


ETD Archive

12-2022

Text and Image Frames Affect Message's Sharing and Acceptance of Social Media Users

Xin Sa

Follow this and additional works at: <https://engagedscholarship.csuohio.edu/etdarchive>

 Part of the [Business Administration, Management, and Operations Commons](#), and the [Databases and Information Systems Commons](#)

How does access to this work benefit you? Let us know!

TEXT AND IMAGE FRAMES AFFECT MESSAGE'S SHARING AND
ACCEPTANCE OF SOCIAL MEDIA USERS

XIN SA

Bachelor of Biology
Ocean University of China
July 1988

Master of Nutrition
Case Western Reserve University
August 1997

Master of Information Science
Case Western Reserve University
August 1999

Submitted in partial fulfillment of requirements for the degree

DOCTOR OF BUSINESS ADMINISTRATION

at the

CLEVELAND STATE UNIVERSITY

DECEMBER 2022

We hereby approve this dissertation for

XIN SA

Candidate for the Doctoral of Business Administration degree for the

Department of Information Systems

and the CLEVELAND STATE UNIVERSITY

College of Graduate Studies by

Committee Chairperson, Dr. Raymond Henry

Department & Date

Committee Member, Dr. Timothy J Arndt

Department & Date

Committee Member, Dr. Tracy H Porter

Department & Date

Committee Member, Dr. Yin Zhang

Department & Date

Student's date of defense: November 3, 2022

DEDICATION

To Kesi Sa, my dad,
who is my inspiration for continuing study.

To my loving family,
who supported my ten-year journey with smiles!

To Jicheng Lin, Gang He, Naizhen Wang, Yu Jiang, and Ming Li,
who support me to pass the finish line!

Words cannot express how much I like to thank all my family members and friends. This
is a tribute to all of you!

ACKNOWLEDGMENTS

Over the past 10 years, the author has received support and encouragement from a great number of individuals. The author would like to specially thank her dissertation chair Dr. Raymond Henry for his thoughtful and unwavering support, critically reading this dissertation, and mentorship during this journey.

The author also wishes to thank her graduate committee (Dr. Raymond Henry, Dr. Timothy Arndt, Dr. Tracy Porter, and Dr. Yin Zhang) for their guidance and encouragement. Their suggestions and generous sharing of knowledge were invaluable to complete this work. The author likes to thank her fellow doctoral students. Their support and great conversations helped shape the research idea.

TEXT AND IMAGE FRAMES AFFECT MESSAGE'S SHARING AND
ACCEPTANCE OF SOCIAL MEDIA USERS

XIN SA

ABSTRACT

With the fast-growing number of users, social media has become an essential part of our daily lives to provide news, status updates, as well as information on technology and science, amongst friends and relatives. Messages posted on social networks are often disseminated to large groups of audiences and aim to influence viewers' behaviors. Some of the most common topics include exercising, eating healthily, voting, and protesting. However, not all messages are spread at the same rate and, therefore, do not receive the same amount of attention. As such, message framing strategies play a critical role in differentiating effective messages and their counterparts.

This project investigates the effects of two message framing strategies on social media. Specifically, we focus on gain- and loss-framing and visual framing, two frequently used message framing strategies. Widely investigated in previous studies, gain- and loss-framing has shown persuasion effects on readers. Visual framing has demonstrated influence in the cognitive processing of message contents. However, effects on persuasion and viewers' sharing behaviors when gain- and loss-framing interacts with visual framing have not been thoroughly studied. Therefore, the purpose of this study is to investigate whether these framing methods influence readers' decisions on sharing messages with others and engaging in behavioral changes as recommended by the messages.

Experimental methods are used to evaluate effects on social media users of gain- and loss-framing combined with visual framing. Participants are asked to read series of

vignettes regarding health promotions and to answer the corresponding questions. Results show that visual framing interacts with gain- and loss-framing in different directions. Gain-framing health promotions are more likely to be shared and adopted. Visuals reduce gain-framing promotion effects but increase the sharing and persuasion effects of loss-framing promotions. Further, the congruence of text and visual framing are more complicated than the agreement in tone or valance of text and visual. Ultimately, health promotions should focus on present positive benefits to encourage message sharing and adoption.

TABLE OF CONTENTS

	Page
ABSTRACT	v
LIST OF TABLES	ix
LIST OF FIGURES	xi
CHAPTER	
I INTRODUCTION	1
II LITERATURE REVIEW	14
2.1 Research on Framing	14
2.2 Prospect Theory Explained by the “Asia Disease”	17
2.3 Image Influence	21
2.4 Accepting Targeted Behaviors	22
2.5 Information Sharing Behaviors	23
2.6 Dual Coding Theory	27
2.7 Dual Processing Theories	29
III RESEARCH HYPOTHESE	39
3.1 Research Model	39
3.2 Hypothesis Building	42
IV RESEARCH METHODOLOGY	53
4.1 Experiment Design	53
4.2 Variables and Measurements	54
4.3 Participants and Sampling	61
4.4 Experiment Procedure	62

V	RESULTS/FINDLINGS	65
5.1	Overall Experiment Participants	65
5.2	Factor Confirmation Analysis	66
5.3	Manipulation Checks	68
5.4	Hypotheses Tests	70
5.5	Ad hoc Analysis	76
5.6	Summary of Results	86
VI	DISCUSSION	87
6.1	Discussion	87
6.2	Research Implications	94
6.3	Practical Implication	96
VII	LIMITATION AND FUTURE RESEARCH	99
VIII	CONCLUSION	101
	REFERENCE	104

LIST OF TABLES

Table	Page
1. Experiment conditions and planned numbers of participants	54
2. Gain- and loss-frames format	55
3. Example gain- and loss- framing phrases from published studies	55
4. Gain- and loss- frame phrases in the current study	56
5. Variables list	60
6. Variables list (continue)	61
7. Participants	66
8. Factors	67
9. Correlation Matrix for Depression Detection	68
10. Correlation Matrix for Meningitis Vaccination	68
11. Manipulation Check Results	69
12. Mean & Standard Deviation for Each Topic and Group	70
13. Mean & Standard Deviation for Each Topic and Group (Continue)	71
14. T-test for Gain- and Loss-framing Without Image (H2)	74
15. T-test of Sharing Intention (H3) - Gain- and Loss-framing With image	74
16. T-test of Message Acceptance (H4) - Gain- and Loss-framing With Image	75
17. ANOVA Results of Interaction of Gain-and Loss-framing and Image without Type (Sharing and Acceptance Intentions)	78
18. ANOVA Results of Interaction of Gain-and Loss-framing and Image without Type (Acceptance Intention Dimension Details)	79
19. ANOVA Results of Interaction of Gain-and Loss-framing and Image with Type (Sharing and Acceptance Intensions)	80

20.	ANOVA Results of Interaction of Gain-and Loss-framing and Image with Type (Acceptance Dimension Details)	81
21.	Summary of Results	86

LIST OF FIGURES

Figure	Page
1. Prospect Theory Value Function	18
2. Research Model	42
3. Topic 1 Depression Detection	64
4. Topic 2 Meningitis Vaccination	64
5. Means Comparison	69
6. Interaction Without Image Type	82
7. Interaction Without Image Type Continue	83
8. Interaction With Image Type	84
9. Interaction With Image Type Continue	85

CHAPTER I

INTRODUCTION

Since the creation of the internet, social media has become one of the most grandiose technological successes and an integrated part of our daily lives. As the internet became more prominent in day-to-day use, major broadcasting sources such as TV, radio, and newspapers were transformed into new means of communication: social media. On the most basic level, this new form of communication connects people and allows them to message each other through the internet, as prototyped by SixDegree.com, which is the first creation of social media (Kilduff & Brass, 2010). Then, social media became increasingly important in serving as the main news and information source for many people (Westerman, Spence, & Van Der Heide, 2014). Throughout the years, social media has experienced a tremendous amount of growth in user numbers, posted messages, and shared content since its inception in 1997 (Kilduff & Brass, 2010). As such, at the end of 2019, Facebook and Twitter reported approximately 2.9 billion and 330 million active users per month, respectively (Retrieved from <https://www.statista.com/statistics/> as of 2022-01-14). This novel method of interpersonal connection is essential as it not only helps its users gain pleasure, attraction, inclusion, and control (Rubin, Perse, & Barbato 1988), but it also

makes communication boundless, easier, and faster, thus making social media an important research topic in the information science (IS) discipline.

When considering social media in the IS discipline, researchers generally define it as a tool of communication based on internet technologies for information dissemination (Kapoor et al., 2018). At the same time, researchers in the IS field have dug deeply into its development, social and economic impacts, behaviors of users, and other usages by analyzing the impacts of digitizing traditional processes and acceptance of new technologies (Kapoor et al., 2018). A number of these projects have demonstrated increased activities among groups and individuals that have been inspired by social media. Clearly, the success in connecting people from post-to-post cannot be separated from the fact that humans inherently desire to share their lives with others. In the meantime, the benefits accrued from bringing people together through social media have extended beyond the individual-to-individual basis.

On the other hand, social media has provided measurable benefits to both organizations and individuals, such that organizations often use user-generated content like reviews or comments to improve their performance (Chau & Xu, 2012; Forman, Ghose, & Wiesenfeld, 2008; Kapoor et al., 2018). In 2014, Dewan et al. used social media to influence music sales by analyzing social media's interaction with traditional marketing strategies. Moreover, social media is employed to further analyze political campaigns, natural disasters, and other crisis events (Giacobe, & Soule, 2014; Majchrzak, & More, 2011; Qi, Liang, Wang, & Cheng, 2018; Wattal, Schuff, Mandviwalla, & Williams, 2010). The current study focuses on how information is processed by its audience on social media and attempts to understand which kinds of message framing is easily spread and accepted

by the social media users. In other words, this study investigates framing effects on readers while maintaining the same take-home message. Unlike other previous research that has centered on user support of a diverse range of content, and on analysis of content properties of viral messages (e.g. “ICE Bucket Challenge”, Shi, Hu, Lia, & Chen, 2018), this study investigates message formatting.

