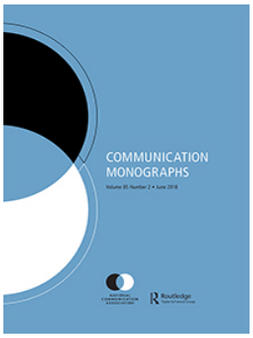

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Persuasive impact of loss and gain frames on intentions to exercise: A test of six moderators

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ABSTRACT
The current study situated loss/gain-framing research in the extended parallel process model and tested whether two message features (dose, efficacy appeals) and four individual difference variables (walking self-efficacy, grit, consideration of future consequences, health information overload (HIO)) moderated the impact of message framing on intentions to engage in physical activity. Adults ($N = 341$, $M_{age} = 38.09$, $SD = 10.94$) were randomly assigned to one of eight message conditions advocating exercise behavior. All four individual difference variables significantly moderated framing effects such that gain-framed messages were more effective for individuals with lower walking self-efficacy, grit, and consideration of future consequences and loss-framed messages were significantly more effective for individuals with higher walking self-efficacy, grit, consideration of future consequences, and for those with lower HIO.

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Loss frame; gain frame; exercise; dose; efficacy; moderators; grit; consideration of future consequences; health information overload; extended parallel process model

Messages can be framed in terms of the advantages of adhering to a recommendation (gain frame) or the disadvantages of non-adherence (loss frame). For example, a communicator could argue those who walk regularly have half the risk of heart disease (gain frame) or those who do not walk regularly have twice the risk of heart disease (loss frame). Though functionally equivalent statements, researchers have argued that people may respond differently to gain- and loss-framed messages (Kahneman & Tversky, 1984; Meyerowitz & Chaiken, 1987). For example, it has been suggested that gain-framed messages may be more effective at increasing disease prevention behaviors whereas loss-framed messages may be more effective at increasing disease detection behaviors (Rothman & Salovey, 1997; Salovey & Wegener, 2003).

O'Keefe and Jensen (2006, 2007, 2009) synthesized decades of research on the relative persuasive impact of loss- and gain-framed messages and found limited evidence for a robust difference. There was also limited support for the previously outlined prevention/detection distinction (O'Keefe & Jensen, 2007, 2009). A follow-up analysis, examining

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Supplemental data for this article (Appendix A and Tables 3–6) can be found at the author's website: www.jakobdjensen.com).

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loss- and gain-frame effects on attitudes, intentions, and behaviors separately, also found limited evidence for a significant difference (Gallagher & Updegraff, 2012).

Yet, the meta-analytic work to date has revealed additional opportunities for loss/gain-framing research. The mean effect sizes exhibit significant heterogeneity across studies, which suggests there may be one or more moderator variables influencing the effects (Covey, 2014; Huedo-Medina, Sánchez-Meca, Marín-Martínez, & Botella, 2006). Concerning the latter, there were insufficient moderator variables present in the literature to allow for sub-analyses in the meta-analyses. For example, it is possible that loss-framed messages are a form of fear appeal as they often focus on susceptibility to undesirable outcomes (e.g., "those who don't walk regularly have twice the risk of heart disease"). Threat susceptibility is a key driver of fear (Witte, 1992). If this is true, then self-efficacy – the perception that a person can perform an action (Bandura, 2006) – might moderate the impact of the appeal (van't Riet, Ruiter, Werrij, & De Vries, 2010). Several fear appeal theories – notably, the extended parallel process model (EPPM; Witte, 1992, 1994) – postulate that fear-inducing messages may only be effective for individuals with sufficient self-efficacy to perform the advocated response.

Unfortunately, few loss/gain-framing studies have examined self-efficacy as a moderator (e.g., van't Riet, Ruiter, Werrij, & De Vries, 2008; van't Riet, Ruiter, Werrij, et al., 2010). As a result, several researchers (Covey, 2014; Latimer, Salovey, & Rothman, 2007; O'Keefe & Jensen, 2007) have argued that the next generation of loss/gain-framing studies, or what might be called second generation loss/gain-framing research, should focus on the identification and testing of possible moderators (see Hull & Hong, 2016).

The present study heeds this call by testing six moderators – two message features and four individual difference variables – that are derived from or related to fear appeal research. Messages advocating routine walking are utilized as stimuli for this research because O'Keefe and Jensen (2011) found gain-framed messages were significantly more effective than loss-framed messages in the context of exercise behavior, though it is unclear why this should be the case. Routine walking was selected to represent physical activity as it is advocated for a wide range of age groups, does not require additional infrastructure (e.g., a gym membership), and is widely promoted in public health campaigns (Wahowiak, 2017). Thus, the current study continues to examine the persuasive impact of loss/gain-framed messages in a promising context (exercise), and tests six theory-relevant moderators per the call for second-generation framing research.

