795.74</td>
<td>1,450.16</td>
</tr>
<tr>
<td>Walking</td>
<td>2,251.70</td>
<td>1,945.92</td>
</tr>
<tr>
<td>MPA</td>
<td>1,710.90</td>
<td>1,418.97</td>
</tr>
<tr>
<td>VPA</td>
<td>1,548.45</td>
<td>1,226.41</td>
</tr>
<tr>
<td>Total PA</td>
<td>5,493.08</td>
<td>4,863.97</td>
</tr>
<tr>
<td>Sitting</td>
<td>2,813.69</td>
<td>2,531.51</td>
</tr>
</tbody>
</table>

Note. IPAQ = International Physical Activity Questionnaire, MPA = moderate-intensity PA; VPA = vigorous-intensity PA; PA = physical activity.

Figure 9. IPAQ scores of preventers and promoters; MPA = moderate-intensity PA; VPA = vigorous-intensity PA; PA = physical activity.
Attitudes

The results showed a significant Focus x Magnitude interaction on attitude scores, $F(2, 435) = 6.35, p = .02$, partial $\eta^2 = .028$. As Figure 10 displays, when participants were exposed to messages mentioning that engaging / not engaging in 150 or 300 MPA minutes increases / decreases their chance up to 10% or 15%, respectively, preventers ($M = 5.65, SE = .06$) reported a lower attitude compared to promoters ($M = 5.98, SE = .06$).

![Figure 10. Means and standard errors of attitude.](image)

Intention

Analysis of covariance (ANCOVA) revealed a marginal Focus x Magnitude x Frame interaction (see Figures 11 and 12) on intention (standardized) scores, $F(2, 436) = 2.66, p = .07$, partial $\eta^2 = .012$, with losses ($M = 0.00, SE = 0.05$) being more effective than gains ($M = -0.14, SE = 0.07$) for preventers when exposed to messages that emphasized big probabilities (15 vs. 20%); and gains ($M = 0.04, SE = 0.06$) being more effective than losses ($M = -0.09, SE = 0.06$) when exposed to small probabilities (5 vs. 10%). For promoters, losses were more effective than gains when exposed to small (5 vs. 10%; Losses: $M = 0.09, SE = 0.05$, Gains: $M = -0.05, SE = 0.05$) or big (15 vs. 20%;
Losses: \( M = 0.10, SE = 0.06 \), Gains: \( M = -0.04, SE = 0.05 \) probabilities, while gains \( (M = 0.02, SE = 0.06) \) were more effective than losses \( (M = -0.06, SE = 0.06) \) when exposed to medium probabilities \( (10 \text{ vs. } 15\%) \). These results show that losses are more effective than gains for both promoters and preventers when they are displayed by using bigger probabilities.

*Figure 11.* Means and standard errors of intention (standardized) for preventers.
The open item intention items were also analyzed separately to explore potential differences in terms of intensity since these were the only items that made this distinction. The results showed a main effect of Magnitude on moderate-intensity PA intention scores, $F(2, 436) = 4.27, p = .015$, partial $\eta^2 = .019$, with an emphasis on 10 vs. 15% being more persuasive ($M = 146.05, SE = 3.67$), followed by 5 vs. 10% ($M = 135.96, SE = 3.67$), and 15 vs. 20% ($M = 130.99, SE = 3.75$). For moderate-intensity PA intention (Figures 13 and 14), losses were more effective than gains for preventers only at medium (10 vs. 15%) and big probabilities (15 vs. 20%), while gains were more effective for promoters only at medium ones. In other words, a fit seems to appear only when medium probabilities are used. The terms “small,” “medium,” and “big” are used for the sake of better understanding rather than as actual descriptors of the probability sizes.

Figure 12. Means and standard errors of intention (standardized) for promoters.

*p < .05.
Figure 13. Means and standard errors of moderate-intensity physical activity intention for preventers.

Figure 14. Means and standard errors of moderate-intensity physical activity intention for promoters.
The results also revealed an effect of Frame on vigorous-intensity PA intention, $F(1, 436) = 6.57, p = .011$, partial $\eta^2 = .015$, with losses ($M = 114.10, SE = 2.39$) being more effective than gains ($M = 105.36, SE = 2.43$). In addition, a Focus x Magnitude x Frame interaction on vigorous-intensity PA intention, $F(2, 436) = 4.13, p = .017$, partial $\eta^2 = .019$, was found. Figures 15 and 16 display that losses were more effective than gains for preventers only at medium (10 vs. 15%) and big probabilities (15 vs. 20%), while losses were more effective than gains for promoters only at small (5 vs. 10%) and big probabilities (15 vs. 20%).

*Figure 15.* Means and standard errors of vigorous-intensity physical activity intention for preventers.
The results did not reveal any significant differences on subjective norm and perceived behavioral control. Figures 17 and 18 show, however, that preventers exposed to losses and promoters exposed to gains reported the worst and best subjective norm scores, respectively, when medium probabilities (10 vs. 15%) were used. About perceived behavioral control (Figures 19 and 20), gains were more effective than losses for preventers when small (5 vs. 10%) or medium (10 vs. 15%) probabilities were used, while gains were more effective than losses for promoters when medium (10 vs. 15%) or big (15 vs. 20%) probabilities were used. Tables 12-15 show the means, standard errors, and 95% confidence intervals of attitude, intention (standardized), subjective norm and perceived behavioral control scores for preventers and promoters.
Figure 17. Means and standard errors of subjective norm for preventers.

Figure 18. Means and standard errors of subjective norm for promoters.
**Figure 19.** Means and standard errors of perceived behavioral control for preventers.

**Figure 20.** Means and standard errors of perceived behavioral control for promoters.
Table 12

Means, Standard Errors, and 95% Confidence Intervals of Attitude

<table>
<thead>
<tr>
<th>Magnitude of Change</th>
<th>Preventers</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 vs. 10% (n = 65)</td>
<td>10 vs. 15% (n = 74)</td>
<td>15 vs. 20% (n = 71)</td>
<td></td>
</tr>
<tr>
<td>Frame</td>
<td>Gains (n = 31)</td>
<td>Losses (n = 34)</td>
<td>Gains (n = 35)</td>
<td>Losses (n = 39)</td>
</tr>
<tr>
<td>Mean</td>
<td>5.95</td>
<td>5.88</td>
<td>5.68</td>
<td>5.62</td>
</tr>
<tr>
<td>Standard Error</td>
<td>0.10</td>
<td>0.10</td>
<td>0.09</td>
<td>0.89</td>
</tr>
<tr>
<td>95% CI</td>
<td>5.76–6.15</td>
<td>5.69–6.06</td>
<td>5.49–5.86</td>
<td>5.45–5.79</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Magnitude of Change</th>
<th>Promoters</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 vs. 10% (n = 86)</td>
<td>10 vs. 15% (n = 76)</td>
<td>15 vs. 20% (n = 76)</td>
<td></td>
</tr>
<tr>
<td>Frame</td>
<td>Gains (n = 45)</td>
<td>Losses (n = 41)</td>
<td>Gains (n = 39)</td>
<td>Losses (n = 37)</td>
</tr>
<tr>
<td>Mean</td>
<td>5.88</td>
<td>5.86</td>
<td>6.03</td>
<td>5.93</td>
</tr>
<tr>
<td>Standard Error</td>
<td>0.08</td>
<td>0.09</td>
<td>0.09</td>
<td>0.09</td>
</tr>
<tr>
<td>95% CI</td>
<td>5.72–6.04</td>
<td>5.69–6.03</td>
<td>5.85–6.20</td>
<td>5.75–6.11</td>
</tr>
</tbody>
</table>

