

## **Would Message Framing Facilitate Long-Term Behavioral Change in Patients with Chronic Pain?**

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### **Abstract**

*This study examined how message framing affected multiple treatment decisions about therapeutic exercise. Participants with chronic pain received either gain-framed or loss-framed messages. A loss-framed message was found to produce a positive influence on participants' attitude change, behavioral intention and long-term behavioral change. Moreover, simple slope analysis showed that participants with high and low self-efficacy all had favorable responses toward loss-framed messages. This study provided important guidelines for practitioners to design persuasive messages to facilitate therapeutic exercise and sustain the behavior.*

**Keywords:** message framing; self-efficacy, chronic pain related therapeutic exercise, prospect theory, health communication

### **1. Introduction**

Musculoskeletal pain might be the most common cause to interfere with daily life (Sahin, Albayrak, Durmus & Ugurlu, 2011). People usually suffered acute pain after the first episode and then got used to the symptoms. However, pain would occur repeatedly and eventually became chronic pain. Pain that persisted over a month after the first episode and was associated with some physical, psychological, and social problems was chronic pain (Smith & Gribbin, 2001).

In many studies, the prevalence of chronic pain among adults varied from 2% to 40% (Pleis & Lethbridge-Cejku, 2007). Moreover, the number had been increasing dramatically. In population-based investigations of England and the United States, the prevalence of chronic pain had increased to 10% and 20% respectively. (Harkness, Macfarlane, Silman & McBeth, 2005). Chronic pain was not only a health problem, but also had a greater economic impact. In the United States, health care costs for people with chronic pain were about 60 % higher than for people without pain (Walker, Muller & Grant, 2003). Furthermore, it had profound effects on social responsibilities such as low productivity, sick days, additional care, and transportation (Katz, 2006; Maniadakis & Gray, 2000). Because chronic pain was such a complex condition and had a significant negative influence on daily life, it should be considered as a disease and treated accordingly (Turk, 2001).

Patients with chronic pain often took non-surgical treatment such as physical therapy to decrease their symptoms. Physical therapists usually used modalities and therapeutic exercise to treat chronic pain. In terms of therapeutic exercise, research had shown it could decrease negative symptoms and increase activity engagement (Marshall, Desai & Robbins, 2011). Patients had to perform the exercise for certain periods of time to obtain the effects (Heymans, van Tulder, Esmail, Bombardier & Koes, 2005) so their motivation was low.

However, the effects of therapeutic exercise last longer and the recurrence rate was lower than modalities (Liddle, Gracey & Baxter, 2007). Hence, it was necessary to design the messages to motivate patients to initiate and adhere to therapeutic exercise.

According to prospect theory, message framing is defined as the presentation of two equivalent conditions, gain-framed and loss-framed. When the message is gain-framed with benefits or positive outcomes, people were more likely to choose avoiding risks. On the contrary, people tend to take the risks when the message was loss-framed. Moreover, people's perceptions, attitudes, and preferences could be altered by message framing. (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981).

Based on the principles of the prospect theory, Rothman and Salovey proposed that the effect of message framing might be related to the functions or types of healthy behaviors (Rothman & Salovey, 1997). Gain-framed messages would be effective to motivate prevention behaviors such as vaccination (Gerend & Cullen, 2008). Loss-framed messages would be more persuasive than gain-framed messages to prompt detection behaviors considered as risky, such as breast self-examination (Abood, Black, & Coster, 2005).

Although studies had shown the consistent results of message framing on prevention and detection behaviors, only a few addressed the treatment behavior and the results were mixed (Levin & Gaeth, 1988; Christensen, Heckerling, Mackesy-Amity, Brenstein, & Elstein, 1995). Those studies were primarily involving hypothetical outcomes (Siminoff & Fetting, 1989; Garcia-Retamero & Galesic, 2010). When it came to the real treatment decisions such as therapeutic exercise, whether framing had an impact on patients' engagement was questionable. Research had shown that patients had to perform the therapeutic exercise at least a month to reach the desirable effects that seemed uncertain (Liddle, Gracey, & Baxter, 2007; Brox, Storheim, Grotle, Tveito, Indahl, & Eriksen, 2008). Moreover, whether they could reach the desirable effects was totally dependent on patients' motivation and abilities. If patients didn't have suitable abilities to follow the instruction, they might get injuries again that were risky (Moffett & McLean, 2006). Prospect theory proposed that people tend to take the risk or uncertainty when considering the loss. Hence, this study hypothesized that if the practitioners wanted to prompt the therapeutic exercise, loss-framed messages would be more persuasive than gain-framed messages.