Loss- and gain-framing research

Decision-making research has consistently found that losses loom larger than equivalent gains (Kahneman & Tversky, 1979). This perceptual difference appears to influence decision-making when participants are presented with functionally equivalent information framed as either a loss or a gain (Salovey, Schneider, & Apanovitch, 2002). For example, people can be told there is a 50% chance of gaining a reward, or they can be told there is a 50% chance of losing a reward. Based on these findings, researchers in a variety of fields have designed and evaluated message experiments comparing the relative persuasive impact of loss- and gain-framed information on attitudes, intentions, and behaviors (e.g., Nan et al., 2016; Rothman & Salovey, 1997; Salovey & Wegener, 2003).

In 2006, O'Keefe and Jensen published a meta-analysis of 165 loss- and gain-framing studies ($N = 50{,}780$) and found no evidence of a robust difference between loss-and gain-framed appeals. The mean effect size, across 165 studies, was small, not significantly different than zero, yet also heterogeneous: $r = .016$, 95% CI: −.004, .035, $Q(164) = 465.7$, $p < .001$. Heterogeneity in a meta-analysis means that the mean effect size might not be representative of the true effect as there are significant, unexplained differences across the set of studies that cannot be explained by chance alone (Higgins & Thompson, 2002). Significant heterogeneity can be a sign that there are moderators of the relationship in question (Rosenthal & DiMatteo, 2001).

One possible moderator, suggested by past literature, is that the impact of loss and gain frames differs according to the health context: gain frames are thought to be more effective for messages advocating disease prevention whereas loss frames are more effective for disease detection (Salovey & Wegener, 2003). Accordingly, two meta-analyses have examined whether loss and gain frames yield significantly different persuasive effects in the context of disease prevention and detection (O'Keefe & Jensen, 2007, 2009). A meta-analysis of 93 studies focused on disease prevention behaviors found an advantage for gain frames, though the effect was small and heterogeneous: $r = .03$, 95% CI: .006, .058, $Q(92) = 239.7$, $p < .001$ (O'Keefe & Jensen, 2007). A meta-analysis of 53 studies focused on disease detection found an advantage for loss frames, though once again the effect was small and heterogeneous: $r = -.04$, 95% CI: −.072, −.007, $Q(52) = 99.2$, $p < .001$ (O'Keefe & Jensen, 2009).

In a follow-up meta-analysis, Gallagher and Updegraff (2012) analyzed 94 studies and examined whether loss- and gain-framed health messages yielded a significant difference for three outcome variables: attitudes, intentions, and behavior (where they combined reported behavior and observed behavior). No significant difference emerged for disease detection situations, regardless of the outcome variable. Within disease prevention, Gallagher and Updegraff noted that gain frames appeared to have a significant advantage over loss frames ($r = .083$, 95% CI: .031, .134), though subsequent re-analysis of that data has revealed that there is no statistical difference between the observed effect sizes for loss/gain frame on attitudes, intentions, and behaviors (O'Keefe, 2013). In other words, the loss/gain frame distinction appears to be larger for behavioral outcomes in disease prevention contexts, but that effect size is not significantly different from the other effect sizes in the metanalysis (which are split two ways: (1) prevention vs detection and (2) attitude, intention, and behaviour).

Relevant to the current study, O'Keefe and Jensen (2011) did find that gain-framed messages were significantly more effective in the context of physical activity appeals [19 studies; $r = .17$, 95% CI: .068, .270, $Q(17) = 80.7$, $p < .001$], a finding that suggests gain frames will be more effective at increasing intentions to engage in routine or daily walking (H1). Even though it is logical to postulate a persuasive advantage for gain frames in this context, it is worth noting that it is still unclear why loss and gain frames are more effective in the context of physical activity appeals compared to other health/persuasion contexts (O'Keefe & Jensen, 2011). That is, the mechanisms underlying this finding remain unknown.

Given the uncertainty in the literature and large number of null findings, it has been proposed that second generation loss- and gain-framing research should focus on identifying and testing moderator variables (Covey, 2014; Latimer et al., 2007; O'Keefe & Jensen,

2007). The search for moderators is grounded in the significant heterogeneity observed in the meta-analyses and the need for a novel theoretical framework to guide future research. Historically, loss/gain-framing research has utilized prospect theory as a theoretical framework, but that was based on the notion that the impact of loss and gain frames significantly differed according to context (prevention, detection); a pattern that has not received robust support in meta-analytic research (O'Keefe & Jensen, 2007, 2009). Thus, researchers have argued that loss/gain-framing scholarship would benefit from a theoretical framework other than prospect theory (Harrington & Kerr, 2017; van't Riet et al., 2016).