*Note.* CI = confidence interval.
Table 13
 Means, Standard Errors, and 95% Confidence Intervals of Intention (Standardized)

<table>
<thead>
<tr>
<th>Magnitude of Change</th>
<th>Preventers</th>
<th>Promoters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 vs. 10% (n = 66)</td>
<td>10 vs. 15% (n = 74)</td>
</tr>
<tr>
<td>Frame</td>
<td>Gains (n = 31)</td>
<td>Losses (n = 35)</td>
</tr>
<tr>
<td>Mean</td>
<td>0.04</td>
<td>-0.09</td>
</tr>
<tr>
<td>Standard Error</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>95% CI</td>
<td>-0.08–0.16</td>
<td>-0.20–0.03</td>
</tr>
</tbody>
</table>

*Note.* CI = confidence interval.
Table 14

*Means, Standard Errors, and 95% Confidence Intervals of Subjective Norm*

<table>
<thead>
<tr>
<th></th>
<th>Preventers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Magnitude of Change</strong></td>
<td>5 vs. 10% (n = 66)</td>
</tr>
<tr>
<td><strong>Frame</strong></td>
<td>Gains (n = 31)</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td>5.81</td>
</tr>
<tr>
<td><strong>Standard Error</strong></td>
<td>0.10</td>
</tr>
<tr>
<td><strong>95% CI</strong></td>
<td>5.62–6.01</td>
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<table>
<thead>
<tr>
<th></th>
<th>Promoters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Magnitude of Change</strong></td>
<td>5 vs. 10% (n = 86)</td>
</tr>
<tr>
<td><strong>Frame</strong></td>
<td>Gains (n = 45)</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td>5.72</td>
</tr>
<tr>
<td><strong>Standard Error</strong></td>
<td>0.08</td>
</tr>
<tr>
<td><strong>95% CI</strong></td>
<td>5.56–5.88</td>
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</tbody>
</table>

*Note.* CI = confidence interval.
Table 15

Means, Standard Errors, and 95% Confidence Intervals of Perceived Behavioral Control

<table>
<thead>
<tr>
<th>Magnitude of Change</th>
<th>Preventers</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 vs. 10% (n = 66)</td>
<td>10 vs. 15% (n = 73)</td>
<td>15 vs. 20% (n = 71)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frame</td>
<td>Gains (n = 31)</td>
<td>Losses (n = 35)</td>
<td>Gains (n = 34)</td>
<td>Losses (n = 39)</td>
<td>Gains (n = 29)</td>
</tr>
<tr>
<td>Mean</td>
<td>5.90</td>
<td>5.83</td>
<td>5.82</td>
<td>5.72</td>
<td>5.68</td>
</tr>
<tr>
<td>Standard Error</td>
<td>0.11</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
<td>0.11</td>
</tr>
<tr>
<td>95% CI</td>
<td>5.70–6.11</td>
<td>5.64–6.03</td>
<td>5.62–6.02</td>
<td>5.54–5.91</td>
<td>5.47–5.90</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Magnitude of Change</th>
<th>Promoters</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 vs. 10% (n = 86)</td>
<td>10 vs. 15% (n = 76)</td>
<td>15 vs. 20% (n = 76)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frame</td>
<td>Gains (n = 45)</td>
<td>Losses (n = 41)</td>
<td>Gains (n = 39)</td>
<td>Losses (n = 37)</td>
<td>Gains (n = 44)</td>
</tr>
<tr>
<td>Mean</td>
<td>5.86</td>
<td>5.95</td>
<td>5.94</td>
<td>5.89</td>
<td>5.91</td>
</tr>
<tr>
<td>Standard Error</td>
<td>0.09</td>
<td>0.09</td>
<td>0.10</td>
<td>0.10</td>
<td>0.09</td>
</tr>
<tr>
<td>95% CI</td>
<td>5.69–6.03</td>
<td>5.77–6.13</td>
<td>5.75–6.12</td>
<td>5.70–6.08</td>
<td>5.73–6.08</td>
</tr>
</tbody>
</table>

Note. CI = confidence interval.

Regarding behavior, only 47 students submitted their data, and they reported engaging in 42.55 moderate-intensity PA minutes and 42.88 vigorous-intensity PA minutes on average for the days that they were physically active. Since very few individuals provided codes that matched their responses between the two parts, the behavioral data refer to all participants irrespective of regulatory focus.
**Decision-Making**

Although there was no association between Frame and decision-making (see Table 16), Pearson's chi-square test showed a significant association between regulatory focus and decision-making when participants were asked to choose between 150 MPA and 300 MPA, $\chi^2(1) = 5.033, p = .025$; 75 VPA and 150 VPA, $\chi^2(1) = 8.084, p = .004$; as well as between 150 MPA and 150 VPA, $\chi^2(1) = 9.288, p = .002$. For the remaining three pairs (i.e., 150 MPA vs. 75 VPA, 300 MPA vs. 75 VPA, and 300 MPA vs. 150 VPA), no significant differences were found. Figures 21 to 26 display the decision-making results.

These results show that preventers chose to engage in less amount and less intense PA while promoters chose to do more intense PA. However, when exposed to less amount and more intensity versus more amount and less intensity, both promoters and preventers chose less amount and more intensity.

**Figure 21.** Decision-making when participants were asked to choose between 150 MPA and 300 MPA.
Figure 22. Decision-making when participants were asked to choose between 75 VPA and 150 VPA.

Figure 23. Decision-making when participants were asked to choose between 150 MPA and 150 VPA.
Figure 24. Decision-making when participants were asked to choose between 150 MPA and 75 VPA.