According to the theory of planned behavior, behavioral intention might be determined by self-efficacy, referring to a person's belief in his capabilities to engage in health behaviors (Ajzen, 1991; Bandura, 1977, 1998). Research had shown that people with more self-efficacy were more likely to have higher behavioral intentions to perform the health behavior (Rothman, Martino, van't Riet, Ruiter, Werrij, & de Vries, 2010). Moreover, they were confident to face the threat and take the risk. Loss-framed messages had been found to prompt a greater sense of risk or threat (Cox, Cox & Zimet, 2006; Shen & Dillard, 2007). A loss-framed message would be more persuasive than a gain-framed message for people with high self-efficacy. For people with low self-efficacy, a greater sense of risk might cause less message acceptance due to a defensive reaction (Witte, 1992) so again-framed message would be more persuasive than a loss-framed message (van't Riet, Ruiter, Werrij, & de Vries, 2008, 2010). Chronic pain related therapeutic exercise was relatively risky and uncertain. Therefore, this study hypothesized that exposure to loss-framed messages would be effective to motivate patients with high self-efficacy and increase behavioral intentions. For patients with low self-efficacy, instead of loss-framed messages, gain-framed messages would produce favorable effects to encourage their engagement.

Although prior research had demonstrated the message framing effect of health behaviors, studies with treatment related behaviors were limited (Janke, spring, & Weaver, 2011; Kim & Park, 2010). Moreover, studies about the impact of message framing on health behaviors were typically on one-time behavior such as vaccination; little evidence was known about a continuous behavior such as therapeutic exercise. The purposes of this study was to investigate and evaluate the impact of message framing on patients' attitude, behavioral intention and long-term behavioral change of chronic pain related therapeutic exercise. This study also included self-efficacy as the moderating variable to explore its influence on patients' engagement in therapeutic exercise. Furthermore, prior studies typically used a questionnaire to examine message framing effects, which was subjective and biased. This study recorded patients' actual presence as the behavioral frequency, objective and trustable, to provide robust evidence.

## 2. Methods

### 2.1 Procedures

This study used message framing as the independent variable and self-efficacy as the moderating variable to investigate their impact on the dependant variables: advertising effectiveness, attitude toward exercise, behavioral intention, and behavioral frequency. This study was a between-subject design. Participants were randomly assigned to a message framing condition. All participants received a study booklet from the physical therapists. Since self-efficacy was defined as a personality trait in the study, it would be preferable to obtain it before the message was received. After reading the messages, participants were asked to answer questions about message effectiveness, attitude, behavioral intention, and demographic information. In previous studies, behavioral frequency was usually collected from participants that might have their responses contaminated by emotion or situational factors. To be more reliable, this study used National Health Insurance Cards to record their behavioral frequency within three time periods: pre-message, one week, and a month after receiving the message.

### 2.2 Participants

Participants were recruited from the rehabilitation clinics in Kaohsiung City, Taiwan. The inclusion criteria of the participants were: (1) musculoskeletal pain for at least a month, and (2) the first episode. There were a total of 180 participants. They were randomly assigned to framing conditions, resulting in 88 participants in the gain-framing group and 92 in the loss-framing group.

### 2.3 Measures

This study designed communication messages of approximately 120 words, emphasizing the positive consequences of doing therapeutic exercise such as *"By doing therapeutic exercise, your symptoms would decrease so you would be more comfortable"*; or the negative consequences of not doing therapeutic exercise such as *"Without doing therapeutic exercise, your symptoms would aggravate so you need to rest on your bed or take medication."* The manipulation check was right after the message communication. Four questions with a 5-point Likert scale were used to assess whether participants perceived the message as positive or negative. Self-efficacy was considered as baseline information in this study. It was assessed by fourteen 7-point Likert-scale items, which were based on the Riggins et al. (1994) scale and the Bandura (1997) general self-efficacy scale. As an item example, *"I believed I can handle the problems while doing the therapeutic exercise."*

The scores of the 14 items were averaged to obtain a combined score (Cronbach  $\alpha = 0.82$ ). Four criteria (credibility, objectiveness, convincingness, and usefulness) were used to assess the message effectiveness through a 7-point Likert-scale (Dillard, Weber, and Vail, 2007) such as *"The message I received was convincing."* The score of four items would be averaged to obtain a message effectiveness score (Cronbach  $\alpha = 0.91$ ). Attitude was assessed with questions suggested by Berry and Carson (2010), and Jones, Sinclair and Courneya (2003). There were four items asking participants to rate with a 7-point Likert scale (e.g., 1 = *"Therapeutic exercise was beneficial"*). The score of four items would be averaged to obtain an attitude score (Cronbach  $\alpha = 0.86$ ). Four items adopted from Rothman et al. (1993) with a 7-point Likert-scale were used to assess the behavioral intention. For example, *"I intend to do therapeutic exercise within the next 6 months."* The score of four items would be averaged to obtain a score (Cronbach  $\alpha = 0.88$ ).