An alternative approach: Loss frames as fear appeals

An alternative approach to loss/gain framing postulates that loss frames are a form of fear appeal. In other words, loss frames may exert influence by conveying the threat-inducing aspects of loss. Consistent with this idea, loss frames do generate more perceived threat, or feelings of threat susceptibility and severity, than gain frames (Cox & Cox, 2001; Shen & Dillard, 2007). If this argument is correct, then theories from fear appeal research could be used to advance our understanding of loss/gain frames. Witte and Allen (2000) argued that fear appeal theories have built upon each other in ways that create a family of theories with similar variables and ideas rather than a collection of competing frameworks. For example, both protection motivation theory (Rogers, 1975) and the EPPM (Maloney, Lapinski, & Witte, 2011; Witte, 1992, 1994) postulate that self-efficacy moderates the impact of threat on outcomes. Self-efficacy is a person's belief that he/she can perform a particular action (Witte, 1992). In the language of the EPPM, "[w]hen people believe they are able to perform an effective recommended response against the threat … they are motivated to … adopt [it] as a means to control the danger" (Witte & Allen, 2000, p. 594).

Accordingly, self-efficacy could function as a moderator such that loss frames are more effective than gain frames for individuals with greater efficacy. Past research has demonstrated that self-efficacy does moderate the impact of loss frames in the context of smoking cessation (van't Riet et al., 2008), skin self-examination (van't Riet, Ruiter, Werrij, et al., 2010), salt intake (van't Riet, Ruiter, Smerecnik, & De Vries, 2010), and intention to participate in research (Balls-Berry et al., 2016). Interestingly, researchers have also found that self-efficacy could moderate the impact of gain frames: gain-framed messages were more effective than loss-framed messages at encouraging healthy eating for individuals with higher self-efficacy (van't Riet, Werrij, Nieuwkamp, De Vries, & Ruiter, 2013; Werrij, Ruiter, Van't Riet, & De Vries, 2011).

Theory-relevant moderators

Dispositional self-efficacy and efficacy appeals

A major question is how to operationalize self-efficacy in loss/gain-framing research. Self-efficacy could be conceptualized as a state, a disposition, or a feature of a message (i.e., an efficacy appeal). Past research in loss/gain framing has typically conceptualized it as a disposition or message feature (e.g., van't Riet et al., 2008; van't Riet, Ruiter, Werrij et al., 2010; van't Riet, Ruiter, Smerecnik et al., 2010). Based on past research, and the EPPM, we hypothesize that dispositional self-efficacy and self-efficacy appeals will both moderate

the impact of loss/gain framing such that loss frames will be more effective for individuals with higher dispositional self-efficacy (H2) and for those exposed to messages with self-efficacy appeals (H3).

Dose

In their initial meta-analysis of loss/gain-framing research, O'Keefe and Jensen (2006) argued that dose was one message feature that could moderate framing effects. Unfortunately, existing research has rarely manipulated, or even quantified, the dose of the message. Whether the quantity of the appeal influences the impact of the message remains unknown.

Dose is pivotal to many fields, notably toxicology, where researchers abide by the axiom that it is the dose that makes the poison (Kraus, Malmfors, & Slovic, 1992). Relatedly, dose has emerged as an area of study in EPPM research. For example, Carcioppolo et al. (2013) examined whether variations in the dose of threat and efficacy appeals impacted intentions to receive the human papillomavirus (HPV) vaccine. If loss-framed messages are a form of fear appeal, then it seems valuable to examine whether the dose of the loss/gain-frame manipulation impacts the magnitude of the effect. It is tempting to hypothesize a linear relationship – where greater dosage equates to increased effect – but a curvilinear trend is also plausible as audiences may reach a threshold at which they tire of the message causing a backlash effect at higher doses. Given the ambiguity about how dose will impact loss/gain framing, we explore the impact of framing dose as a research question (RQ1).

When people believe they are able to perform: Self-efficacy or something else?

The EPPM postulates that fear appeals are most likely to be effective "when people believe they are able to perform" the recommended response (Witte & Allen, 2000, p. 594). Self-efficacy is conceptualized as the construct that best captures this idea, but significant questions remain concerning the measurement and nature of efficacy beliefs. First, self-efficacy measurement remains a topic of debate with researchers arguing that existing measures may be insufficient and that the construct might need further explication (e.g., Beauchamp, 2016; Schwarzer & McAuley, 2016; Williams & Rhodes, 2016). Thus, researchers interested in self-efficacy should be mindful that it is a construct at the center of intense debate. Second, while some researchers conceptualize self-efficacy as context specific (Bandura, 2006) others have postulated that it also exists as a general, context-free trait (Schwarzer & McAuley, 2016). The latter is intriguing as it suggests that efficacy could hinge, in part, on more enduring individual difference variables. For example, context-specific self-efficacy may reflect underlying persistence to achieve goals, also known as grit (Duckworth, Peterson, Matthews, & Kelly, 2007). To that end, the current study examines three additional individual difference variables (grit, consideration of future consequences, and health information overload (HIO)) that could represent or influence whether a person believes he/she can perform a particular behavior.