Figure 25. Decision-making when participants were asked to choose between 300 MPA and 75 VPA.
Table 16

Association Between Frame and Decision-Making (%)

<table>
<thead>
<tr>
<th></th>
<th>150 MPA</th>
<th>300 MPA</th>
<th>150 VPA</th>
<th>300 VPA</th>
<th>75 MPA</th>
<th>75 VPA</th>
<th>150 MPA</th>
<th>150 VPA</th>
<th>75 MPA</th>
<th>75 VPA</th>
<th>300 MPA</th>
<th>300 VPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gains</td>
<td>57.0</td>
<td>43.0</td>
<td>52.5</td>
<td>47.5</td>
<td>32.3</td>
<td>67.7</td>
<td>57.0</td>
<td>43.0</td>
<td>41.7</td>
<td>58.3</td>
<td>35.4</td>
<td>64.6</td>
</tr>
<tr>
<td>Losses</td>
<td>51.3</td>
<td>48.7</td>
<td>45.1</td>
<td>54.9</td>
<td>34.5</td>
<td>65.5</td>
<td>53.1</td>
<td>46.9</td>
<td>43.8</td>
<td>56.2</td>
<td>34.1</td>
<td>65.9</td>
</tr>
</tbody>
</table>

Note. MPA = moderate-intensity physical activity; VPA = vigorous-intensity physical activity.

Finally, the PA benefits that were selected more often included: positive mood and good mental health (47.88%), healthy body weight (45.43%), high self-confidence (44.99%), better physical appearance and greater attractiveness (42.09%), strong immune system and good physical health (31.63%), strong muscles (28.06%), better performance such as academic or professional (27.62%), relaxation feelings (16.26%), and improvement in various cognitive functions such as memory or concentration (12.25%).
Discussion

Although the message framing paradigm (Rothman & Salovey, 1998) is considered an application of prospect theory (Kahneman & Tversky, 1979) to the health domain, the present study tested an alternative application of this theory to promote PA. Specifically, Kahneman and Tversky (1979) supported that when people get exposed to a certain option that is used as a reference point and to a second option, which includes probabilities that determine whether individuals gain or lose, they tend to make different decisions. By using probabilities, individuals experience uncertainty, need to take a risk, and under these conditions, they take a greater risk when exposed to losses because the pain of losing is bigger than the pleasure of gaining something. Without using probabilities and options, it is not sure whether losses should be expected to be more effective than gains. For instance, exposure of individuals to messages such as “If you are active, you will be healthy” or “If you are not active, you will be sick,” looks like an application of the principles of reinforcement and punishment (operant conditioning theory, Skinner, 1938) rather than an application of prospect theory to the health domain. Such examples, however, have been used in previous studies (e.g., Bassett-Gunter et al., 2013; Berenbaum & Latimer-Cheung, 2014) and reported that they represented an application of prospect theory to the health domain (i.e., message framing paradigm).

The present study tried to construct messages in a way that was more similar to the examples that have been used in prospect theory. Since the results revealed a significant main effect of Frame, with losses being more effective than gains, this supports the first hypothesis because losses are more effective than gains based on prospect theory. Contrarily, gains are expected to be more effective than losses for
promoting prevention behaviors based on the message framing paradigm. These results were shown, of course, only for vigorous-intensity PA intention indicating the need for further research.

About the effect of Magnitude on attitude, medium probabilities (10 vs. 15%) had a slightly better effect than small probabilities (5 vs. 10%) for promoters, but a smaller effect compared to bigger probabilities (15 vs. 20%). For preventers, bigger probabilities (15 vs. 20%) led to a higher effect compared to medium ones (10 vs. 15%), but medium ones (10 vs. 15%) did not lead to a higher effect compared to small ones (5 vs. 10%). So, the second hypothesis (i.e., bigger gains / losses would lead to better attitudes) was not supported.

The results also revealed a marginal three-way interaction on overall intention (standardized), with losses being more effective than gains for promoters and preventers when exposed to big probabilities (15 vs. 20%). For preventers, gains were more effective than losses when exposed to small probabilities (5 vs. 10%). For promoters, losses were more effective than gains when exposed to small (5 vs. 10%) or big probabilities (15 vs. 20%), and gains were more effective than losses when exposed to medium probabilities (10 vs. 15%). These results indicate that when individuals get exposed to messages without knowing their motivational orientation, it might be better to use bigger probabilities. Further research is needed, however, to identify a more accurate range of probabilities and their effectiveness in message framing and PA.

When intensity was considered by analyzing only the open items of intention, losses were more effective than gains for promoters when exposed to small (5 vs. 10%) or big probabilities (15 vs. 20%) while losses worked better than gains for preventers.
when exposed to medium (10 vs. 15%) or big probabilities (15 vs. 20%). These results did not fully support the hypothesis according to which an emphasis on greater chances of achieving benefits would bring greater effects on PA outcomes. For the rest of the PA outcomes (i.e., subjective norm and perceived behavioral control), no significant differences were found, while for behavior, there were not enough data for analysis.

Finally, the decision-making measure revealed that individual differences led to different decisions. Preventers chose smaller amounts and less intense PA. Promoters chose more intense PA while the amount did not affect their choices when the intensity remained constant. However, when they had to choose between less amount / greater intensity and more amount / less intensity, both promoters and preventers chose the former. These results did not provide support to the third hypothesis, but showed that individual differences influence decisions differently than expected.

The results of the present study are consistent with Updegraff and Rothman (2013) and Covey (2014) who argued that individual differences should be considered when constructing messages. Although such differences influence the results, this does not mean, however, that there must be a unique fit between message content and message recipients’ characteristics to improve the persuasiveness of messages. As Study 1 showed, there was not a fit when gains and losses were interpreted in terms of prospect theory, whereas a fit was disclosed when they were interpreted in terms of operant conditioning theory. In other words, viewing things from a different perspective can reveal a fit. So, it might be better to explore how individuals respond differently to messages depending on their characteristics and identify specific patterns. Exploring these patterns can lead to alternative ways of viewing and interpreting individuals’
responses that can reveal a fit between message content and message recipients. These patterns can then be used to prepare customized messages that will be displayed to other individuals with similar characteristics.

The lack of similar effects on all PA outcomes in the present study is also consistent with the mixed results that have been reported in the literature of message framing and PA. Some studies have reported a better effect of gains on some PA outcomes (Bassett-Gunter et al., 2014; Berenbaum & Latimer-Cheung, 2014; Gray & Harrington, 2011; Jones et al., 2003; Kozak et al., 2013; Latimer et al., 2008; Li et al., 2014; Parrott et al., 2008; Sweet et al., 2014; van’t Riet et al., 2010). Other studies have reported a better effect of losses over gains (Arora et al., 2006; Bassett-Gunter et al., 2013; de Bruijn et al., 2014; Wirtz & Kulpavaropas, 2014). There are also studies that reported gains as more effective on some outcome variables while losses as more effective on others (Broemer, 2002, study 1; Broemer, 2004, Study 1; Gallagher & Updegraff, 2011; Jacks & Lancaster, 2015; Robberson & Rogers, 1988). These results as well as the results of the present study show that looking for a superior effect of gains over losses (or vice versa) might not be the best way of improving the persuasiveness of messages. What seems more appropriate is to collect as many data as possible from studies that explore message framing along with specific individual characteristics. These databases can then be used to identify specific personality patterns that are more responsive to gains or losses under specific conditions.