Framing in communication pertains to the way in which one expresses certain ideas over others. There is a variety of framing techniques, but they can be roughly classified into two categories: emphasis framing and equivalent framing. Emphasis framing highlights particular aspects of a subject and intentionally ignores others. For example, “undocumented immigrant” does not have the same meaning as “illegal immigrant”. The latter emphasizes the unauthorized feature and triggers negativity towards the group (Liu & Scheufele, 2016). Effects of emphasis framing are also demonstrated in various fields (e.g. “Values, Framing and Citizens”, Brewer & Gross, 2005), but this type of framing is not suitable for disciplines such as health promotions. Messages regarding individual or public health cannot disclose partial information or purposely play down information. In other words, for all discussions of treatments of a certain disease or tests of a health condition, readers must have all information regarding the treatments or tests. In contrast to emphasis framing, equivalent framing highlights the idea that equal amount information has been presented, regardless of the format of the sentences.

Equivalent framing is more applicable to health promotion messages because it changes the tune of the message, not the content. For example, “staying home prevents virus spread” and “not staying home does not prevent virus spread” are simply a set of equivalent frames. The two phrases represent the same meaning, but they are in two

different frames. The effect of equivalent framing has been addressed by Kahneman and Tversky using their famous “Asia Disease” (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981). Their work demonstrated that individuals made decision choices based on how the problems were described instead of the expected utilities of options. Such work was viewed as the theoretical foundation of equivalent framing because it relies on different words but logically presents the same meaning. In summary, equivalent framing focuses on how a piece of information is presented to an audience, rather than what is being communicated (emphasis framing). Gain- and lost-framing is one of the widely used equivalent framing techniques. A gain-framed message highlights benefits of adopting a recommended behavior, while a lost-framed message highlights the loss or lack of gain of benefits without the adoption of the behavior. Both types of messages are easily found in promotion or campaign events.

The goal of promotions and campaigns, whether for healthcare, marketing, or political issues, is to persuade people and change their beliefs, attitudes, or behaviors. One of the barriers of these promotions is the maintenance of the freshness of the arguments, in order to retain readers’ interest. The novelty of arguments is demonstrated to be important for accepting change (Morley & Walker, 1987). Rearranging words, the common text framing technique, is not sufficient to gain freshness of the promotion and additional message features need to be considered.

Non-text traits, pictures, videos, and audios play important roles in modern communications. Visuals also can be considered as one kind of framing; pictures have superior effects over text to grab readers’ attention and create a more lasting memory. Experiments have shown that pictures solicit strong emotions and attention from readers

compared to text only messages (Iyer & Oldmeadow, 2006). Visuals can be also served as an unspoken proposition (Abraham, 1998; 2009), and they interactively work with verbal content to help readers grasp the meaning of messages (Ormerod & Ivanic, 2002). Images serve as a reproduction of reality to the human mind (Messaris & Abraham, 2001) and the framing effects of image and text depend on their differing characteristics. Zillmann et al. (1999; 2002) demonstrated in a series of studies that adding pictures to news stories can elevate perceived risks of various threats and impact persuasive outcome (Zillmann, 1999; 2002; Gan, Hill, Pschering, & Zillmann, 1996). Ultimately, the goal of framing is to effectively influence the audience's decision-making. While gain- and loss- framing is a widely used strategy in constructing promotion or campaign messages, adding other kinds of framing, such as visual should help to improve effectiveness.

Unlike attribute framing (e.g. 25% fat ground beef vs. 75% lean ground beef), which is based on numerical facts of an object and also derived from prospect theory, gain- and loss-framing is a goal-oriented framing technique that promotes people to act for end results. This is a popular strategy for creating promotion or campaign messages. These kinds of framing messages propel people to adopt behaviors presented in the messages, no matter which forms they are written in (gain or loss). We name the presented behaviors as targeted behaviors to distinguish them from other behaviors. Several studies have shown loss-framed messages have more effects than gain-framed messages. For example, the number of a credit card users who received loss-framed messages, which emphasize losses from not using credit card or not starting to use the card, is significantly more than that of the card users who received gain framed messages (Ganzach & Karsahi, 1995). Another example showed that tax preparers were more willing to sign tax returns under conditions

of ambiguity when loss of existing clients was likely (Newberry, Peckers, & Wyndelts, 1993). While gain- and loss-framing studies have been investigated in many disciplines, most studies reside in the healthcare field (O'Keefe & Jensen, 2007).

Health promotion messages promote a specific action, such as quitting smoking, increasing exercise, or being vaccinated. A large body of healthcare research literature has been dedicated to the study of persuasive effectiveness of gain- and loss-framing in health campaigns. Due to a large variation of health behaviors in the population, universal framing effects have been rarely found. Rothman and Salovey (1997) suggested that health behaviors could be classified into two large categories. Gain-framed messages are more persuasive in health prevention campaigns, and loss-framed messages are more compelling for disease detection promotions (Rothman & Salovey, 1997). Their propositions are adopted by many researchers, but literature reviews and metadata analysis of existing research cannot confirm this general belief of framing effects (O'Keefe & Wu, 2012; Lueck, 2017). Moreover, a recent research article challenged the validity of the implementation of gain- and loss-framed message and questioned whether it is causing the inconsistency of gain- and loss-framing power on persuasion (Van't Riet et al., 2016). Further research is needed to determine other factors. While gain- and loss-framing has been heavily analyzed for health promotion, message sharing behaviors have not been linked to framing. Sharing messages on social media is also an essential component in persuasion.

Spreading news on social media is a part of modern human communication. Humans are fundamentally social creatures, and social media plays into our predisposition to enjoy sharing information. The desire to live as a group encourages people to willingly

pass information to other members because the information is deemed useful. In fact, people have been observed warning others or passing information to others without benefits to themselves (Baumeister, Marangers, & Vohs, 2018). Humans are motivated to share their experiences with others to develop and maintain relationships. This is because information trade is essential in solidifying and reinforcing interpersonal ties (Wiener, 2017). On the other hand, people's behaviors are also influenced by the messages they receive. For example, college students' smoking behaviors are significantly impacted by received pro-smoking messages (Yoo, Yang, & Cho, 2016). Sharing and receiving information are important parts of interpersonal communication.

Communication scholars have long suggested that interpersonal communication is important in affecting people's attitudes and decision making (Katzvand & Lazarsfeld, 1955). Through social media, people can spread information to large crowds of audiences in a short period of time and reach out to those who live in isolated or remote locations where information generally does not reach (Miah, Hasan, Hasan, & Gammack, 2017). In other words, social media is an interpersonal communication channel, as it allows human interactions and emotional support (Veil, Buehner, & Palenchar, 2011). Posted messages are often shared and re-shared, demonstrating how information dissemination on social media is similar to words of mouth communication. Interestingly, Colley and Collier (2009) suggest that word-of-mouth news is more influential than mainstream media because people perceive that whom they know are more trustworthy than strangers in the mainstream media (Colley & Collier, 2009).

Organizations, like Facebook and Twitter, well understand the importance of sharing information in human behaviors. These social media platforms act as conduits,

establishing information-sharing mechanisms to help users spread information faster. They allow users to pass on messages as easily as one click, for example, the “retweet” button. Swift information sharing on social media is shown to be a powerful way of influencing people’s decision-making regarding certain events, as seen by Arab Spring in 2010 (Howard et al., 2011), the US presidential election in 2008 (Hughes & Palen, 2009), and the US presidential election in 2016 (Groshek & Koc-Michalska, 2017). Studies in other fields, such as politics, have also found that content-sharing and frequency of sharing on social media have greatly influenced people’s attitudes (Aruguete & Calvo, 2018). Similarly, Facebook post popularity is found to have a strong persuasive power regardless of readers’ education or knowledge level (Chang, Yu, & Lu, 2015). However, the huge power of information dissemination on social media is not only critical to political leaders, the government, academic researchers, but also to healthcare organizations.

Social networking sites have been recognized as powerful platforms for reaching large audiences and empowering people to do health related activities (Thackeray, Neiger, Hanson, & McKenzie, 2008; Center for Disease Control and Prevention, 2011; Neiger, Thackeray, Burton, Giraud-Carrier, & Fagen 2013). As early as 2011, the Center for Disease Control and Prevention (CDC) had recommended healthcare workers to utilize social media (DHHS et al., 2011). Particularly, social media has been used as a tool for health information dissemination and patient support. For example, online cancer patient communities use social media to share knowledge and provide emotional support (Kim, Hou, Han, & Himmelboin, 2016; Sedrak, Cohen, Merchant, & Schapira, 2016). Without a doubt, the propagation of content on emerging social networks shapes the public collective narratives (Hall & Artwick, 2012). While it is not clear how social media posts can affect

human behaviors, researchers suggest that the medium of the posts might affect the intensity in which the audience is influenced by the post (Vranken, Geusens, Meeus, & Beullens, 2020)

Social media is a place for multimodal presentations. As such, YouTube and Flickr users have shared millions of videos and pictures. Well-known social networking sites, such as Facebook, Twitter, and Instagram, all support multimedia messages and their dissemination. Posts with pictures attract more likes and comments from readers (Bakhshi, Shamma, & Gilbert, 2014). Messages with visuals are shared more often by social media users in various topics, such as political events, vaccine promotion and other topics (Chung & Yoon, 2011; Westman & Oittinen, 2006; Yoon & Chung, 2016; Chen & Dredze, 2018). Clearly, visuals in messages potentially influence readers and their decision to share.

We not only recognize social media as a powerful platform for information diffusion, but we also notice that not every piece of information receives equal attention from the audience. Some messages go viral in a short period of time while others tend to go unnoticed by the majority. Researchers have investigated the factors that have contributed to the difference among viral messages and unnoticed posts from several perspectives. Qi et al. (2018) have discovered that most diffusion finishes within 10 hours and all spreading trends have an exponential decay pattern. Further, the information quality and relationship between nodes have a strong impact on information diffusion (Qi, Liang, Wang, & Chen, 2018). Research in the same line also tried to identify social networking nodes' centrality, influence, and the application of model uses (Chang, Xu, Liu, & Chen, 2018; Chen & Wang, 2012; Lei, Maniu, Mo, & Cheng, 2015; Li, Wang, Gao, & Zhang, 2017). Some models included factors beyond social networks, such as social influence and

user self-selective tendency (Mozafari & Hamzeh, 2015; Susarla, Oh, & Tan, 2012). These results will help decision makers develop strategies to manage and expand their network structures. In many situations, leaders and professionals have to use existing social media groups to which they have access.