Grit

Grit is an individual's ability to persevere through challenges in order to achieve long-term goals (Duckworth et al., 2007). Recent research has examined grit in West Point cadets

(Duckworth et al., 2007) and attrition in surgical residency (Burkhart, Tholey, Guinto, Yeo, & Chojnacki, 2014). The current study examines messages that advocate routine walking, a form of physical activity that yields benefits over time. Walking self-efficacy directly engages beliefs about the behavior in question, but grit represents "trait-level perseverance and passion" and "entails the capacity to sustain both effort and interest in projects that take months or even longer to complete" (Duckworth & Quinn, 2009, p. 166). Of particular interest to this study is the notion that individuals high in grit can persist even in the absence of positive feedback (Duckworth & Quinn, 2009) as that suggests an ability to process and benefit from negatively framed information (or, without positively framed information). Accordingly, the current study examines whether grit moderates the impact of loss/gain framing (RQ3a).

Consideration of future consequences

Another variable that captures long-term thinking is consideration of future consequences (CFC; Strathman, Gleicher, Boninger, & Edwards, 1994). Individuals value the future consequences of events differently, with some placing more value than others on long-term benefits or harms. Research has shown, for instance, that arguments emphasizing the future advantages of off-shore drilling persuaded those who scored high in CFC while those who scored low in CFC were more influenced by the immediate disadvantages (Strathman et al., 1994).

A more recent study examined CFC and self-efficacy in participants obtaining the H1N1 vaccine and determined that those with a higher CFC tended to have higher self-efficacy for obtaining the vaccine (Nan & Kim, 2014). The relationship between CFC (a motivation) and self-efficacy raises questions about the motivational components underlying efficacy. Researchers have noted that current measures of self-efficacy often contain items assessing what appears to be motivation (Beauchamp, 2016) and others have argued that it may be impossible to disconnect feelings of efficacy from motivation (Schwarzer & McAuley, 2016). From a theory standpoint, the EPPM postulates that motivation to take action hinges on perceived threat not efficacy (Maloney et al., 2011; Popova, 2012), which raises questions about how long-term motivations might underlie or parallel the moderating role of self-efficacy.

There is also evidence that CFC might moderate loss/gain-framing effects. For individuals with high CFC, both loss- and gain-framed messages were more effective than a control condition, and gain-framed messages were more effective than loss-framed messages (Zhao, Villagran, Kreps, & McHorney, 2012). Relatedly, Strathman et al. (1994) structured their surveys with a loss-framed message for those who scored low on CFC, while using gain-framed messages for those who scored high on CFC. Though not an experimental design, the logic of their approach was that loss- and gain-framed messages might differentially impact individuals based on their CFC.

Taken together, existing research suggests that gain frames will be more effective for individuals with higher CFC. However, it also seems logical that loss frames could be more effective for individuals with higher CFC. For example, greater attention to long-term consequences could amplify the perceived costs of not adhering to a recommendation. Moreover, the EPPM conceptualizes threat as the driver of motivation. The current study continues to investigate the moderating role of CFC in loss/gain-framing research (RQ3b).

Health information overload

The stimuli that participants are responding to is a message; so it is important to consider what communication-relevant dispositions – with connections to efficacy – might moderate loss/gain framing. From a communication standpoint, a key perception is whether message recipients feel sufficient efficacy to respond to their information environment. For instance, survey research has revealed that nearly three-quarters of Americans feel there are so many cancer recommendations, they do not know which ones to follow (Niederdeppe & Gurmankin Levy, 2007). Though initially labeled cancer fatalism, more recent studies have demonstrated that this belief is a separate construct, referred to as cancer information overload (Jensen, King, et al., 2014). Cancer information overload is an aversive motivational disposition wherein a person feels overwhelmed by the number of cancer messages in his/her environment. Overload is negatively related to the performance of cancer prevention and detection behaviors (Jensen, Carcioppolo, et al., 2014), and could influence how individuals perceive and respond to health messages (Jensen, King, et al., 2014).

In the present study, we reconceptualized cancer information overload to focus on health recommendations in general, and labeled it HIO. Though routine walking could be viewed as a form of cancer prevention, our health messages focused on other benefits (reduction in heart disease and risk of developing diabetes). HIO directly engages beliefs about behavioral performance with items such as, "No one could actually do all of the health recommendations that are given."

No study to date has examined whether information overload, cancer or otherwise, moderates loss/gain-framing effects (RQ3c); however, it is possible that loss/gain-framing differences will only emerge for those with lower overload. Individuals with higher overload may be more likely to reject all health messages, regardless of frame.

Method

Procedure

Participants were recruited through Mechanical Turk into a 2 (loss vs. gain) × 3 (Dose: 1, 2, or 3) online experiment with a nested third factor (efficacy vs. no efficacy appeal) in the 3 dose messages (i.e., 8 conditions total). They received .50 cents for completing the study and were entered into a drawing for a $100 lottery. Participants were also recruited from all 50 states in the U.S., and the final sample represented 44 of those states. Participants were dropped from the study if they violated the 90th percentile speed threshold or if they failed to correctly answer any of the five attention check questions (Downs, Holbrook, Sheng, & Cranor, 2010; Sheehan, 2017). Fourteen participants failed to meet one or both attention checks, yielding a final sample of 341.