For instance, Robberson and Rogers (1988) found that gains were more effective than losses when they emphasized self-esteem, while losses were more effective than gains when they emphasized health benefits. Broemer (2004) reported a superior effect of
losses over gains when it was easy to imagine the symptoms, while Berry and Carson (2010) added that these effects appear better in inactive individuals. Taking the results of these studies together, it seems that losses work better than gains when messages emphasize health benefits that at least inactive individuals can imagine easily. Instead of looking for whether gains or losses are more effective, it might be better to explore the optimal conditions under which gains or losses work better for individuals with specific personality patterns. In the above example, it would be interesting to test whether this pattern works better for promoters or preventers, as well as when the chances of experiencing gains / losses are small, medium, or big. Moreover, Li et al. (2014) found that gains were more effective than losses only among older men. So, this is another aspect that could be added to the previous example to investigate whether it adds to the effectiveness of messages or not. Broemer (2002) also explored the effect of ambivalence and message framing on PA outcome variables, and found that losses were more effective for highly ambivalent, while gains were more effective for low ambivalent individuals. In addition, de Bruijn et al. (2014) reported that losses worked better than gains when physically inactive participants were exposed to desirable outcomes, indicating that the type of benefits also needs to be considered.

Each of the studies that were cited in the previous two paragraphs offers some useful information that can further enhance the efforts of constructing optimal messages. The goal is to keep looking for what else can further enhance the effect of gains or losses for specific groups of individuals who display similar personality patterns.

Although it would be better if results provided a clear picture, it seems that instead of using a single message for everyone, it might be better to create interactive
messages that will be customized to individuals depending on their own traits. Even if customized messages can just improve individuals’ ability to recall message content, this might be very useful. For instance, Huhman and Berkowitz (2014) reported that teens who were aware of the VERB campaign tended to engage in PA more often than those who did not. If so, then, the present study that revealed individual differences to message exposure could inform mass media personnel to prepare tailored messages that can be recalled by audience more easily. If message tailoring can improve message recall and awareness of various mass media campaigns, then, PA levels of individuals might improve. So, this study can have some significant implications for the Mass Media sector of the National Physical Activity Plan (Pate & Buchner, 2014), which can contribute to improving public health.

The main strength of this dissertation study was the large sample size that was used to test an alternative application of prospect theory to the health domain compared to previous studies (Bassett-Gunter et al., 2013; Berenbaum & Latimer-Cheung, 2014). In addition, it tested message framing along with individual differences showing that message customization is useful when constructing PA messages. A main limitation of this study was the recruitment of undergraduate students to test the hypotheses. This restricts the external validity of the results because the conclusions can be generalized to this population only. Another limitation was that the behavior measure was offered as optional, which resulted in an inadequate amount of data. This measure was offered as optional because it was not expected students’ behavior to change within a month after a single exposure to a message. It was used mainly to test the percentage of participants who would show interest to submit their results. The wording and phrasing of messages
might also have made it hard for some participants to understand the content. Finally, this study explored acute effects, which raises the question about whether messages can really have an effect on message recipients after being exposed to messages once. Although the results revealed some significant differences, more research is needed to further validate that a single exposure to messages can really have an initial effect on individuals that can be further built upon via additional exposures (e.g., advertising).

Future studies should test alternative messages that apply prospect theory to promoting PA in special populations such as patients who suffer from cardiac problems, diabetes Type II, and so on. By using special populations who suffer from hypokinetic diseases, it would help generalize results to people who are in greater need to benefit from PA. To really test changing behavior, next studies should test groups of inpatients that allow researchers better control of their behavior, or engage participants in a long-term intervention where their behavior will be monitored via PA monitors and will receive weekly tailored feedback. In addition, future studies could use comprehensive standardized personality tests and identify how individuals with specific personality patterns respond to health promotion strategies. Moreover, they could test the effect of message framing on individuals who suffer from personality disorders (e.g., narcissistic personality disorder, etc.). Finally, it would be interesting to explore a greater range of probabilities in the message content to further refine the optimal ways of presenting gains and losses. This study showed that the magnitude of probabilities matters, with medium probabilities interacting with motivational orientation. These probabilities, however, can be broken down even more to identify the optimal probabilities that render messages
more persuasive. There are also PA benefits that have a greater chance to appear than others. So, messages could mention more realistic chances of achieving specific benefits.

Overall, the results of the present study confirmed that individual differences should be considered when preparing PA messages. Considering that human personality is more complicated than simply distinguishing individuals between promoters and preventers, it makes message customization and PA a promising area that needs further investigation. Although the PA guidelines play the role to inform people about the benefits that they can receive from a healthy lifestyle, they cannot sustain individuals’ efforts without the help of various agents (e.g., exercise programs, mass media campaigns) that provide them with the opportunity to translate the guidelines into action. These agents need to coordinate individuals’ efforts into a common platform to help them sustain their progress in the long run. Even if this might be difficult for adults, it can be easier for youth where they can learn at an early age to be physically active, submit their PA data to a platform, and receive a regular customized report that will be constantly updated depending on their profile, and new research related to message framing and individuals with their own profile. For instance, they can just walk, go to the gym, or participate in sports. No matter what they do, they can submit their PA data, and then get a customized progress report that will help them maintain or improve their current PA levels. Coordinating individuals’ efforts by using a common platform might be the vehicle of facing the physical inactivity crisis effectively.
CHAPTER 6
GENERAL CONCLUSIONS

General Discussion

This dissertation tested whether individual differences in terms of motivation lead people to respond differently when exposed to PA messages. Two studies were conducted to test this hypothesis.

Study 1 tested whether a fit between Frame (gains, losses), Regulatory Focus (promoters, preventers), and Message Valence (positive, negative, mixed words) improves the persuasive effect of PA messages. If so, then, messages emphasizing gains with positive words should be more effective for promoters while messages emphasizing losses with negative words should be more effective for preventers due to a better fit. The results showed that gains worked better for preventers while losses worked better for promoters on changing their PA attitude when only positive or negative words were used. These results, therefore, support that individual differences matter, but to the opposite directions than expected. This conclusion, though, arises based on how gains and losses have been used in prior studies (e.g., Bassett-Gunter et al., 2013; Berenbaum & Latimer-Cheung, 2014) that applied the message framing paradigm (Rothman & Salovey, 1997).