Beyond network structure and social influence, other researchers also look into messages effects with readers' fit. For example, Chung, (2017) analyzed Twitter's data for breast cancer promotion and found that users' characteristics and content related features have significant influence on information dissemination. Beyond healthcare topic, studies on other subjects, such as branding (new products broadcasting on social media), marketing (Newman, 2011), and political campaigns (Media & York, 2013), indicated that message content and their alignment with message recipients' interests greatly impacted readers' rebroadcasting activities (Zhang et al., 2017).

Currently, Boehmer and Tandoc (2015) classified the three-category factors that impact message diffusion through social media: information source, user related factors, and the content itself (Boehmer & Tandoc, 2015). In their research, viewers' trust regarding the information source translates to increased trust in the messages' contents, therefore, people are willing to pass along the information (Liu & Goodhue, 2012; Boehmer & Tandoc, 2015). Factors linked to online users, such as user loyalty and attachments, have displayed positive relations with people's willingness to spread information (Cho, Huh, & Faber, 2014; Aghdaie, Sanayei, & Etebari, 2012). For content alone, through analyzing the sharing of about 700 articles from the New York Times, researchers found that positive contents are more viral than negative content, and emotions heavily link to virality through a complex relationship (Berger & Milkman, 2012). Investigation into the "Ice Bucket

Challenge” discovered that content richness impacted readers’ decisions to disseminate the information (Shi et al., 2018). Furthermore, message lengths influence the retweeting of brand marketing messages. Messages with a reasonable longer length is preferred to shorter length (Lahuerta-Otero, Cordero-Gutierrez, & De la Prieta-Pintado, 2018). In short, message characteristics influence sharing.

Gain- and loss-framing studies have largely been done in healthcare fields to investigate their persuasive effects on targeted behaviors, but the current research pool lacks sufficient research on gain/loss framing’s relationship with sharing tendency on social media. This current study focuses on healthcare promotion messages as a way to recognize their importance in engaging in the public and improve social health awareness. The goal of a health-related promotion, as described by the World Health Organization, is to address and prevent the root of unhealthy situations (Meyerowitz & Chaiken, 1987). Increasingly, healthcare professionals use social media – such as Twitter and Facebook, etc. – as health promotion channels (Scanfeld, Scanfeld, & Larson, 2010). Furthermore, recent research on Twitter has shown that users’ characteristics and content related features have significant impacts on information dissemination (Chung, 2017), more evidence found tailored messages are highly effective interventions (Webb, Joseph, Yardley, & Michie, 2010 using the internet to promote health behavior), and finely tailored messages are hard to apply to a large audience. General message features, such as framing, and image are more practicable approaches.

While the results of previous studies on gain-loss framing vary, (Van’t Riet et al., 2016), healthcare workers continue to explore framing effects on a variety of health-related topics (de Alcantara, Ares, de Castro, & Deliza, 2020; RatCliff, Jensen, Scherr, Krakow,

& Crossley, 2019). Among which, De Alcantara et al. investigated logos and warning messages in their experiments (2020), and RatCliff et al. (2019) investigated moderators. The common ground of these studies is that social media has provided an easy way to distribute all kinds of formats of messages, regardless of images, videos, audio and other features. Visuals are a common and powerful presentation in communication. The persuasive effects with pairing imagery and text have rarely been studied (Fahmy, Bock, & Wanta, 2014). An earlier brand marketing study explored image and text interactions, concluding that pictures influence persuasion to an extent, but picture appropriateness is an important indicator for persuasion effectiveness (Miniard, Bhatla, Lord, Dickson, & Unnava, 1991). Further, studies suggest that pictures in messages not only serve as assistance roles in message processing but could also be used to provide concrete information as a text message (Scott, 1994). Recent articles on charity and political campaigns demonstrated that framing and imaging interact with each other to influence message receivers' opinion (Powell, Boomgaarden, De Swert, & de Vreese, 2019; Boomgaarden, Boukers, & Iorgoveanu, 2016). These works show that gain-loss framing effects need to be further investigated in a multimodal-message realm.

Overall, both framing and imagery are influential in persuading their audience, though currently there is no evidence in agreement with specifically how framing and imagery work together to impact the audience's behaviors. Interactions between message framing and images remain largely unexplored. Therefore, more research is needed. This current research focused on the niche of the impact of framing messages in combination with images. The work has been instrumental in the context of healthcare and health-related promotions on social media. Healthcare professionals and practitioners face the daunting

task of promoting information and health recommendations to large populations. With social media as a primary mode of communication and information dissemination, a successful health promotion message must have two major functions: it must be able to successfully propagate itself and it must be persuasive to the audience. However, to construct a message with these two characteristics is hard.

Our primary focus on how to utilize gain-loss framing to achieve the goal of health promotion. Our research questions are:

1. How do gain- and loss-framed health promotion messages influence readers' acceptance of recommended health solutions and their sharing of received information?

2. How do images work interactively with gain- and loss-framing to effectively persuade readers and influence their information sharing behaviors?

Results from this study are important contributions to both framing persuasive research and visual effective research. As indicated earlier, this work has answered if these two message features can work together to achieve widespread and effective persuasion. We used healthcare promotion messages, but the results could be applied to other fields, such as politics and marketing. These results have provided more understanding on how framing affects persuasion and how verbal components are evaluated by the audience. Further, we have answered if image enhances framing effects and which way the image helps the most.

CHAPTER II

LITERATURE REVIEW

Messages are one of the most fundamental elements that make up social media communication. How messages on social media propagate and persuade their readers is complicated due to a range of variables such as message content, perspective readers, choice of social media platforms (whether Twitter or Facebook, etc.), and network structures. However, the very attributes of a message, along with their framing, modality, tones, and other characteristics play essential roles in persuasion and the dissemination of the messages. These attributes are independent of network structures, content sources, and users. In this chapter, I will review concepts including message framing and its relationship with different types of images.

2.1 Research on Framing

Framing has been a popular research area in many disciplines, such as communication, sociology, healthcare, and advertising. Nonetheless, framing word is popular, framing concept is less clear. At least seven definitions of framing concept were collected in Druckman's book on framing (Druckman, 2001). Most researchers agree that the concepts on framing generally can be traced back to two roots: sociology and

psychology, which consider framing via two distinct perspectives. Although under the same label, the framing concept, construction, and emphasis are systematically different (Liu & Scheufele, 2016). A brief discussion of the two types of framing categories is essential to our current research.

Scholars in the sociology department consider framing as a “schema of interpretation” that guides people to comprehend daily events (Goffman, 1974). Specifically, framing assists an individual in constructing life-event meaning by organizing a series of activities and incoming information into a meaningful understanding of himself and herself (Scheufele & Tewksbury, 2007; Pan & Kosicki, 1993). These scholars also consider framing as a device to facilitate information presentation, selection, emphasis, and exclusion (Gitlin, 1980). Furthermore, framing is seen as a method “to select some aspects of perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described” (Entman, 1993 p. 52). In general, researchers in the sociology department focus on the content of information when considering framing.

Unlike their counterparts in the sociology department, when studying framing, psychologists emphasize *how* the information is presented, instead of *what* is presented. They suggest that framing makes the selected element in a message more salient to the cognitive process and, therefore, influencing one’s judgement or decision making (Pan & Kosicki, 1993; Cacciatore, Scheufele, & Iyengar, 2016). Message strategic design focuses on how to effectively convey information. As equivalent information can be presented in various formats, whether the information is processed is dependent upon the format in

which the information is presented to its audience. This leads to the research emphasis on studying how information is framed. The prospect theory is built upon Kahneman and Tversky “Asia Disease” experiments (1979; 1981). The theory states that an individual’s decision making is not based on the expected absolute value but rather a reference value. Here is a more concrete example related to equivalent framing. Two groups of people were asked if they wanted to flip a coin under a condition after they were given 30 dollars: (1) they were asked if they would flip a coin to win additional nine dollars or lose nine dollars; (2) they were asked if they would flip a coin to get either 39 dollars or 21 dollars in total. More people chose to flip a coin in case one than in case two (Bernstein, 1996). As we know, flipping a coin to win nine dollar ends the same amount as in total as thirty-nine dollars and to loss nine dollar also end with the same total amount twenty-one dollars. People make different choices under the “same” condition. In the end, psychologists focus on the way information is presented, as equivalent information is perceived differently depending on how it is presented.

Not only is the focus of emphasis framing from sociology different from equivalent framing from psychology, but the ways they measure the framings are also different. Since the framing from sociology roots is concerned with what to present, which is highly linked to the content, it is difficult to conceptualize and define measurable variables. The framing effects are hard to be identified in research and separated from other factors, such as content itself (Borah & Xiao, 2018; Cacciatore, et al., 2016; Liu & Scheufele, 2016). Despite the wide usage of framing, the current research body still lacks work that describes how information framing influences human cognition (Entman, 1993). Framing from psychological root is based on the same content. In other words, framing is directly tied to

the alteration of the presentation of contents, rather the content itself. The current study has focused on identifying framing effect, so we choose the equivalent framing, which is derived from the prospect theory.

2.2 Prospect Theory Explained by the “Asia Disease”

As mentioned in the earlier section, Kahneman and Tversky proposed the Prospect Theory that studied human decision-making. In their research experiment, Kahneman and Tversky (1981) used an imagined disease (Asia Disease) to test people’s choice under the control and “risk” condition. Participants were told that this disease was threatening to kill 600 people and that they had a few options to resolve the situation. One set of options was: if Program A is adopted, 200 will be saved [28%]; if Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people [72%]. The other set of options was: if Program C is adopted, 400 people will die [22%]; if Program D is adopted there is 1/3 probability that nobody will die and 2/3 probability that 600 people will die [78%]. Although these two sets of options are logically equivalent, The group with A/B options favors choice A, while the group with C/D options favors choice D. From this experiment, the researchers concluded that people tend to take risks when the loss is also presented to them (Tversky & Kahneman, 1981).