Two studies recruited participants simultaneously as one of the studies was only relevant to young adults aged 18–26. That study was focused on the HPV vaccination, and included an intervention that targeted young adults aged 18–26 (Krakow, Yale, Perez Torres, Christy, & Jensen, in press). The current study recruited participants at the same time and accepted everyone that was 27 and older. In this way, the research team was able to accept any participant 18 and older (and not turn anyone away). Routine walking is a health behavior that can be targeted at most age groups; therefore, it was deemed an ideal research study to pair with the HPV data collection effort.

After reading and providing consent, participants completed a battery of demographic and individual difference measures and then were randomly assigned to one of the experimental conditions. The intervention was a digital image with a manipulated messages advocating walking. After viewing the intervention stimuli, participants completed a posttest and were debriefed about the purpose of the study. All procedures were approved by a university Institutional Review Board.

Participants

The participants consisted of adults 27 and older ($N = 341$, $M_{age} = 38.09$, SD = 10.94, range: 27–79). More females (53.1%) participated than males (46.9%). The racial/ethnic distribution was slightly different than the U.S. as a whole, with more participants identifying as White (81.8%) and fewer identifying as Black (8.2%), Hispanic (4.7%), Asian (5.3%), American Indian/Native American (1.5%), Native Hawaiian/Pacific Islander (0.6%), and Other (0.9%). Education was distributed as follows: Less than high school (1.2%), high school graduate (10.0%), some college (18.8%), trade/technical school graduate (5.9%), associate's degree (12.0%), bachelor's degree (37.0%), master's degree (11.4%), and professional degree (3.0%).

Intervention

The intervention was a digital image that depicted people walking for enjoyment and health. Messages in the image were manipulated to be either loss or gain framed. A loss-framed message emphasizes the disadvantages of non-adherence whereas a gain-framed message emphasizes the advantages of adherence (Salovey & Wegener, 2003). Past research has noted that loss and gain framing also can assume different forms, depending on the phrasing or kernel state of the message (e.g., Dillard & Marshall, 2003). O'Keefe and Jensen (2006) argue that the kernel state focuses on the "explicit linguistic representation … of the consequence under discussion" (p. 10). For example, "Those who walk regularly have half the risk of heart disease" is a gain-framed message with an undesirable consequence (heart disease) that is avoided. "Those who don't walk regularly have twice the risk of heart disease" is a loss-framed message with an undesirable consequence that is obtained.

The current study utilized undesirable outcomes as the kernel state for both framing conditions. This is notable as loss/gain-framing research in the context of physical activity has rarely examined gain frames that focus on avoiding undesirable states (O'Keefe & Jensen, 2011). Available evidence suggests that gain frames that focus on avoiding undesirable states may be less effective than those that focus on obtaining desirable states, but there are so few cases of the former that more research is needed before definitive claims can be made (O'Keefe & Jensen, 2011).

The dose of the framing manipulation was also manipulated such that participants either received 1, 2, or 3 sentences that were loss or gain framed (depending on the condition). Those in the 3 dose condition also had a nested manipulation wherein they were randomly assigned to an efficacy or no efficacy appeal condition (for all stimuli materials, see Appendix A online: http://jakobdjensen.com/appendix/acm2017/).

Measurement

There are five measures in the current study. Four were found to have a single underlying dimension (walking self-efficacy, CFC, HIO, and intention). Consistent with past research, there were two dimensions underlying grit. Duckworth and Quinn (2009) label these dimensions as interest and effort, but confirmatory factor analysis has demonstrated that they are highly correlated first-order factors. Accordingly, Duckworth and others typically combine them into a single measure (Duckworth & Quinn, 2009).

Grit

Grit was measured using an 8-item measure that included items such as, "Setbacks don't discourage me," and "I finish whatever I begin" from Duckworth et al. (2007). Items were assessed on a 5-point scale ranging from *not like me at all* (1) to *very much like me* (5) ($M = 3.43$, SD = 0.80, $\alpha = .88$).

Walking self-efficacy

Walking self-efficacy was assessed using a variation of Bandura's (2006) exercise self-efficacy measure. Sample items include, "I could take a 30 minute walk when I am feeling tired," and "I could take a 30 minute walk when there are other interesting things to do," measured on an 11-point scale ranging from *not very confident* (1) to *very confident* (11) ($M = 5.92$, SD = 2.23, $\alpha = .95$).

CFC

CFC was measured using a 9-item scale from Strathman et al. (1994) with sample items such as "I only act to satisfy immediate concerns, figuring the future will take care of itself," and "I am willing to sacrifice my immediate happiness or well-being in order to achieve future outcomes." Participants responded using a 5-point scale ranging from *extremely uncharacteristic* (1) to *extremely characteristic* (5) ($M = 3.55$, SD = 0.78, $\alpha = .91$).

HIO

HIO was measured using a revised version of the 8-item measure from Jensen, Carcioppolo, et al. (2014). Sample items include "Health recommendations all start to sound the same after a while," and "I feel overloaded by the amount of health recommendations I am supposed to know," and were measured on a 5-point scale ranging from *strongly disagree* (1) to *strongly agree* (5) ($M = 2.78$, SD = 0.82, $\alpha = .86$).