According to operant conditioning theory (Skinner, 1938), however, positive gains and negative losses, refer to the principles of positive and negative reinforcement, respectively. These two types of reinforcement, though, have been used in the literature as gains. Conversely, positive and negative losses, which refer to the principles of positive and negative punishment, respectively, have been used in the literature as losses. For instance, Bassett-Gunter, Martin Ginis, and Latimer-Cheung (2013) used messages such as “Leisure time physical activity reduces your risk of Type 2 diabetes!” (gain-
framed message, p. 1198) and “Physical inactivity increases your risk of Type 2 diabetes!” (loss-framed message, p. 1198). The first statement is actually a negative loss, while the second statement is a negative gain. In a similar way, Berenbaum & Latimer-Cheung (2014) used messages such as “On the right track? Staying active reduces your risk of heart disease” (gain-framed message, p. 274) and “Not on the right track? Failing to stay active increases your risk of heart disease” (loss-framed message, p. 274). Again, the first statement is actually a negative loss, while the second one is a negative gain.

Based on this alternative interpretation, the results that came from Study 1 show that reinforcement (positive and negative) works better for promoters while punishment (positive and negative) works better for preventers. In other words, the “mixed” level of Message Valence that rendered gains more effective for promoters, and losses more effective for preventers, refers actually to “positive and negative” reinforcement for promoters and “positive and negative” punishment for preventers, respectively. This interpretation supports that fit messages are more effective, but also further highlights the need for establishing a common language regarding what gains and losses refer to.

Study 2 explored an alternative application of prospect theory (Kahneman & Tversky, 1979) to promoting PA by including probabilities and risk perception information in the message content more clearly than the message framing paradigm (Rothman & Salovey, 1997) has done. The results provided some support to the argument that the message framing paradigm might not be an accurate application of prospect theory to the health domain. Specifically, the findings on VPA intention revealed a main effect, with losses being more effective than gains. Furthermore, they showed that losses were more effective than gains for preventers when exposed to medium (10 vs. 15%) or
big probabilities (15 vs. 20%) while losses worked better for promoters when exposed to small (5 vs. 10%) or big probabilities. Regarding attitudes, an emphasis on medium probabilities (10 vs. 15%) revealed individual differences, with preventers reporting worse attitude than promoters. This study also showed that preventers prefer less and easier amount of PA while promoters prefer more intense PA. When they had to choose, however, between longer and easier versus shorter and harder PA, both promoters and preventers chose the latter. These results indicate that individual differences influence decisions differently.

The results of Study 2, which disclosed a main effect of losses on VPA intention are consistent with those of de Bruijin, Out, and Rhodes (2014) who tested young women and those of Bassett-Gunter, Martin Ginis, and Latimer-Cheung (2013) who tested middle-aged people with spinal problems. Conversely, they are inconsistent with the results of Gray and Harrington (2011) who used young people; and Parrott et al. (2008) who used sedentary adult students, and found that gains were more effective than losses. These studies, though, did not specify between moderate- and vigorous-intensity intention, which might be important because the differences in this dissertation appeared mainly when participants were exposed to messages emphasizing vigorous-intensity PA. Considering also that promoters preferred vigorous-intensity PA compared to preventers who preferred less and moderate-intensity PA, then, individual differences along with an emphasis on vigorous intensity could have led to different results in prior studies. These studies also applied prospect theory differently that this dissertation study did (i.e., their messages looked more like an application of operant conditioning theory).
Furthermore, Li et al. (2014) and Jones et al. (2003, 2004) did not find significant differences when they tested young people, while Li et al. reported that gains were more effective than losses only among older men, and argued that it might be more difficult to detect significant differences in younger people because they have the tendency to underreport their PA data. Both dissertation studies, however, used young people and if age leads to different outcomes, it is possible that the same messages could have had a different effect on older people. These differences among the studies that have been done in message framing and PA make it hard to argue clearly whether gains or losses are more effective for promoting PA. More studies need to be conducted, but it is important to focus on positive gains and positive losses because these types of gains and losses really refer to gains and losses, in both prospect- and operant conditioning theory terminology. If studies keep using the terms gains and losses without being clear about whether they refer to positive / negative gains / losses, inconsistencies might keep appearing in literature.

This dissertation also contributed to increasing the knowledge regarding message recipient moderators that affect message framing results. Previous studies have found several variables related to individuals that lead to different outcomes such as negative mindset (Bassett-Gunter et al., 2013; Broemer, 2004), need for cognition (Gallagher & Updegraff, 2011); health status (McCall & Martin-Ginis, 2004; Kozak et al., 2013), age (Li et al., 2014; Jones et al., 2003, 2004), and ambivalence (Broemer, 2002). The two dissertation studies explored whether the regulatory focus leads to different results when participants get exposed to gains or losses, and although the they assessed acute effects, they revealed some interesting significant differences. Regulatory focus can also be
considered more stable compared to other variables describing message recipients (e.g., health status), and therefore, if any differences exist, they are probably not due to chance. If so, then, knowing how individuals respond to PA messages can further improve their effectiveness if they get tailored to these differences.

**Implications**

This dissertation was based on the rationale that some messages that have been used to promote PA (Basset-Gunter et al., 2013; Berenbaum & Latimer-Cheung, 2014) are influenced by the guidelines, which present PA as medicine and have a tone of duty. These messages, however, might be more consistent with the prevention regulatory focus, and therefore might influence preventers more than promoters. Although the guidelines cannot be customized to individual differences, it seems that they inspire various programs (e.g., VERB campaign) that promote PA to use slogans and messages that are consistent with the official PA guidelines. These programs also tend to encourage message recipients such as parents to help their kids meet the guidelines (Huhman & Berkowitz, 2014). Moreover, this dissertation validated the existence of individual differences since message framing had a discrete effect on specific PA outcomes, indicating the need for customizing messages to individual characteristics to improve their persuasive effect. This shows that preparing customized PA messages based on the guidelines can have some important implications.

The PA guidelines also provide individuals with different options to do PA in terms of amount and intensity. Study 2 manipulated these options in the message content and the results showed that preventers prefer less and easier PA while promoters prefer more challenging PA options if the amount remains the same. Considering that PA is
presented as medicine that might work better for preventers, then, appropriate manipulations of PA amount and intensity could be used to create rules for PA games as an alternative way of motivating promoters to engage in PA. In addition, mass media represents one of the National Physical Activity Plan sectors (Pate & Buchner, 2014), and therefore, if combinations of PA amount and intensity can be used to prepare rules for games to promote PA, then, this could inspire media personnel to prepare and use different games to motivate at least youth to engage in PA and meet the guidelines in an entertaining way. If this suggestion is tested and proved to be effective, then, the repertoire of PA opportunities can be increased considerably since there are numerous types of games that can be created to promote PA. For instance, a board game could be created and players would be asked to do specific activities (e.g., skipping, jumping, etc.) for a few seconds depending on their answers to specific questions. In that way, they would engage in PA without feeling that they complete a duty or that they are sick who need medicine.