In Taiwan, when patients with chronic pain went to clinics to receive physical therapy, the clinics had to log in the patient's National Health Insurance Card for the National Health Insurance payment. Hence, every time they showed up, the computer recorded their presence and kept the data. This study collected the behavioral frequency within three time periods: a week before the study, a week later and a one month follow-up.

## 3. Results

### 3.1 Participant characteristics

A total of 180 patients with chronic pain participate in the study. Two participants receiving loss-framed messages didn't return for 1-month follow-up so the final number of participants was 178. The sample consisted of 58% females ( $n = 104$ ) with ages ranged from 19 to 81 years and a mean age of 47.5 years ( $SD = 13.90$ ). 36 participants' educational levels were primary school, 54 were high school, and 90 were either university or graduate level. The income ranged from TWD 0 to 100,000 with a mean of 36,712.7 ( $SD = 27,846.5$ ). The mean self-efficacy score was 73.2 ( $SD = 10.7$ ). The mean pre-message exercise frequency was 3.1 ( $SD = 1.5$ ).

### 3.2 Manipulation check

To test whether the framing manipulation was successful, this study used paired-sample t-tests to make sure there were differences between the gain-frame and the loss-framed messages. The results revealed that gain-framed ( $N = 88$ ,  $t = 7.803$ ,  $SD = 2.9$ ,  $p < 0.001$ ) and loss-framed messages had significant differences ( $N = 92$ ,  $t = 4.0$ ,  $SD = 2.4$ ,  $p < 0.001$ ). The manipulation was successful.

### 3.3 Message effectiveness

The results revealed that neither framing ( $\beta = -0.47$ ,  $p = 0.731 > 0.05$ ) nor framing  $\times$  self-efficacy interaction term ( $\beta = 0.314$ ,  $p = 0.076 > 0.05$ ) had significant effects on the message effectiveness. However, self-efficacy contributed significantly to the prediction of message effectiveness ( $\beta = 0.248$ ,  $p = 0.038 < 0.05$ ).

### 3.4 Attitude

Regression analysis with attitude as a dependent variable showed that framing had a significant effect on attitude toward the message, self-efficacy and framing  $\times$  self-efficacy interaction term had a significant predicting effect on attitude (framing:  $\beta = -0.645$ ,  $p = 0.000 < 0.05$ ; self-efficacy:  $\beta = 0.360$ ,  $p = 0.001 < 0.05$ ; framing  $\times$  self-efficacy interaction term:  $\beta = 1.253$ ,  $p = 0.000 < 0.05$ ). Furthermore, simple slope analyses revealed that participants with high self-efficacy rated higher attitudes when exposing to loss-framed messages than gain-framed messages ( $t(170) = 6.641$ ,  $p = 0.000 < 0.05$ ). These findings were consistent with the hypothesis that a loss-framed message was more persuasive to prompt attitude change than a gain-framed message, especially for participants with high self-efficacy. For participants with low self-efficacy, their attitude rating was also higher when exposing to a loss-framed message than a gain-framed message ( $t(170) = 3.319$ ,  $p = 0.001 < 0.05$ ). This result was contrary to the hypothesis.

### 3.5 Behavioral intention

The results showed a significant effect of framing on behavioral intention ( $\beta = -0.66$ ,  $p = 0.000 < 0.01$ ). Participants receiving loss-framed messages had higher behavioral intention than those receiving gain-framed messages. Framing  $\times$  self-efficacy interaction term also had a significant influence on behavioral intention ( $\beta = 0.80$ ,  $p < 0.001$ ) (Fig 1). Those results support the hypothesis that to prompt chronic pain related therapeutic exercise, loss-framed messages had significant persuasive effects.

### 3.6 Behavioral frequency

This study used a framing by time ANOVA to examine how behavioral frequency changed over time. The pattern in Figure 2 indicated that participants continued to perform exercise in 1 week and 1 month after the message ( $F(1.848, ) = 38.391$ ,  $p < 0.001$ ). *Post hoc* comparison with Bonferroni correction showed that 1-week frequency was higher than for pre-message ( $p < 0.001$ ) and 1-month frequency was higher than for 1-week ( $p < 0.001$ ). Although there was no framing effect, both framing groups' behavioral frequency increased continuously between the pre-message and one month. Furthermore, from 1-week to 1-month, the behavior frequency of the loss-framed group was higher than the gain-framed group ( $t(177) = -1.506$ ,  $p = 0.134 > 0.05$ ). This indicated that a loss-framed message was more likely to prompt long-term behavioral change.