Tversky and Kahneman’s results are explained by the value function in prospect theory. The value function shows concave in gain domain and convex in loss domain with different slopes (see Fig. 1). The X-axis represents absolute value, the Y-axis represents expected value, and the origin represents the reference point. From the figure, it shows the same absolute value is viewed differently in the gain-loss domain. The loss domain results in a larger value than the gain domain, in which both are based on the same absolute value.

To explain, how people view values depend on situations. Because same values are viewed differently in different condition, researchers found that people tend to choose the safe ways in the gain domain and make riskier decisions when loss is presented. Based on Kahneman and Tversky's work, information can be framed, or presented, in either a positive or a negative manner.

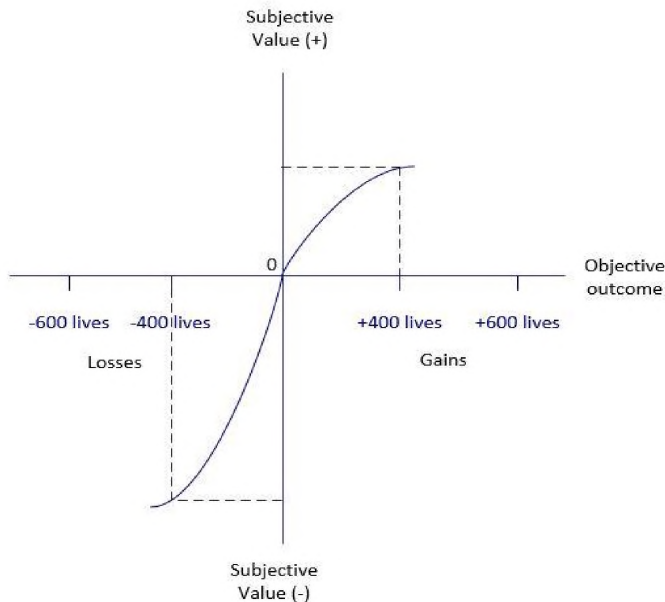


Figure 1: Prospect Theory Value Function

*The prospect theory value function with objective outcomes related to subjective value. Originated from "The Framing of Decisions and the Psychology of Choice" by A Tversky & D Kahneman, January 30,1981. Science 211, p454

Overall, presenting information in positive or negative manners - or valence framing - includes three main components: risky choice, attribute framing, and goal framing (Levin et al., 1998). Risky choice is a choice that is associated with certain risks.

As seen in Kahneman and Tversky's experiment (1981), risky choice is the set of choices with associated risks that were presented to participants. Attribute framing is a simple form of framing, which only focuses on certain categories of the object, instead of analyzing it from a holistic perspective. For example, ground beef can be labeled as "75% lean" or "25% fat". The third component - goal framing - presents the goal in an action or behavior. Two typical types of goal frames are gain- and loss-frames; these frames emphasize the reasons behind their common goal of recommending behaviors to their audience (Levin, Schneider, & Gaeth, 1998).

Gain- and loss-framing has grabbed wide attention of healthcare researchers and practitioners after an early study conducted by Meyerowitz and Chaiken (1987). It has demonstrated that loss-framed messages are more persuasive than gain framed messages when promoting self-examination of breast (SEB). The authors concluded that the loss-frame is more effective than the gain-frame in this case because it is used to describe a negative event. More specifically, the purpose of the SEB is to detect breast cancer - which is a relatively high-risk behavior - and the possibility of being diagnosed with breast cancer is a negative event. Their findings are further confirmed by the experiment conducted by Banks and his colleagues (1995), which showed that women who have viewed loss-framed messages are more likely to obtain mammograms (another method to diagnose breast cancer) than those who have viewed gain-framed messages (Bank et al., 1995). Other studies have also found loss-frame messages have greater influence on health behavior intentions, such as avoiding sexual transmission disease or using mouth washes (Block & Keller 1995; Homer & Yoon, 1992). As these previously mentioned studies show, loss-

framed messages lead to higher intentions of performing recommended health related behavior (Block & Keller, 1995).

However, conflicting findings in which messages of gain-framing are more persuasive have also been found in promoting other health related behaviors. For example, gain-framed messages increase stronger intention to exercise (Robberson & Rogers, 1988), car seat usage among mothers (Christophersen & Gyulay, 1981), and the intention of using sunscreen (Rothman, Salovey, Antone, Keough, & Martin, 1993). To explain these inconsistencies, Rothman stated in his later publication (1997) that while risk choice framing is useful in the public health domain, the gain- and loss-framing in actual health recommendations are more complicated. This is because gain- and loss-framing effects are dependent upon the type of health behaviors. In general, gain-framed messages are more effective in regard to health preventive behaviors, and loss-framed messages are more persuasive when analyzing disease detection behaviors (Rothman & Salovey, 1997). Better results with gain frame were found in other studies on the self-examination of skin cancer (Maheswaran & Meyers-Levy, 1990; Banks et al., 1995). Although, prospect theory has been used to explain gain- and loss-framing effects in healthier behavior promotion messages, more researchers studied other mechanisms involved in influencing framing. In Maheswaran and Meyer-Levy's study (1990), they found that loss-framed messages are found to be more persuasive when an individual is actively involved in processing information. Some researchers suggested that how an individual processed gain- and loss-framed messages shapes the persuasion results and governs framing effects (Rothman & Salovey, 1997; O'Keefe & Jensen, 2008). According to dual processing theories, such as elaboration likelihood model and heuristic-systematic model, system processing leads

reader to scrutinize incoming information. With people's natural tendencies to avoid loss, loss-framed messages are examined and weighed more carefully than gain-framed messages. Therefore, loss-frames may be more effective over gain frames (O'Keefe & Jensen, 2008; Nan et al. 2018).

2.3 Image Influence

Besides manipulation on the message texts, images in the message can also be manipulated to improve the message effects. Image superior effects have long been recognized. For example, pictures are more easily memorized than words (Durso & Johnson, 1980). Imagery is a powerful component of communication. This is because the vividness of an image creates a memorable mental picture. This mental picture can make a longer impression on a person than the texts do (Zillmann, 1999; Cameron & Chan, 2008). It is easier and faster for people to learn through images than the texts because there is a designated spot in the human brain - the cortex - for images to be processed, whereas there is no clear location for text processing in the brain (Messaris & Abraham, 2001). Messaris and Abraham (2001) also found that memories learned from images are more accessible at future times. Indeed, visual media scholars have suggested that processing information from images and texts is more efficient than text only (Barry, 1997). While images alone are more effective than texts messages, they can also work as a complement in combination with text messages.

More research shows that visual supplements help readers to understand texts. A study found that visual supplements help textual learning in general (Ollerenshaw, Aidman, & Kidd, 1997) and improve learning and post-test recall (Mayer & Gallini, 1990). Further, visual accompanied texts tend to catch more readers' attention and increase likelihood of

information dissemination. With more than 200 patients participating in the experiment, physicians found that instructions with visual illustrations were more effective in helping patients understand and follow the instructions. In the public health realm, medical adherence is better followed with instructions having visual than those of text only (Delp & Jones, 1996). Studies of visual effects in messages are scant, but one review of the impacts in healthcare communication, has concluded that visual present in messages improves attention and has useful contributions (Houts, Doak, Doak, & Loscalzo, 2006).

Some research has demonstrated that visuals stir up emotions. When Casas and Williams (2019) studied the “Black Live Matters” social media campaign on Twitter, they observed that pictures in messages could provoke strong emotions (Casas & Williams, 2019). Similarly, visuals solicited readers’ intense concern about the issue, high communication quality ratings, and readers’ strong responses when they were presented in the news story of Gaza conflicts (Brantner, Lobinger, & Wetzstein, 2011). In addition to political fields, images are often used in antismoking campaigns to elicit emotions and improve persuasion on quitting (Montazeri & McEwen 1997; Emery, Romer, Sheerin, Jamieson, & Peters, 2014). A recent article on visual framing has shown that visual framing promotes strong emotions and elicited similar effects as texted framing (Sontag, 2018). In summary, text and visual usage in messages define problems, draw issues, promote solutions, and are set to influence audience behaviors. Although the primary focus on framing research is the targeted behavior stated in the message, the impact of sharing behavior on social media needs to be further studied because message propagation has the same importance as targeted behavior to achieve the goal of population persuasion.

2.4 Accepting Targeted Behaviors

We define behaviors in framed messages as targeted behaviors. The purpose of persuasive messages is to encourage one to act in a certain way. For example, banks that promote cash users to use credit card can state loss framed message like “One is that in using cash there is a danger that money will be lost or stolen, but if someone uses your card, we are responsible, and the money will be returned to you. This means that paying by cash is not only less convenient but also much less secure,” making using cards the target behavior (Ganzach & Karsahi, 1995). While prospect theory postulates that people respond to gain- and loss-frame differently, the level of risks of each alternative choice is not as clear as the outcome risk levels described in “Asia Disease” experiments. Gain- and loss-framing in health studies is usually defined by desirable outcome or undesirable consequences with the goal to promote one specific action to audience. For example, gain frame -- “If you get a mammogram, you decrease the risk of an undetected, potentially life-threatening tumor” versus loss frame -- “If you do not get a mammogram, you increase the risk of an undetected, potentially life-threatening tumor” is for promoting the same target behavior as getting a mammogram (Rothman & Salovey, 1997).

Targeted behaviors regarding personal health are more complex than other behaviors, such as buying merchandise or using credit cards, because they cannot be valued by simple measurement, such as money. Healthy behaviors can be classified into two categories by their functions: maintaining current health and preventing problems; detecting potential illness. Although these two kinds of behaviors cannot be evaluated by the value of their outcome, many researchers believe that they carry out different risk levels. Preventive behaviors are viewed as less risky than detecting behaviors, because

detection of a disease does provide a probability of finding an unwanted outcome, such as having the disease (Rothman & Salovey 1997).