Since the guidelines cannot be customized to individuals, the programs or campaigns that try to disseminate the PA guidelines could play that role. For instance, it would be interesting if individuals had the chance to submit their PA data to an online platform and receive weekly reports regarding their progress. They could also be assigned a personal assistant that would be responsible to help them. Participants would just need to wear an accelerometry-based monitor, submit their data, and check their e-mail once per week to see their progress and read their customized feedback. They would also be invited to take specific tests (e.g., personality, etc.) allowing for more accurate feedback. Such an ongoing online system could help them adhere to a physically active
lifestyle for a long time until they establish it as a habit. It could also be a potential solution to the lack of time that has been reported as a barrier to engaging in PA (Wetter et al., 2001). Based on this dissertation, lack of time seems to be a barrier mainly for preventers because they consistently preferred less amount while promoters chose less amount only when combined with vigorous intensity.

Providing tailored feedback might also be a solution to the high dropout rates that appear in exercise programs. Wilson and Brookfield (2009) reported that almost 50% of individuals drop out within 6 months after starting an exercise program. This should not be surprising because individuals have different needs and if they do not get the personalized treatment that they expect, they might lose their interest. Monitoring their progress, however, and preparing customized feedback could motivate them to stay in the programs knowing that they receive appropriate care.

Promoting PA effectively is important because it can also improve the effectiveness of an existing psychotherapeutic technique for depression, which is known as behavioral activation (Lewinsohn, Biglan, & Zeiss, 1976). If so, it contributes to improving knowledge regarding Healthcare, which is also one of the sectors of the National Physical Activity Plan (Pate & Buchner, 2014). The main goal of this technique is to motivate individuals to engage in activity, for being sedentary keeps them engaged in negative thinking, which undermines their mental health. However, bad mental health leads to obesity, obesity leads to physical health problems, which decreases PA, which eventually maintains or deteriorates the bad mental health of people. In other words, mental health leads to a chain of negative consequences that keeps people unhappy. Irrespective of whether individuals attend psychotherapeutic sessions that employ this
technique, the rationale is that being physically active decreases depression. If individuals engage in PA, they self-employ behavioral activation to help themselves.

Customized messages can also contribute to provide insights to experts in Business and Industry, which represents another sector of the National Physical Activity Plan (Pate & Buchner, 2014). Considering that PA can improve individuals’ performance, employers should be interested in finding ways to keep employees active. Since there are employers who use reliable and valid measures as tools of recruiting the best employees, they could take full advantage of such great measurements. Specifically, if they have the profiles of their employees available, they can use them to improve their productivity, too. Depending on the personality characteristics of the employees, they can identify which of them will engage in activity and which ones will not. For example, if there are employees who do not like PA, they might not be productive enough. Therefore, it would be useful to identify the best ways of persuading individuals with different personalities and convince them to be physically active by providing them with tailored feedback. For instance, worksites could develop a social comparison game where employees will compare their PA levels against others who work at different companies. This kind of competition could improve their productivity in the long run.

Future Research

There are various social marketing efforts that promote PA in youth such as the VERB campaign, which do not emphasize the recommended 60 minutes in the messages that teens exposed to although their parents are encouraged to help their kids to meet these levels (Huhman & Berkowitz, 2014). These campaigns prefer to present PA as fun to motivate teens to be active. Since they promote PA in such an entertaining way to
youth, it would be interesting to structure PA in the form of games based on the four schedules of reinforcement and punishment (i.e., fixed-ratio, fixed-interval, variable-ratio, variable-interval) and test their effectiveness. These schedules come from operant conditioning theory (Skinner, 1938) and reward or punish behavior depending on the number of successes and / or the time that a success takes place. Considering that the VERB campaign has used scorecards that participants redeemed for specific prizes such as bus fare (Huhman & Berkowitz, 2014), these scorecards could be built upon the reinforcement and punishment schedules. For instance, teens can get their reward (e.g., bus fare) after spending 60 minutes in PA three days in a row (i.e., fixed-ratio). This would provide useful information to health promotion specialists regarding the effectiveness of the reinforcement or punishment schedules (i.e., fixed-ratio, fixed-interval, variable-ratio, variable-interval) in promoting PA. It could also have significant practical significance, for teens who completed scorecards in the VERB campaign also tended to engage in PA more often than those who did not (Huhman & Berkowitz, 2014).

Furthermore, next studies could investigate several types of rewards for promoting PA at least in youth because identifying the appropriate rewards can lead to the formation of habits according to habit theory (Duhigg, 2012). Habits depend on a loop that consists of cues, routines, and rewards. Although health benefits are the direct rewards that result from PA, they might not motivate some kids or teens. By broadening the repertoire of potential rewards, however, it is possible to increase the chances of identifying something that really motivates them. These external rewards could be relevant to PA to further motivate them to be active. For example, future studies could use one group that will experience only the PA health benefits (e.g., better mood,
relaxation, etc.), and a second group could experience the health benefits along with PA-relevant external rewards (e.g., a PA monitor). They could also use a third group where participants would experience the health benefits along with PA-irrelevant external rewards (e.g., a concert ticket). Testing these groups could provide information regarding the comparative effectiveness of different rewards on motivating youth to engage in PA.

Another suggestion would be to develop different types of PA games (e.g., board games, movement-sensitive slot machines, etc.) and explore whether they can motivate individuals to be physically active, and whether these potential effects differ depending on individuals’ personality. These studies could be built upon the rationale of conditioning PA to various things. For instance, instead of just playing a board game, kids could play a board game asking them to perform various activities depending on whether they give right or wrong answers (e.g., galloping around for 30 seconds, etc.). In that case, all these things (e.g., a board game) could work as cues to motivate kids to engage in PA. The rationale is based on classical conditioning theory (Pavlov, 1927, 1960) according to which when a neutral stimulus is paired with a potent stimulus repetitively, it leads to learning because the neutral stimulus will elicit the same response as the potent one does, after many repetitions. For instance, if playing a board galloping game is a pleasurable experience that elicits positive emotions (e.g., happiness), then, preparing a similar game on skipping that uses the same rules, might elicit similar emotions. This leads to generalization of learning because positive feelings can be paired with a series of physical activities. If so, individuals may experience positive emotions for a vast range of activities, and this way of promoting PA might prove more effective than medicalizing it, at least for some individuals.
In addition, one of the main tenets of regulatory focus theory (Higgins, 1997, 1998) is that promoters are more sensitive to the presence / absence of positive psychological outcomes (e.g., energy, strong bones, etc.) while preventers are more sensitive to the absence / presence of negative psychological outcomes (e.g., boredom, osteoporosis, etc.). It would be interesting to expose promoters and preventers to lists of positive and negative psychological outcomes and test whether promoters / preventers can really recall significantly more frequently positive / negative outcomes, respectively.