## 4. Discussion

Prior message framing research about treatment behavior was primarily on hypothetical situations and only one-time decisions such as surgery. Whether such framing has effects on multiple treatment behaviors was still unknown. This study might be the first to test the framing effects with multiple treatment behaviors for therapeutic exercise. The results of this study support the hypothesis that framing had differential effects for participants with high and low self-efficacy. The study hypothesized that a loss-framed message was more persuasive than a gain-framed message due to the uncertainty and risk it displayed. The study also hypothesized that a loss-framed message would effectively motivate participants with high self-efficacy because they believed they can behave against the risk. The results showed that participants with high self-efficacy had higher attitudes and higher behavioral intention when exposing to loss-framed messages than gain-framed messages.

For participants with low self-efficacy, they were more likely to avoid the risk and dismiss the negative information (van't Riet, Ruiter, Werrij & de Vries, 2008, 2010). So the study hypothesized that a gain-framed message was favorable. However, the findings were to the contrary. Like for participants with high self-efficacy, loss-framed messages had positive influence on their attitudes. Self-affirmation literature might provide the explanation for these results.

If people feel good about themselves, they might not process threatening information defensively when health behavior information contains a threat to self-image, such as a pale face or slow movement. This might be because self-affirmed individuals would recall positive experiences with health behavior information and had high perceived behavior control (Reed & Aspinwall, 1998; Sherman, Nelsen & Steele, 2000). This could also explain why framing didn't have a significant effect on the message effectiveness. Another reason for the lack of evidence for message effectiveness might be due to inappropriate measures. There were various measures of message effectiveness such as reading time (Reed & Aspinwall, 1998), or the number of counterarguments generated by recipients (Keller & Block, 1999). This study might overlook the other defensive processes by only using the short scale.

Although framing and self-efficacy didn't have any significant effects on one week and one month follow-up behavioral frequency, framing did have a positive influence on behavior changing. Both framing groups' behavior frequency continuously increased from pre-message to 1-month. Moreover, for those participants receiving loss-framed messages, their behavior frequency was higher than the gain-framed message group from 1-week to 1-month. This result supports that loss-framed messages were more likely to motivate participants to engage in the therapeutic exercise. This study had some limitations to address. First, this study only targeted participants receiving therapeutic exercise and modality. It didn't have a control group to make comparisons. Second, this study recorded participants' behavioral frequency by their actual presence in the clinics. However, they might do the therapeutic exercise at home. If the study could count the at-home exercise frequency, framing might have profound effects. Third, chronic pain was a chronic illness. This study only examined the effect at a one month follow-up. Future studies might want to evaluate the longer effectiveness of messages.

Due to the increasing number of patients with chronic pain, the results of this study might prompt the practitioners and physical therapists to apply easy, low-cost and persuasive messages to improve patients' well-being and quality of life. This study revealed that loss-framed messages might be more effective to increase behavioral intention and behavioral frequency than gain-framed messages for patients with chronic pain. Moreover, for patients with high and low self-efficacy, loss-framed messages all had a positive influence. Hence, with appropriate design and delivery, loss-framed messages could empower patients with chronic pain to initiate and continue doing therapeutic exercise. This study added the evidence of framing on real treatment decisions and it could be applied to other actions such as dialysis.