2.5 Information Sharing Behaviors

Gain- and loss-framing techniques emphasize factors to motivate the audience to adopt suggested behaviors. In this Internet information age, in which people constantly share information, messages shared on social media influence people's judgements and behaviors substantially (Lottridge & Bentley, 2018). Therefore, an effective frame of the words and an attractive visual are even more important in message construction. How to frame a message to motivate readers to accept and share the message is more complicated and difficult than how it looks on the surface. As sharing behaviors (e.g. forwarding or reposting a message) and targeted behaviors are two distinctive actions, the decisions to perform these two behaviors will likely occur for different reasons. Carrying out healthy behaviors is for an individual's own health benefit; however, passing information to others is beneficial to others and does not generate immediate benefits for the individual most of the time. While framing research on persuasion has gained tremendous attraction in recent years, studies on framing with the basis in information sharing are sparse. Although framing has not been a focus in social media message sharing, the current body of research on information sharing provides a foundation to further study the effects of framing.

Current literature on information sharing states that information sharing is identified at three levels: individual or interpersonal, within an organization, and between organizations (Yang & Maxwell, 2011). Each level has a different focus and utilizes different technologies to maximize benefits. For example, if the supply chain information sharing is an inter-organizational information sharing behavior, then information and

knowledge sharing keeps supply chain members connected, collaborated, and coordinated, thereby improving their efficiency and competitive advantage (Koçoğlu, Imamoglu, Ince, & Keskin, 2011; Cheng, 2011; Cheng & Fu, 2013). Especially in the healthcare realm, patients' medical information sharing among hospitals can provide better care to patients (Schols & de Veer, 2005; Van Walraven et al., 2008). Knowledge sharing is another example of information sharing and is an important component due to its benefits to keeping organization intangible value and helping technology develop in society. Knowledge sharing is a good example of sharing behavior at both intra-organization level and interpersonal level. In fact, one of the main goals of an organization is to encourage its employees to share knowledge among themselves to improve the organization's efficiency and value.

Since knowledge sharing and management have been heavily studied in the IS field and they covered both intra-organization and interpersonal level communication, findings here are well applied to other types of information sharing. For example, in the environmental realm, researchers have found that sharing information within a corporation is impacted by the organization's structure, culture, and value, etc. (Constant, Kiesler, & Sproull, 1994; Jian & Jeffres, 2006). To uncover exactly how knowledge sharing functions, researchers have dug deep into the motivation factors behind knowledge sharing.

Knowledge sharing motivation has been widely investigated. For example, financial incentive, career advance opportunities, self-esteem, feedback on sharing contents, and ease of sharing are all important factors that influence people's decision to share (Vuori & Okkonen, 2012; Kosonen, 2014), and people often have the urge to share their knowledge with their co-workers and those of their corporations. As concluded by

Durcikova and Gray's work on the influence of the validation process on employee's efforts on sharing (2008), in the context of an organization, employees are willing to share and care about how their sharing is evaluated. Similarly, another survey has also found that employees enjoy sharing knowledge on intra-company social platforms in order to help others if there is not a lot of extra effort involved (Schiuma, Vuori & Okkonen, 2012). In summary, people have the "innate" desire to pass on knowledge and share with others what they know within their organizations/companies. However, it is important to note that this interpersonal knowledge sharing happens outside corporations as well. A study done on high school students (Ma & Chan, 2014) shows that there is a positive relationship between commitment/group attachment and knowledge sharing.

Besides exclusively sharing knowledge, people also share their interests, experiences, and news on social media platforms. In contrast to TV and radio through which people passively receive information, social media allows people to actively participate, create, and share content. Regardless of the physical distance, people can connect with others who share the same interests through comments and discussion on social media. Studies have been done not only what has been shared, but also why people like to share. From an analysis of people sharing their tour experience, researchers found that helping others is one of the most important reasons for people to share. People want to prevent others from getting bad products (Munar & Jacobsen 2014). Also, people are motivated by positive responses, so they are encouraged to share news stories and socialize on social media with feedback (Lee, Ma, & Goh, 2011). More analyses on the sharing behaviors from five social networking sites have also confirmed that self-achievement,

self-satisfaction, and reputation building are factors that influence sharing tendencies (Oh & Syn, 2015).

Similar to knowledge sharing, health information sharing is prevalent in the public health division. A recent research study on social media usage of healthcare institutions shows that the major themes on social media for seventeen hospitals are the sharing of health medications and health issues, etc. (Kordzadeh & Young, 2018) . Another recent analysis on Twitter usage by three top hospitals has also found that hospitals frequently use their Twitter account to engage their followers on information dissemination with topics such as diet, exercise, cancer, and other health-related issues. The three hospital Twitter account followers ranged from half a million to almost 2 million (Kordzadeh, 2019). With 332 million people in the US, of whom 83.4 million are Twitter users and 239 million are Facebook users, the ability to encourage forwarding health related messages is not only important but also necessary.

2.6 Dual Coding Theory

Both targeted and sharing behaviors center on received messages. Whether an individual decides to pass along the messages to others, to take the recommendations in the messages, or to do nothing heavily depends on the messages themselves. Several theories have attempted to explain the reading comprehension of text messages with images. Dual coding theory developed by Paivio in 1971 from education discipline attempts to give even weight to verbal and image information processes. According to dual coding theory, text and picture process through different channels in the human brain. Verbal information and picture information give separate mental pictures in the human brain. They can be recalled individually too. The separate mental pictures will be integrated

and reconciled to form the understanding of incoming information (Paivio, 1991). In simple terms, an individual has a verbal system, which stores mental presentations of words, such as “book” and “school”. When a person reads verbal expressions, the words are linked to the corresponding mental representations. The same human brain also has a non-verbal system, which stores mental presentations of images. For example, when “book” is presented with a picture of book, both the word of “book” and the picture are processed. Two mental representations are created and integrated to provide the meaning of message.

Dual coding theory explains imagery importance which has been demonstrated from educational studies. Textbooks with supplemented images or pictures generally benefit text comprehension (Denis & Le Ny, 1984). An experimental study has shown that grade school students recall more often on imagery points (Long, Winograd, & Bridge, 1989), while a more recent study has shown that students have performed better on comprehension with texts accompanied with pictures than text only (Jalilehvand, 2012). One of the important hypotheses in dual coding theory is that verbal and nonverbal codes in the two systems are functionally independent. Their effects are additive on memory recalls (Paivio & Clark, 2006). Some researchers have further combined dual coding theory and findings in technology acceptance to study students’ attitudes toward multimedia presentations. They found students viewing multimedia presentations have more favorite attitude towards presentation sessions and presenters (Butler & Mautz, 1996; Nouri & Shahid, 2005). While dual coding theory aims at cognitive function in human learning, which may not directly explain the influence of multimodal message towards sharing and targeted behaviors, the findings of additive effects from the two coding systems and

favorite attitudes generated by multimodal presentation imply that if we want to understand framing and imagery effects on persuasion, interaction on both systems should be considered.

Work from Zillmann and his coauthors has complemented dual coding framework. Their series of studies have indicated that images or visuals in messages play the roles of amplifying texts. Therefore, they could help to influence people's beliefs. Their analysis on Lyme disease news reports has shown that an image of threatening ticks increases people's risk perspective on the disease (Gibson & Zillmann, 2000). Other experiments focus on images' influence on two topics: economic concerns of the growing gap between rich and poor farmers and safety of amusement parks. Both examples indicated that images influence people's perceptions (Zillmann, 1999). In summary, images not only attract readers' attention but also provoke readers to think through the messages, thus supplementing the meanings of messages or the emotions of readers.

2.7 Dual Processing Theories

Many theories have been developed to explain how humans process information. The two most prominent theories are the Elaborate Likelihood Model (ELM) and the Heuristic Systematic Model (HSM). These models propose similar central ideas, such that humans have two separate ways to process received information in order to form a response or opinion. One way demands significantly more cognitive efforts (named as central process in ELM or systematic process in HSM) and scrutinizes messages carefully, while the other requires limited cognitive efforts and processes information based on salient cues or rule of thumb judgements (peripheral process in ELM or heuristic process in HSM) (Petty & Cacioppo, 1986; Chaiken, 1987). According to these theories, when an individual

is motivated and has the ability, the individual will form evaluation of messages based on arguments' strength, message quality, and other reasoning factors. However, an individual is not always motivated or has the capability to capture the arguments. In this situation, an individual will do superficial assessments of messages based on salient characteristics, such as message length, sources, and other attributes.

Despite the similar processing routes proposed by ELM and HSM, (both suggested two routes and that the two routes required different cognitive efforts), the two models have fundamental differences in how an individual handles information. In ELM, peripheral cues are those that do not directly link to the essential meaning of the message. There are many cues present at a time and ELM does not indicate which cue will be used (Kirmani & Shiv, 1998). Peripheral route includes, "but is not restricted to, heuristic processing; it refers to any attitude formation or change mechanism that causes persuasion in the absence of argument scrutiny (e.g., operant and classical conditioning or identification-based attitude change)" (Chaiken & Maheswaran, 1994). On the other hand, HSM indicated that people use heuristics from expectancies, schemas, and other theories to process. These heuristics are learned from people's experiences and social worlds. Details can be found in Chaiken's book (Chaiken, 1987). HSM expands beyond persuasion context. Its heuristic processing has been illustrated in other situations, such as person perception. For example, if someone has an assumption in mind that successful women are aggressive, this will lead this individual to form a perception of a woman who signals success with or without aggressive behaviors (Bohner, Moskowitz, & Chaiken, 1995). Similarly, heuristic processing can also explain self-presentation.

Self-presentation is a matter of creating one's own impression to others through self-expressions and a behavior to manage one's self-expressions to others through social interaction and information exchange. There are two main types in self-expression: one is to please the audience, which is matching self to the audience's expectation and preference, while the other type is to simply construct an ideal self (Baumeister, 1987). In either case, to make a positive impression, one often adopts different behaviors or appearances around others (Goffman, 1959). Self-presentation often follows the basic guidelines of social norms. A social norm serves as guideline of human behavior and is a mental picture of appropriate behavior in society and groups. For example, a survey of over a thousand social media users has shown that perceived appropriateness of positive emotion expression is significantly higher than that of negative expression. The survey includes users from different social media sites, such as Instagram, Facebook, Twitter, and WhatsApp. The appreciation of positive expression is across all sites (Waterloo, Baumgartner, Peter, & Valkenburg, 2018). It is not surprising that people who are highly concerned about how they are viewed by others tend to display positive self-expression online (Lee-Won, Shim, Joo, & Park, 2014). In contrast, MUM effect indicated that people are reluctant to be negative. The MUM effect refers to the consistent finding of people's reluctance to share bad news (Dibble & Levine, 2010). Dibble and Levine (2010) found that those who are reluctant to share bad news tend to also delay sharing. In their studies, researchers found that self-presentation is one of the explanations of MUM effects (Dibble & Levine, 2010). Heuristic statics of people's acceptance of an individual's action helps the individual to react.