It would also be interesting if future studies could disseminate the PA guidelines via edutainment programs for kids. For example, they could prepare the scenario for a program similar to the old educational cartoon French-Japanese TV series “Il était une fois... la vie” (= Once Upon a Time... Life) but each episode would cover a different lesson plan inviting children to watch it, do what the cartoon characters model, and then follow up with providing them access to a relevant website where they would complete various assignments and get customized feedback based on their performance. If children found such programs engaging, it would be an effective way to monitor their progress and help them cultivate and sustain a healthy lifestyle in the long run. Each episode could end with a slogan that would disseminate the PA guidelines in some way.

**Conclusions**

Although this dissertation provided support that message framing might not be an accurate application of prospect theory to the health domain, more research is needed to further validate this argument. To reach right conclusions, though, it is necessary for researchers to agree on what they mean by saying gains versus losses otherwise inconsistencies in the literature will remain.
In addition, both studies showed that individual differences lead to different results and therefore, message customization seems to be a promising area that can motivate individuals to be physically active and decrease the chances of developing obesity and hypokinetic diseases. Preparing effective PA messages can also have practical implications in some of the National Physical Activity Plan sectors (NPAP; Pate & Buchner, 2014) such as in Mass Media, Business and Industry, and Healthcare.

In sum, the results of the present dissertation provide useful information especially for mass media specialists, and therefore, can contribute to improve the existing health promotion strategies. Better health communication can help more people to adopt healthy lifestyles, which can decrease the rates of hypokinetic diseases, and the cost of health care, which in turn leads to greater savings that can be invested to provide additional services to further promote people’s well-being such as parks, road diets, inclusive parks, and so forth.
REFERENCES


APPENDIX A
STUDY 1 MESSAGES

Message 1: Emphasis on gains and positive words

If you PARTICIPATE in regular physical activity, you INCREASE the chances of:

- Having a healthy body weight.
- Building-up your self-confidence making that easier for you to reach out others and making new friendships.
- Experiencing positive mood and having good mental health.
- Developing strong muscles.
- Strengthening your immune system and keeping your physical health good.
- Experiencing relaxation feelings.
- Improving various cognitive functions (e.g., memory, concentration) and your performance (e.g., academic, professional).
- Improving your physical appearance making yourself more attractive to others.

\(^5\) In Message 1, the arguments prime the promotion regulatory focus, which means that they emphasize improving one’s life by engaging in PA. In Message 2, the arguments prime the prevention regulatory focus, which means that they emphasize the avoidance of negative consequences that can result from lack of PA.
Message 2: Emphasis on gains and negative words

If you PARTICIPATE in regular physical activity, you DECREASE the chances of:

- Developing obesity.
- Having low-self-confidence and feeling lonely.
- Experiencing negative mood and suffering from mental health problems (e.g., depression).
- Having weak muscles.
- Having a weak immune system that can make you more susceptible to several diseases.
- Experiencing stress.
- Having low levels of cognitive functioning (e.g., memory, concentration) and low performance (e.g., academic, professional).
- Developing a bad shape and looking less attractive to others.

Message 3: Emphasis on gains and mixed words

If you PARTICIPATE in regular physical activity, you

- INCREASE the chances of:
  - Having a healthy body weight.
  - Experiencing positive mood and having good mental health.
  - Strengthening your immune system and keeping your physical health good.
  - Improving various cognitive functions (e.g., memory, concentration) and your performance (e.g., academic, professional).

- DECREASE the chances of:
  - Having low-self-confidence and feeling lonely.
  - Having weak muscles.
  - Experiencing stress.
  - Developing a bad shape and looking less attractive to others.
Message 4: Emphasis on losses and positive words

If you DON’T PARTICIPATE in regular physical activity, you DECREASE the chances of:

- Having a healthy body weight.
- Building-up your self-confidence making that more difficult for you to reach out others and making new friendships.
- Experiencing positive mood and having good mental health.
- Developing strong muscles.
- Strengthening your immune system and keeping your physical health good.
- Experiencing relaxation feelings.
- Improving various cognitive functions (e.g., memory, concentration) and your performance (e.g., academic, professional).
- Improving your physical appearance making yourself more attractive to others.

Message 5: Emphasis on losses and negative words

If you DON’T PARTICIPATE in regular physical activity, you INCREASE the chances of:

- Developing obesity.
- Having low-self-confidence and feeling lonely.
- Experiencing negative mood and suffering from mental health problems (e.g., depression).
- Having weak muscles.
- Having a weak immune system that can make you more susceptible to several diseases.
- Experiencing stress.
- Having low levels of cognitive functioning (e.g., memory, concentration) and low performance (e.g., academic, professional).
- Developing a bad shape and looking less attractive to others.
**Message 6: Emphasis on losses and mixed words**

If you DON`T PARTICIPATE in regular physical activity, you

➢ **DECREASE** the chances of:
  - Having a healthy body weight.
  - Experiencing positive mood and having good mental health.
  - Strengthening your immune system and keeping your physical health good.
  - Improving various cognitive functions (e.g., memory, concentration) and your performance (e.g., academic, professional).

➢ **INCREASE** the chances of:
  - Having low-self-confidence and feeling lonely.
  - Having weak muscles.
  - Experiencing stress.
  - Developing a bad shape and looking less attractive to others.
APPENDIX B
STUDY 2 MESSAGES

According to the Physical Activity Guidelines for Americans, adults need at least 150 minutes of moderate-intensity (e.g., walking) or 75 minutes of vigorous-intensity (e.g., jogging, running) physical activity (PA) per week to experience various benefits that result from it.

Some of these benefits include the following (please select the top three benefits that you DESIRE to improve):

☐ healthy body weight
☐ high self-confidence
☐ positive mood and good mental health
☐ strong muscles
☐ strong immune system and good physical health
☐ relaxation feelings
☐ improvement in various cognitive functions (e.g., memory, concentration, etc.)
☐ better performance (e.g., academic, professional, etc.)
☐ better physical appearance and greater attractiveness

Note. Next, one of the following messages will be randomly chosen and displayed to the participants.

GROUP 1:
The extent to which an individual might experience any of these benefits depends on various parameters such as prior levels of PA, current body weight, age, etc. Please read the following information and then click on “Next Page” to answer the questions that follow:

A. If you PARTICIPATE in 150 minutes of moderate-intensity (or 75 minutes of vigorous-intensity) PA per week on average, you HAVE the chance of increasing your desired PA benefits (i.e., ${q://QID27/ChoiceGroup/SelectedChoices}) up to 5% on average within the next 12 months.

B. If you PARTICIPATE in 300 minutes of moderate-intensity (or 150 minutes of vigorous-intensity) PA per week on average, you HAVE the chance of increasing your desired PA benefits (i.e., ${q://QID27/ChoiceGroup/SelectedChoices}) up to 10% on average within the next 12 months BUT in that case you also INCREASE the risk of experiencing some kind of injury.