Intention

Three items assessed intention to walk routinely: "In the future, I intend to walk 30 minutes a day at least 5 days a week," "In the future, I intend to walk more," and "The information I just read made me seriously think about walking 30 minutes a day." All items were assessed on a 5-point scale ranging from *strongly disagree* (1) to *strongly agree* (5) ($M = 3.71$, SD = 0.93, $\alpha = .73$).

Prior exercise behavior

Four items assessed current exercise behavior in order to differentiate between prior habits and the influence of the message. The assessment of physical activity can be complex.

Therefore, we utilized a multiple-item battery from the National Cancer Institute (2014). Two items assessed moderate physical activity (i.e., that does not cause sweat or heavy breathing) and two items assessed vigorous physical activity (i.e., that causes sweat or heavy breathing). For each level of activeness, participants reported average hours weekly on a 5-item scale (*None*; *up to 1 hour*; *1–2 hours*; *3–4 hours*; *more than 4 hours*), and the degree to which any exercise was sustained during the past year (12-item scale; *1–12 months*). For example: "Over the past 12 months, in how many months, if any, did you do any kind of moderate physical activity?" and "During those months, on average, about how many hours per week did you do moderate physical activities?"

Results

Bivariate correlations

Bivariate correlations were calculated between all variables to examine zero-order relationships. Loss/gain framing was significantly related to prior vigorous physical activity at 12 months ($r = -.13$, $p < .05$) and hours/week ($r = .13$, $p < .05$). Accordingly, both measures of vigorous activity were included in all subsequent analyses as controls.

Loss/gain frame, message moderators, and intention

H1 stated that gain-framed appeals would be more effective at increasing intentions to routinely walk than loss-framed appeals. RQ1 and H3 investigated whether framing dose (1, 2, or 3 sentences) or the inclusion of an efficacy appeal would moderate the effect of loss/gain framing. A hierarchical linear regression was utilized to test H1. Vigorous physical activity measures were entered in block one (given their bivariate relationship with loss/gain framing), loss/gain, dose, and efficacy were entered in the second block, and the loss/gain × dose and loss/gain × efficacy interactions were entered in the third block. The regression was significant at block one, $r = .18$, $R^2 = .03$, $F(2, 280) = 4.88$, $p = .01$, but, contrary to H1 and H3, it was not significant at block two or three (reported at block 3): $r = .22$, $R^2 = .05$, $F(2, 275) = 1.62$, $p = .20$ (coefficients reported in Table 1; means and standard deviations by condition in Table 2).

Table 1. Intentions to walk by loss/gain frame, dose, and efficacy message features.

	b (SE)	*β*	R^2 Δ
Block 1			.034**
Vigorous PA – 12 months	.03 (.02)*	.15	
Vigorous PA – hours/week	.04 (.05)	.05	
Block 2			.005
Loss/gain frame (0, 1)	−.03 (.11)	−.02	
Dose (1, 2, 3)	−.02 (.09)	.01	
Efficacy (0, 1)	.16 (.14)	.08	
Block 3			.011
Loss/gain × dose	.07 (.18)	.10	
Loss/gain × efficacy	−.49 (.29)	−.18	

Notes: By each condition, numbers in parentheses indicate the coding of each variable for interpretative purposes. For example, loss and gain framing was coded as 0 (loss frame) and 1 (gain frame).
*$p < .10$.
**$p < .05$.

Table 2. Means and standard deviations for intentions to walk by frame, dose, and efficacy message features.

	Dose 1	Dose 2	Dose 3 – no efficacy	Dose 3 – efficacy	Total
Loss frame	3.64 (1.28)	3.87 (0.77)	3.52 (0.97)	4.01 (0.73)	3.78 (0.92)
	$n = 41$	$n = 41$	$n = 32$	$n = 42$	$n = 156$
Gain frame	3.63 (1.40)	3.74 (0.82)	3.71 (0.84)	3.67 (1.06)	3.70 (0.94)
	$n = 10$	$n = 41$	$n = 42$	$n = 41$	$n = 134$
Total	3.64 (1.17)	3.80 (0.79)	3.64 (0.89)	3.85 (0.91)	
	$n = 51$	$n = 82$	$n = 74$	$n = 83$	

Notes: Means and standard deviations (in parentheses) by condition. Sample size for each cell included beneath the mean and standard deviation (e.g., $n = 41$ for the single dose, loss-framed condition). None of the means are significantly different.

Loss/gain frame, individual difference moderators, and intention

H2 and RQ3a–c questioned whether four individual difference variables would moderate the relationship between loss/gain framing and intentions to routinely walk. Testing moderation for continuous measures is different than testing interactions between experimental factors. For continuous measures it is necessary to utilize an analytical approach that identifies key thresholds at which the interaction is significant. Accordingly, moderation was tested using a conditional process modeling program, PROCESS, that utilizes an ordinary least squares path analytical framework to test for both direct and indirect effects (Hayes, 2013). All indirect effects were subjected to follow-up bootstrap analyses with 1000 bootstrap samples and 95% bias-corrected confidence intervals. All significant interactions were plotted and their Johnson-Neyman significance region was examined (Hayes & Matthes, 2009).