Other significant differences between the two dual processing models have also been noticed. ELM suggested information processing processes through the two routes are mutually exclusive (Petty & Cacioppo, 1986), either central or peripheral, the message evaluation from one mode of process. HSM explained dual processing as co-concurrence activity, which means that evaluation outcomes from two routes can influence each other to form the final judgement. There are three effects in the co-occur processing: attenuation, additivity, and bias (Chaiken, 1987; Chaiken & Maheswaran, 1994). Attenuation effects proposed that systematic processing messages could provide additional evidence of a message's validity, which may conflict with heuristic cues. Therefore, the system processing results reduces heuristic cues impact on message judgement (Maheswaran, & Chaiken, 1991; Maheswaran et al., 1992). Bias effects are the heuristic information that influences systematic processing (Chaiken & Maheswaran, 1994). For example, information from expertise has more weight than information from somebody that is not. Additivity is the effect that both message factors (such as argument quality) and heuristic cues (such as information source) have significant impact on judgment of the message (Maheswaran & Chaiken, 1991). HSM has been applied to investigation of online activities, such as impact of product reviews on purchasing intention and phishing scams. These studies have shown that both message quality and message source influenced readers' judgement of the message (Zhang, Zhao, & Cheng, 2014; Luo, Zhang, Burd, & Seazzu, 2013). The important premise of HSM that both processes can co-occur made it more suitable to apply to our study. The effectiveness of multimedia messages on social media depends on the attractiveness of the image and quality of message arguments.

Based on dual coding and dual processing theories, we can safely suggest that image and text in one message would be processed through different paths at the same time and the final meaning is the conclusion from combination of both. Research on media learning suggested that rich visual messages are likely to trigger heuristic processes with less cognitive effort and have stronger effects in persuasion (Sundar, 2008). Previous studies on images found that they are more widely used to illustrate objects, which assist idea generation, emotion expression, and persuasion (Chung & Yoon, 2013; Westman & Oittinen, 2006). In a more recent study that has analyzed more than 1600 pictures during a 15-day period of a special situation - Boston Marathon Bombing - researchers found that pictures are used with the purpose of information processing, illustration, and opinion expression (Yoon & Chung, 2016). Through Twitter messages' analysis, Chen and Dredze (2018) also suggested three functions that imagery has in their work: declare topic, supplement Twitter messages, and solicit emotions, which is in agreement with the previous Twitter study done by Chung and Yoon (2013). These studies have shown that images are not only a supplement to texts but are also essential parts of the message. While texts and images are processed concurrently in the human brain, their relationship with gain-loss framing is also intertwined.

Previous research has documented that there are many factors that influence the persuasion effects of gain- and loss-framing. Images act as a combination frame in multimedia while messages contribute to the overall message effects. In other words, gain-loss framing does not work alone. Gain- and loss framing on texts emphasizes authors' perspectives and induces readers' likelihood to accept recommended behaviors. Previous studies have shown that gain-loss framing effects are influenced by many other factors. In

more than two decades, many studies have found significant effects on health promotion messages stemming from the gain or loss framing (Meyerowitz & Chaiken 1987; Rothman & Salovey, 1997). A few metadata analysis articles, which have synthesized decades of gain-loss framing research articles, have found limited evidence to support robust framing effects (O’Keefe & Jensen, 2006; 2007; Gallagher & Updegraff, 2012). The inconsistency of the results suggests that possible moderators or mediators exist and influence framing effects (Nan, Daily, & Qin, 2018). A meta-analysis on published literature of gain-loss framing research during the period from January 1990 to January 2012 established that a few dispositional factors - issue involvement, need for cognition, and regulatory focus - have significant interactions in more than half of the studies (Covey, 2014). Similarly, an experimental research endeavor with more than 300 participants used eight message conditions to measure the message’s effect on individual intention to engage in physical activities. Researchers paired gain-loss framing with four different variables: walking self-efficacy, grit, considering future consequences, and information overhead. The research ultimately found significant moderate effects of all four variables on an individual’s intention to engage in physical activities (Jensen et al., 2018). A follow-up study from this group did not find moderator effects with factor “reactance” and factor “dose” to gain-loss framing, but the experiment results did show the two factors influence gain-loss frame persuasion in an unclear way (Ratcliff, Jensen, Scherr, Krakow, & Crossley, 2019). Furthermore, it is commonly believed that vividness has a greater influence on persuasion. Messages that contain images should impact how the audience perceives the message. For example, the vividness of an advertising message influences readers’ attitudes toward the advertisement and brand (Babin & Burns, 1997). Images that accompany texts highlight

certain parts of the message, but they may or may not directly link to the recommended behaviors. Their influence on gain-loss framing could be explained by the three effects (bias, additive, and attenuation) proposed in HSM.

As discussed earlier, HSM suggested heuristic cues can either enhance (additive effect) or reduce (bias effect) a message persuasive power. Images as illustrations, symbols, expressions, and other indicating functions serve as remarkable cues for the message. Smith and Shaffer (2000) suggested that images can both enhance and undermine a message's persuasive power because image and message need to be congruent on meanings to strengthen each other. Further, they argued that when images attract attention and generate mental images that can easily be recalled and work together with the message, images enhance message processing. On the contrary, when an image attracts attention and occupies memory with irrelevant mental images that are associated with the message, it will make message processing difficult and undermine the message effects. They tested their proposal with two experiments. They showed that while vividness of images is the same, the strong argument message with congruent picture has the highest positive attitude toward the message. Even lower quality argument messages with congruent pictures received a higher favor attitude toward the message (Smith & Shaffer, 2000).

HSM has also given the equal consideration of influence from arguments scrutiny (text processing) to response from cues. While there is no example from existing research to show how well-designed texts overcome misleading images, Seo and his colleagues have found that gain framed messages display imaging amplification effects on message persuasion, which are absent from loss framed messages (Seo & Dillard, 2019). However, experiments from Niu et al. (2020) have shown larger attitude change with loss framed

messages coupled with images. Their work has shown that framing on text interfere with image effects. Gain- and loss-framing intends to formulate benefits or loss, in order to form readers' favor opinions on recommended health behaviors. Furthermore, images paired with texts have been observed to increase readers' perception of health risk and lead to intention of change behaviors (Gibson & Zillman, 2000). The content agreement between image and text plays a role in the receivers' reactions to the message (Chen & Dredze, 2018).

Unlike persuasion studies, which have examined gain- and loss-framing effects in detail, online sharing behavior research has largely been at high level of individual emotions: positive versus negative. Online messages that display positive contents or emotions are disseminated more often because they are in accordance with people's desire to maintain a positive online presence (Gonzales & Hancock 2011). Berger and his colleague analyzed nearly seven thousand New York Times articles where readers' spread activities and found that positive content is more likely to go viral than negative content (2012). Similarly, Choi and Toma's experiment also concluded that people are more likely to share positive events than those that are negative on low-intrusive media such as Twitter since positive content is associated with increased positive effect (2014). Since multimedia messages are common on social media, dissemination of messages with pictures has also been investigated by some investigators.

Because the messages that contained images inspired many shared emotions among viewers, those messages were diffused more widely than the text-only messages. For example, Chen and Dredze (2018) found that, when comparing similar messages with and without images, there is a huge difference in the retweeting function between the two.

Specifically, the probability of retweeting is doubled with messages accompanied by pictures: 30.7% versus 15.3% without pictures (Chen & Dredze, 2018). Furthermore, analysis on images' impact on "Black Life Matters" messages have shown that images not only provoke strong emotions but also motivate readers who have not shared a message before (Casas & Williams, 2019).

Although one study did include both framing and image in the research experiments, it stayed at high level observation and did not look into framing and image interactions. Gough and his coworkers (2017) have set a quasi-experiment on Twitter to measure how skin cancer health promotion messages are disseminated through the platform. The experiment examined five frames: informative, story, shock, humor, and opportunistic category. All five framed messages accompanied corresponding pictures. The researchers concluded that message framing influences the number of retweeted messages; in particular, informative frames are retweeted the most, whereas shocking frames are less likely to be retweeted. Furthermore, this experiment showed that message framing impacts different behavior differently. Although informative framing gets the most retweets, humorous framing has the most content engagement and shocking framed messages give the most impression (such as attention and longer memory) to readers (Gough et al., 2017).

In summary, images coupled messages are common forms in both online and offline communication, such as social media and promotion brochures. Although gain-loss framing has been widely studied on its effects of targeted behaviors, its influence on people's sharing behaviors has not been inspected. It is widely noticed that imaging affects an individual's decisions on sharing or acceptance of messages, but how images interact

with their text contents is rarely studied. Existing theories, prospect theory, dual coding theory, and HSM, have indicated that image and text framing are two important components on influence people's choices and their impacts on people's decision are interrelated. Our current investigation is focusing on filling the gaps of framing impacts on both sharing and targeted behaviors and interactions between text frames (gain- and loss-) and image frames (positive and negative).

CHAPTER III

RESEARCH HYPOTHESE

3.1 Research Model

As discussed earlier, how messages are framed can potentially influence viewers' behavioral outcomes. Health promotion is an area that heavily utilizes framing techniques as policymakers design the optimal way to convey messages to the public. Prospect theory indicates that people value loss more, so loss-framing in promoting an individual to avoid serious consequences in riskier health behavior domain, such as disease detection, should perform better than gain-framing with engaging people (Rothman & Salovey, 1993). Studies promoting early detection of breast cancer show that women were more willing to perform breast cancer self-examinations while reading loss-framed messages with potential consequences presented (Meyerowitz & Chaiken 1987). Similarly, Banks et al. (1995) showed that women were more willing to take mammograms after viewing loss-framed messages. While loss-framing has repeatedly shown effectiveness in breast cancer detection topics, it does not give the same consistency in other health promotions. Some meta-analysis research results show that there is no difference between gain- and loss-framing messages on disease detection persuasion (Van't Riet et al., 2016).