Note. At the part of the message where it shows i.e., the message will display the top three benefits that participants will have selected in the previous part as the ones that they want to improve more through PA.
GROUP 2:
The extent to which an individual might experience any of these benefits depends on various parameters such as prior levels of PA, current body weight, age, etc.

Please read the following information and then click on “Next Page” to answer the questions that follow:

A. If you **DO NOT PARTICIPATE** in 150 minutes of moderate-intensity (or 75 minutes of vigorous-intensity) PA per week on average, you **MISS** the chance of increasing your desired PA benefits (i.e., ${q://QID27/ChoiceGroup/SelectedChoices}) **up to 5%** on average within the next 12 months.

B. If you **DO NOT PARTICIPATE** in 300 minutes of moderate-intensity (or 150 minutes of vigorous-intensity) PA per week on average, you **MISS** the chance of increasing your desired PA benefits (i.e., ${q://QID27/ChoiceGroup/SelectedChoices}) **up to 10%** on average within the next 12 months **BUT** in that case you also **DECREASE** the risk of experiencing some kind of injury.

GROUP 3:
The extent to which an individual might experience any of these benefits depends on various parameters such as prior levels of PA, current body weight, age, etc.

Please read the following information and then click on “Next Page” to answer the questions that follow:

A. If you **PARTICIPATE** in 150 minutes of moderate-intensity (or 75 minutes of vigorous-intensity) PA per week on average, you **HAVE** the chance of increasing your desired PA benefits (i.e., ${q://QID27/ChoiceGroup/SelectedChoices}) **up to 10%** on average within the next 12 months.

B. If you **PARTICIPATE** in 300 minutes of moderate-intensity (or 150 minutes of vigorous-intensity) PA per week on average, you **HAVE** the chance of increasing your desired PA benefits (i.e., ${q://QID27/ChoiceGroup/SelectedChoices}) **up to 15%** on average within the next 12 months **BUT** in that case you also **INCREASE** the risk of experiencing some kind of injury.
GROUP 4:
The extent to which an individual might experience any of these benefits depends on various parameters such as prior levels of PA, current body weight, age, etc.

Please read the following information and then click on “Next Page” to answer the questions that follow:

A. If you **DO NOT PARTICIPATE** in **150 minutes** of moderate-intensity (or **75 minutes** of vigorous-intensity) PA per week on average, you **MISS** the chance of increasing your desired PA benefits (i.e., $\{q://QID27/ChoiceGroup/SelectedChoices\}$) **up to 10%** on average within the next 12 months.

B. If you **DO NOT PARTICIPATE** in **300 minutes** of moderate-intensity (or **150 minutes** of vigorous-intensity) PA per week on average, you **MISS** the chance of increasing your desired PA benefits (i.e., $\{q://QID27/ChoiceGroup/SelectedChoices\}$) **up to 15%** on average within the next 12 months **BUT** in that case you also **DECREASE** the risk of experiencing some kind of injury.

GROUP 5:
The extent to which an individual might experience any of these benefits depends on various parameters such as prior levels of PA, current body weight, age, etc.

Please read the following information and then click on “Next Page” to answer the questions that follow:

A. If you **PARTICIPATE** in **150 minutes** of moderate-intensity (or **75 minutes** of vigorous-intensity) PA per week on average, you **HAVE** the chance of increasing your desired PA benefits (i.e., $\{q://QID27/ChoiceGroup/SelectedChoices\}$) **up to 15%** on average within the next 12 months.

B. If you **PARTICIPATE** in **300 minutes** of moderate-intensity (or **150 minutes** of vigorous-intensity) PA per week on average, you **HAVE** the chance of increasing your desired PA benefits (i.e., $\{q://QID27/ChoiceGroup/SelectedChoices\}$) **up to 20%** on average within the next 12 months **BUT** in that case you also **INCREASE** the risk of experiencing some kind of injury.
GROUP 6:
The extent to which an individual might experience any of these benefits depends on various parameters such as prior levels of PA, current body weight, age, etc.

Please read the following information and then click on “Next Page” to answer the questions that follow:

A. If you **DO NOT PARTICIPATE** in **150 minutes** of moderate-intensity (or **75 minutes** of vigorous-intensity) PA per week on average, you **MISS** the chance of increasing your desired PA benefits (i.e., ${q://QID27/ChoiceGroup/SelectedChoices}) up to **15%** on average within the next 12 months.

B. If you **DO NOT PARTICIPATE** in **300 minutes** of moderate-intensity (or **150 minutes** of vigorous-intensity) PA per week on average, you **MISS** the chance of increasing your desired PA benefits (i.e., ${q://QID27/ChoiceGroup/SelectedChoices}) up to **20%** on average within the next 12 months **BUT** in that case you also **DECREASE** the risk of experiencing some kind of injury.
APPENDIX C
IRB APPROVAL FOR STUDIES 1 AND 2

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
1138 Pearson Hall
Ames, Iowa 50011-2207
515-294-4560
FAX 515-294-4267

Date: 9/8/2015
To: Konstantinos Mantis
237 Foraker

CC: Dr. Spyridoula Vazou
235 Foraker Bldg

From: Office for Responsible Research

Title: The Effect of Regulatory Focus and Message Framing on Constructing Physical Activity Messages

IRB ID: 15-464

Approval Date: 9/4/2015
Date for Continuing Review: 9/3/2017

Submission Type: New
Review Type: Expedited

The project referenced above has received approval from the Institutional Review Board (IRB) at Iowa State University according to the dates shown above. Please refer to the IRB ID number shown above in all correspondence regarding this study.

To ensure compliance with federal regulations (45 CFR 46 & 21 CFR 56), please be sure to:

- Use only the approved study materials in your research, including the recruitment materials and informed consent documents that have the IRB approval stamp.
- Retain signed informed consent documents for 3 years after the close of the study. When documented consent is required.
- Obtain IRB approval prior to implementing any changes to the study by submitting a Modification Form for Non-Exempt Research or Amendment for Personnel Changes form, as necessary.
- Immediately inform the IRB of (1) all serious and/or unexpected adverse experiences involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.
- Stop all research activity if IRB approval lapses, unless continuation is necessary to prevent harm to research participants. Research activity can resume once IRB approval is reestablished.
- Complete a new continuing review form at least three to four weeks prior to the date for continuing review as noted above to provide sufficient time for the IRB to review and approve continuation of the study. We will send a courtesy reminder as this date approaches.

Please be aware that IRB approval means that you have met the requirements of federal regulations and ISU policies governing human subjects research. Approval from other entities may also be needed. For example, access to data from private records (e.g., student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. IRB approval in no way implies or guarantees that permission from these other entities will be granted.

Upon completion of the project, please submit a Project Closure Form to the Office for Responsible Research, 1138 Pearson Hall, to officially close the project.

Please don't hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.
Note. In the dissertation, Study 2 is entitled differently than the IRB approval shows, but it is the same study.