All four individual difference variables significantly moderated the relationship between loss/gain framing and intentions to routinely walk. For walking self-efficacy, gain-framed messages were more effective for those with very low scores (walking self-efficacy <3.54) which equated to approximately 16.25% of the sample. Loss frames were more effective for those with very high scores (walking self-efficacy >7.52) which equated to approximately 21.56% of the sample (for model summary and conditional effects, see Table 3 online: http://jakobdjensen.com/table-3/). Overall, the loss/gain × walking self-efficacy interaction explained 2.91% of the variance in routine walking intentions.

For grit, gain-framed messages were more effective for those with very low scores (grit < 2.12) which equated to approximately 4.24% of the sample. Loss frames were more effective for those with very high scores (grit > 4.23) which equated to approximately 15.90% of the sample (see Table 4 online: http://jakobdjensen.com/table-4/). Overall, the loss/gain × grit interaction explained 2.11% of the variance in routine walking intentions.

For CFC, gain-framed messages were more effective for those with very low scores (CFC < 2.65) which equated to approximately 13.78% of the sample. Loss frames were more effective for those with high scores (CFC > 4.13) which equated to approximately 25.80% of the sample (see Table 5 online: http://jakobdjensen.com/table-5/). Overall, the loss/gain × CFC interaction explained 2.83% of the variance in routine walking intentions.

For HIO, loss-framed messages were more effective for those with very low scores (HIO < 1.69) which equated to approximately 6.71% of the sample. Gain-framed message were not more effective for those with higher HIO scores (see Table 6 online: http://jakobdjensen.com/table-6/). Overall, the loss/gain × HIO interaction explained 1.35% of the variance in routine walking intentions.

Discussion

O'Keefe and Jensen (2011) found that gain-framed messages were generally more effective than loss-framed messages at influencing exercise behaviors. The current study did not replicate this finding as loss and gain frames did not directly influence intentions.

In a larger sense, the present study was more interested in testing possible moderators of loss- and gain-framing effects. On that front, four variables materialized as promising candidates for future research (walking self-efficacy, grit, CFC, and HIO). In all four cases, loss-framed messages yielded a more robust effect on those with higher walking self-efficacy, grit, and CFC as well as those with lower HIO. Taken as a whole, there appears to be support for the notion that efficacy-related beliefs moderate loss/gain framing. When individuals have sufficient efficacy (walking self-efficacy, grit, and HIO) and motivation (CFC), then they respond positively to loss-framed information.

Loss frames accounted for between 1% and 3% of the variance in intentions to walk but, importantly, the strategy impacted intentions for as many as 35% of the participants. In other words, loss frames produced a small but relatively widespread impact. Conversely, gain frames – when effective – were more effective for a small cohort of participants (between 4% and 16% of participants). Those participants exhibited very low walking self-efficacy, grit, and CFC scores.

Researchers have traditionally hypothesized that either loss or gain frames would be more effective for various populations or contexts. The results of the current study suggest that it is possible for both loss and gain frames to be more effective, if one considers relevant moderators. The Johnson-Neyman method for probing interactions proved useful at deciphering this more nuanced pattern. Continued use of the Johnson-Neyman method is recommended in this area as is the continued identification and testing of moderators.

The significant interaction for walking self-efficacy mirrors past findings. Previously, four studies (Balls-Berry et al., 2016; van't Riet et al., 2008; van't Riet, Ruiter, Smerecnik, et al., 2010; van't Riet, Ruiter, Werrij, et al., 2010) found that self-efficacy moderated loss and gain framing such that loss frames were more effective for individuals with higher self-efficacy. Given the results of the current study, it seems logical for future loss- and gain-framing studies to include and test self-efficacy whenever possible. Moreover, there are now five studies (including the current one) that demonstrate an identical pattern of results – loss frames more effective for higher self-efficacy individuals – across five different contexts. This supports van't Riet's contention that fear appeal theories, such as the EPPM, might be ideal theoretical frameworks for studying loss and gain framing. Loss frames, either by definition or practice, could be threat appeals that are more effective for high-efficacy individuals. The current study did not find a significant interaction for an efficacy appeal – which somewhat contradicts this idea – yet it is possible that the efficacy appeal utilized here was insufficient to garner such an effect. For example, the efficacy appeal was nested within the 3 dose condition, which means that it had limited power from an analytic standpoint.

Alternatively, one could argue that there is evidence that efficacy appeals were effective in this study. If loss frames are threat appeals, then does it make sense to conceptualize gain frames as efficacy appeals? Consistent with this idea, the current study found that gain frames were effective for individuals with lower walking self-efficacy, grit, and CFC. We argue that all three moderators are related to individual efficacy; thus, gain

frames could be directly or indirectly engaging feelings of efficacy to achieve effect. For example, it is easy to see how gain frames might engage populations with lower CFC. Gain frames highlight the benefits of engaging in an action – for routine walking, those are long-term benefits – which could engage people who do not typically think of future consequences. Future research with CFC and loss/gain framing could explore how temporal framing impacts the situation (see Zhao, Nan, Iles, & Yang, 2015).