The inconsistent results of gain- and loss-framing in health promotions suggest more factors are involved. Rothman and his colleagues have found three-way interactions among gain- and loss-framing, behavioral function, and need for cognition (Rothman, Martino, Bedell, Detweiller, & Salovey, 1999). Furthermore, O'Keefe and his colleagues have done a series meta-analysis on gain- and loss-framing. Their results from 165 samples with reasonable effective size have concluded that gain-framing performs better than loss framing on disease prevention, which align with suggestions in Rothman and Salovey article in 1993. But the analysis also pointed out that loss-framing did not have advantages over gain-framing with disease detection (O'Keefe & Jensen, 2006). Continuously, meta-data analysis with 93 research in prevention behavior and 53 research in disease detection, has only showed marginal difference between gain- and loss-framing in some topics. This group of researchers suggested other factors might be involved (O'Keefe & Jensen, 2007, 2009). Later, results from meta-analysis of skin cancer prevention topic found no significant difference effects of gain- and loss-framing (O'Keefe & Wu, 2012;). More studies have been done in searching for other factors that will significantly interact with gain- and loss-framed messages (e.g. self-efficacy in smoking cessation, Wilson, Wallston, & King, 1990; self-discipline in breakfast eating habit, Tykocinski, Higgins, & Chaiken, 1994; need for cognition in smoking cessation, Steward, Schneider, Pizarro, & Salovey, 2003). Health behavior domain, which is often used to categorize health behavior risks, is indeed an interacting factor. The factor has two values: preventive behavior which is considered as less risky action and disease detective behavior which is considered as more risky action (Rothman & Solavey, 1997). As persuasive messages accompanied by images are widely used in healthcare interventions and public announcements (Berry, 2008),

visuals could be one of the critical interacting factors. Therefore, this study focuses on investigating visuals.

With the increase of multimodal messages' availability on social media, it is essential to understand text and visual in online posts. In the healthcare realm specifically, visual images have been observed to impact health-related cognitive processes, such as perceptions on disease and risks of health threats (Zillmann 1999; 2002). Based on information processing theories, image-supported text contents should smooth the information processing from the messages. Therefore, congruence between text and image helps readers to have positive attitude toward products (Van Rompay, De Vries, & Van Venrooij, 2010). Since gain- and loss-framed messages are valance-framed messages (Levin et al., 1998), which solicit positive or negative emotions correspondingly, they can be matched with positive and negative images as congruence or incongruence. Recent research investigated valance congruence of gain-and loss-framing and image with green advertising. The study has found valance congruence of text and image impacts consumers' attitude (Lee & Cho, 2021). This current study investigates how two important online behaviors, message sharing and message acceptance, are influenced by gain- and loss-framing; also, how the framed messages interact with positive and negative images to influence the two behaviors. The research model is illustrated in Figure 2. Valance matching between gain-frame and positive image will enhance the message effects. This is the same as messages with loss-frame and negative image. The mismatch of valance between frame and image will reduce the message effects. Eventually, images and texts together can either facilitate or impede human information processing (Smith & Shaffer, 2000).

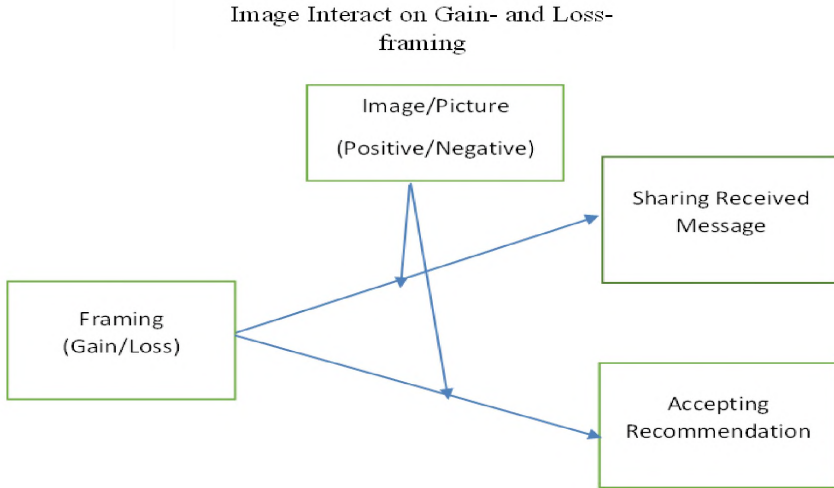


Figure 2: Research Model

3.2 Hypothesis Building

Gain- and loss-framing effects have not been studied in the context of health information sharing on social media. Although there are many existing studies for information sharing on social media, they focus on describing characteristics of users and network structures, such as social media users' personality, network density, and popularity (Laranjo et al., 2015; Lee-Won, Abo, Na, & White, 2016). Also, research regarding health promotion messages has mainly focused on identifying consistent message strategies that help to effectively cultivate positive health behavior change or maintenance (Pope, Pelletier, & Guertin, 2018). Gain- and loss-framing is valance oriented, so studies on emotions on the Internet may shine some lights. A recent analysis on health-related posts on Facebook indicated that positive emotional languages increase message virality (Bail, 2016). Similarly, an analysis on messages about breast cancer on Twitter also concluded

that messages with positive emotions were retweeted more than negative emotion messages (Kim et al., 2016). These results indicate that messages with positive emotions are preferred for sharing. Additionally, studies on knowledge sharing offer a good starting point to investigate people's motivation of sharing information online. These studies suggest that people like to share what they know when they feel that there is a potential improvement of self-satisfaction, identification, and reputation. (Chang & Chuang, 2011; Chen & Hung, 2010; Gagne 2009; Foss, Minbaeva, Pedersen, & Reinholt, 2009; Wang & Hou, 2015). Moreover, other studies also proposed self-presentation and self-enhancement as the motivation for knowledge and information sharing (Munar & Jacobsen 2014; Oh & Syn, 2015, Chung, Koo, & Park, 2012).

The idea that people like to give others the best self-presentation of themselves will play a role in sharing. People behave based on their perceptions, leading them to display what they perceive to be a desirable image of themselves to others (Baumeister & Hutton, 1987). For example, people want others to like them, so they display positive qualities of themselves. Getting a "like" from the social media community provides many benefits such as self-satisfaction, happiness, and indication of favor from others. Therefore, people have the intrinsic urge to want to please those around them. Social media facilitates the creation of like-minded communities of individuals with whom people can share thoughts and feelings and receive positive feedback from others in the view as an expert (Rohlinger & Bunnage, 2017). While knowledge sharing is thought to lead to high reputation in the long run for fulfilling professionals' self-presentation (Lin & Huang, 2008; 2010), research has also discovered that people like to share positive events to maintain their desired self-

images, make themselves memorable by others, and maximize their reputations (Bazarova., Choi, Schwanda Sosik, Cosley, & Whitlock, 2015).

Self-presentation is not only a product of a person's desires but also a compliant act to a person's social environment (Ahuja and Galvin 2003). As such, people follow published rules, such as the law, to avoid punishment. They also follow unspoken rules, such as social norms, to gain friendship or avoid critics and isolation. Although both gain- and loss- frames promote the same health solution, the enjoyment or satisfaction from sharing of the messages is more aligned with the emphasis of gain-framed messages, which promote benefits from accepting recommended behaviors. Studies suggested that positive expressions were preferred norms for online expressions (Waterloo et al., 2018). Gain-framed messages help people maintain positive images of themselves, increase their approval from others, and comply with social norms (Ajzen 1991).

If maintaining favorable self-presentation motivation is not enough to encourage messengers to share/forward gain-framed messages, then the MUM effects will result in a lower likelihood of forwarding loss-framed messages. The MUM effect is the reluctance to pass on bad news to others (Rosen & Tesser, 1970). The reluctance in passing on bad news or undesirable messages is due to the sender's sensitivity to the recipient's discomfort and fear of hurting them (Dibble & Levine, 2010; 2013). Research shows that the valence of a sender's message is impacted by the sender's consideration in fear of distressing recipients, desire to avoid engaging negative mode with recipients, and negative evaluation from recipients (Dibble & Levine, 2013). Further, experiments show that reluctance and the likelihood of passing on bad news are driven by the anticipated concerns of the recipients. That is, the fear of distressing recipients and being blamed is a negative

predictor of likelihood of sharing information (Dibble 2018). Loss-framed messages focus on threatening the message readers with consequences in order to push them to accept promoted health behaviors. Therefore, the negative valence could make potential messenger readers reluctant to forward information to others. Here, we propose our first hypothesis:

H1: Gain-framed messages will be shared more often than loss-framed messages.

As mentioned earlier, gain- and loss-framing are sourced from the prospect theory (Tversky & Kahneman, 1981), which has displayed different persuasion effects in different topics (Levin et al., 1998; O’Keefe & Jensen, 2009). Loss-frames are more effective in persuasion of the use of credit card (Ganzach & Karsahi, 1995), self-exam of breast cancer (Meyerowitz & Chaiken 1987), and some other cases, because people perceive the same value more in loss situation than in gain situation (Tversky & Kahneman, 1981). This tendency has been proved in many experiments (Rachlinski, 1996; Kahneman & Tversky, 1982; Yechiam, Telpaz, & Hochman, 2014), but it is unclear how people measure benefit or loss in health and evaluate their perceived value.

Loss-framed messages are widely viewed as more persuasive in the healthcare field because both the health belief model and the protection motivation theory proposed that people are motivated to respond to threats or warnings (Prentice-Dunn & Rogers, 1986) to their health. As loss-framed messages state the negative consequences of not engaging in the recommended behavior, these negative consequences are served as threats and/or warnings. As we mentioned earlier, gain- and loss-framing persuasive effects are different in different health improving behaviors (O’Keefe & Jensen, 2007; 2008). Existing gain- and loss-framing studies on health behavior changes use health behavior domain to classify

promoted health behaviors. Health behavior domain has two groups: less risky behaviors such as preventive behaviors and more risky behaviors such as disease detection (Rothman & Salovey, 1997). We use this classification in our current study, which has chosen two target health behaviors: taking depression detection tests and getting the meningitis vaccine.