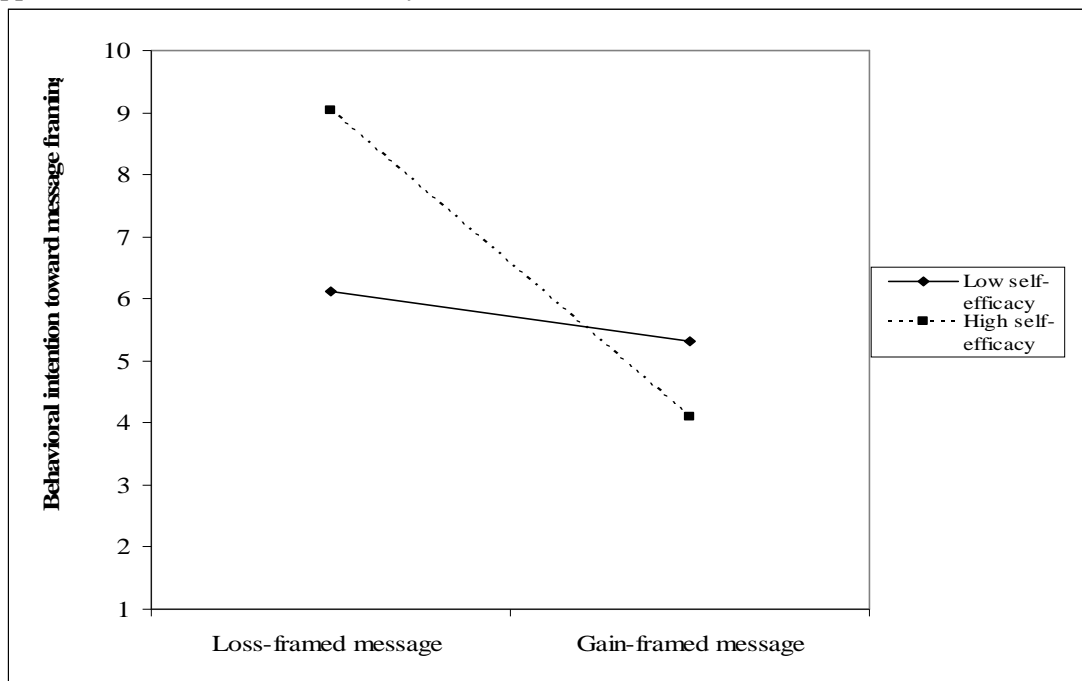
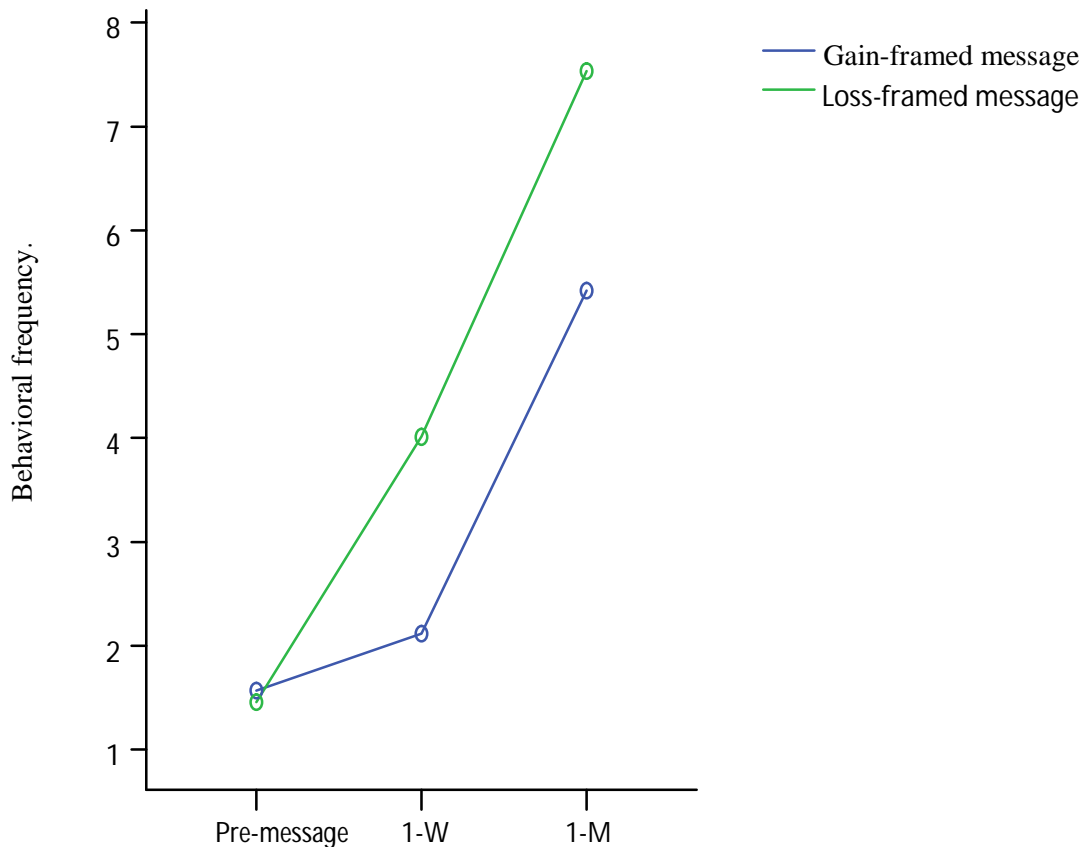


Fig 1: The interaction effects of message framing and self-efficacy on behavioral intention.



**Fig 2: Mean behavioral frequency at the three time periods**

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