But how do gain frames engage populations with lower self-efficacy and grit? Gain frames could indirectly engage feelings of self-efficacy because they focus on the efficacy of a course of action. In the language of the EPPM, gain frames focus on response efficacy or the likelihood that a particular course of action will produce a particular result (Witte, 1992, 1994). Future research could manipulate whether gain frames include components targeting response efficacy, self-efficacy, or both. If gain frames with self-efficacy components are more effective for individuals with lower self-efficacy, then that would be consistent with gain-frames-as-efficacy-appeals argument. The current study did include a self-efficacy manipulation of this sort, but future work should continue to investigate this idea.

Another possibility is that gain frames might be an example of positive messaging or the positivity effect. Meta-analyses have found a positivity effect such that positive messages increase attention and motivation, notably for older populations (Reed, Chan, & Mikels, 2014). Moreover, positive messages have been shown to promote walking behavior in older adults (Notthoff & Carstensen, 2014). Future research could examine whether positive messages (that are not gain-framed) and gain frames yield different effects. Researchers believe that the gain-frame structure of loss/gain framing is meaningful, but perhaps gain frames are better conceptualized as positive messages more generally.

Bandura (1991) theorized that positive feedback was one way to enhance self-efficacy. Yet, individuals with high grit do not require positive feedback to persist in the face of adversity (Duckworth & Quinn, 2009). But what about individuals with low grit? Do they benefit from positive feedback? Gain-framed messages are not positive feedback, per se, given that they do not provide information concerning the performance of the message recipient (Bandura, 1991). Yet, because positive feedback is a reoccurring theme in both self-efficacy and grit research, researchers should study whether message recipients view gain frames as positive feedback (of some sort) and/or whether adding positive feedback to gain frames enhances the effect.

Dose was unrelated to intention, and neither a linear nor a curvilinear relationship was found. It is still too early to make definitive claims about the role of dose in loss/gain-framing research as the current study examined three dosage levels for a single message and context. The highest dose considered here was (what we called) three; future research should investigate whether differences emerge at higher levels. For example, in another physical activity intervention, Dishman, Vandenberg, Motl, Wilson, and DeJoy (2010) conceptualized dose as the amount of exposure to an intervention over 12 weeks, and they found several dose–response relationships. Communication researchers should also consider the relationship between dose and repetition. Are these two constructs synonyms, or is repetition a particular type of dose? In other words, does it matter whether the dose is repetitive or unique? Researchers have been interested in repetition for several decades (e.g., Cacioppo & Petty, 1989), and this line of inquiry has recently migrated to EPPM research. Shi and Smith (2016) observed that the hypothesized relationships of the EPPM seemed to manifest after three repetitive exposures to a message about preventing

melanoma. Future research should investigate whether dose and repetition yield similar findings in loss/gain framing research. It is worth noting that a curvilinear relationship was initially postulated in fear appeal research, but ultimately rejected due to lack of support (Witte & Allen, 2000).

There are several additional limitations that need to be acknowledged. The current study utilized behavioral intention as an outcome. Intention is significantly related to behavior, but the former is not a perfect proxy for the latter. The intervention consisted of a single message that was manipulated to represent various message feature conditions. The generalizability of these findings to other messages and situations is currently unknown. Relatedly, only two kernel states were examined in this study (avoiding or obtaining undesirable states). Past research suggests that gain frames which promote avoiding undesirable states may be less effective than those that promote obtaining desirable states (O'Keefe & Jensen, 2011) which may explain the failure to replicate the direct effect for gain frames on intentions to engage in physical activity. Future research should replicate this study with the other kernel states (or all kernel states) to examine if the moderation observed in this study replicates to other kernel phrasing. The EPPM appears to be a meaningful framework for studying loss/gain framing, yet the current study did not measure all of the key constructs in that theory. For instance, future research should measure perceptions of response efficacy, threat susceptibility, and threat severity (Witte, 1992). For example, Nan et al. (2016) examined perceived threat susceptibility as a moderator of loss/gain framing and found that parents who perceived their child to be at risk for contracting HPV were more persuaded by gain-framed messages (but see also van't Riet et al., 2014). Finally, participants were recruited from an online sample. Researchers are still studying the validity of online samples, including how differences in education, income, and technological access might influence study results.

Loss- and gain-framing research is at an important turning point. Second generation studies need to identity and test promising moderators to advance our understanding of what appears to be a complex process. The next decade of research should be dominated by moderator-focused studies that facilitate another wave of meta-analyses seeking to explain the significant heterogeneity observed by O'Keefe and Jensen (2006). To that end, the current study contributes several moderators that can and should be explored in additional studies.

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