Because depression is stigmatized in many parts of the country and the world, we define seeking such diagnosis as a relatively risky move viewed by people. The confirmed diagnosis could bring shame and uneasy feelings to the person and his/her surrounding people. Therefore, loss-framed message should be more effective for this behavior because the readers will evaluate unwanted consequences more than the benefits presented in the gain-framed message. The early study results in that loss-framed messages are more salient in depression topic and more persuasive for depressed people seeking help (Suka, Yamauchi, & Yanagisawa, 2018) support loss-frame advantage in depression detection. Getting a vaccine is a way to prevent diseases, but unlike exercise or changing diet, it is seen as riskier due to declared side effects of vaccines (Nan & Madden, 2012). Although it is rare, severe side effects do exist. Meningitis attacked US colleges a few years ago, and the disease is deadly (McNamara et al., 2015). The dire consequences are more noticeable in loss-framed statements. Thus, the loss-frame should also be a more effective means of persuasion in this topic. Therefore, we propose our second hypothesis as follows:

H2: Gain-framed messages will have less effect on readers' decisions in accepting recommended actions than loss-framed messages.

Graphic visuals are an important part of today's health promotion communication. Although changing the wording in a text message is shown to influence content

understanding and decision making, visuals cause stronger psychological reactions than text because they resemble real life and are attention grabbing (Powell & Boomgaarden, 2015). Many previous research works have demonstrated that images interact with their accompanied text content in human information processing. Images enhance readers' understanding of textual information, improve their memorization, and augment their ability to complete requested tasks (Fang, 1996; Jalilehvand, 2012; Zhao, Schnotz, Wangner, & Gaschier, 2014).

In addition, images are found to be helpful in spreading messages. Recent research shows that vaccine messages on Twitter have almost doubled the retweet rate when the message is accompanied with a picture (Chen & Dredze, 2018). Other studies of pictures on social media have also shown similar conclusions that image-accompanied messages or posts received more comments and sharing in a variety of topics, such as healthcare (Strekalova & Krieger, 2017), marketing (Leung, Tanford, & Jiang, 2017), and branding (Villarroel Ordenes et al., 2019). Messages with images are preferred in sharing possibly because images' unique characteristics evoke a certain emotion (Joffe, 2008). However, stronger emotions solicited from the images do not always correlate to more sharing behaviors.

More studies have given evidence that different kinds of emotions can lead to different sharing patterns. One research investigated different responses and visual attentions of readers from social media posts paired with positive, negative, or no images. This study performed within-subject experiments with 60 participants and used eye tracking techniques. It is observed that positive image paired posts are shared more than negative image or no image paired posts (Keib et al., 2018). The results agree with Berger's

analysis on online sharing of New York Time news story, which has concluded that positive contents are more viral (Berger & Milkman, 2012). These previous results suggested that positive images stir up intense emotions compared to text only messages and higher emotions lead people to share. As we discussed earlier, gain-framed messages will be shared more than loss-framed messages because their positive view is more aligned with the sharers' self-presentations and more acceptable with social norms. Adding positive picture to a gain-framed message will reinforce the message positive tone.

The emotional alignment of the message is also favored by human information processing because it provides smooth processing condition which has been explained in HSM additivity effect (Chaiken, 1987; Chaiken & Maheswaran, 1994). The emotion from the system process of the gain-framed message and heuristic process of the positive image are both positive. They reinforce each other. Although loss-framed messages with negative images will also provide smooth process, the messages will reinforce negative tone through the two processing. This result does not fit with the readers' sharing motivation, which gives the best of self-presentation to the receivers. Therefore, the valance congruence with gain-framing and positive image will have different effects on sharing messages from the congruence with loss-framing and negative message. Congruence of gain-framing and positive image will enhance message sharing; congruence of loss-framing and negative image will reduce message sharing.

Gain-framed messages with negative images are not congruent in their valance. This incongruency will lead to conflicting results from two information processing paths. Instead of reinforcing the message, the conflict will reduce the readers' confidence in the message. As HSM attenuation effect (Chaiken, 1987; Chaiken & Maheswaran, 1994)

suggested, results from gain-framed text process could help message validity and reduce effect from negative image, but the overall valance will be mixed. The message readers will not prefer the disagreement of text and image in the message, because it will jeopardize their self-image, such as bad judgment on information. We propose:

H3: Positive images with gain-framed messages will lead to a greater increase in message sharing compared to (1) negative images with loss-framed messages, (2) negative images with gain-framed messages.

The interaction between images and texts can improve readers' understanding of message content. Image effects on persuasion have been widely studied, but less understood, because image can interact with text in many ways. For example, Kisielius and Sternthal (1984) found that images' vividness can either enhance or reduce messages' persuasion power. Another example, the smokers' own artery images solicited more susceptibility, therefore the personalized images increased the smokers' intentions to stop smoking and have more persuasive effects (Shahab, Hall, & Marteau, 2007). While pictures are viewed as attention grabbing devices and message processing facilitators (Finn 1988; MacKenzie 1986), they can influence people's viewing of information through a few forms: enhancing, undermining, and neutralizing. As we mentioned earlier, image and text can interact through information processing. And smooth processing will benefit message meaning delivery and persuasion. Besides getting message recipients' attention, pictures relevant to messages increase a consumer's favorable attitude and purchase intention of a product (Miniard et al., 1991). Previous studies consistently showed that picture and text congruence helped readers' memorization of the message and increased readers' interests when the message was not complicated (Luna & Peracchio, 2001; Luna, Peracchio, & de

Juan, 2003; Miniard et al., 1991). Text-image congruence at times takes place in a few forms, such as meaning congruence and vividness congruence. Smith and Shaffer (2000) showed that vividness can enhance or reduce message persuasion effects. Also, the difference of influences is determined by if the vivid presentation is congruent with the theme of text message. A study of online hotel advertising provided more support that text-image congruence would enhance persuasion. Researchers have found that text-image congruence boosts consumers' attitudes toward products. They argued that text-image congruency eased information processing and provided clear ideas to readers (Van Rompay, De Vries, & Van Venrooij, 2010). Moreover, other studies show that incoming information is enhanced when verbal messages are accompanied by relevant imagery or versa (Tetlock, Saar-Tsechansky, & Macskassy, 008), especially in the situation of vividness presentation congruence with message theme (Smith & Shaffer, 2000).

In addition to images' supplementary meanings to text contents, Seo (2020) suggested that visual images serve as a moderator to influence persuasion outcomes, as visual images can highlight specific part of messages by showing positive or negative aspect of the issue. This is similar to part of gain- and loss-framing function, which also highlights the positive or negative results from compliance in health promotion messages. A study in health promotion inspected image interaction with gain- and loss-frames. The research has concluded that loss-framed text only message solicits higher risk response, but images are more powerful in persuasion with both gain- and loss-framed messages (Niu et al., 2020).

Another study on gain- and loss-framing persuasion has paired gain- and loss-framing with healthy and unhealthy mouth to investigate stopping smoking intentions. The

results showed that unhealthy mouth picture induces a higher intention to quit regardless of framing. Additionally, unhealthy mouth pictures with loss framing have the most persuasive effects (Verlhiac, Chappe, & Meyer, 2011). This result agrees with earlier studies that negative images elicit more attention (Thornton, Kirchner, & Jacobs, 1991). Smith and Shaffer's study (2000) on charity promotion has also examined gain- and loss-framing interaction with positive and negative valance images. The study's results confirmed that text-picture congruence enhances the message's effects on persuasion.

With the evidence from previous studies, we can conclude that text and image can be congruent in many forms, such as meaning congruence and vividness congruence. Valance congruency is one of them. Gain-framing with positive image and loss-framing with negative image are considered as valance congruence. They will have better persuasion effect than gain-framing with negative image. Information processing theories also support that valance congruent messages should have more persuasive power than valance incongruent messages. With the suggestion from previous research that simple pictures induce superficial process (Schnotz & Bannert, 1999), positive or negative pictures (considered as simple pictures) will go through heuristic process (superficial process) and generate corresponding emotions. Negative images solicit stronger emotions, leading to either increasing or reducing one's inclination toward text contents. As we discussed in hypothesis 2, the two topics in current study can be categorized as riskier health behavior domain. Based on the discussion in hypothesis 2 and some supportive findings that loss-frames are more persuasive in disease detection and vaccine promotion (Abhyankar, O'connor, & Lawton, 2008; Gerend & Magloire 2008; Nan, Xie, & Madden, 2012), loss-framing with negative images should be more persuasive than gain-framing with positive

image. Although these two combinations both focus on valance congruence, loss-framing and negative images increase susceptibility and lead readers to be more compliant with recommendations. Therefore, we propose that:

H4: Negative images with loss-framed messages will lead to a greater increase in accepting recommended behaviors compared to (1) positive images with gain-framed messages, (2) positive images with loss-framed messages.

CHAPTER IV

RESEARCH METHODOLOGY

This study investigates two elements of a social media post (gain- and loss-framing and visual) that may potentially influence two types of behaviors: performing targeted behaviors and sharing received information in social media. The experimental design is chosen to validate the propositions articulated in Chapter III. The current study design is adapted from previous studies on gain- and loss-framing (O’Keefe & Jensen 2007; 2008; O’Keefe & Wu, 2012).

4.1 Experiment Design

The current study employs a two by three between-factorial design implemented on the online platform. This design is similar to some of recently published studies on text-visual research (Powell et al., 2015; 2019; Niu et al., 2020), and creates six treatment conditions. Six treatments are Gain-framed text with white background (G), Gain-framed text with positive picture (GP), Gain-framed text with Negative picture (GN), Loss-framed text with white background (L), Loss-framed text with positive picture (LP), Loss-framed text with negative picture (LN). The six treatments also encompass two healthcare topics

to address the potential issue in which yielded results may be context oriented. Two health topics represent two quite different characters. Depression is a well-known disorder with negative stigma (Lueck, 2017). The promotion of driving people to seek help is a continuous effort. In contrast meningitis is rarely mentioned in public, but its prevention method is to take vaccine, which is not universally accepted by people (Nan & Madden, 2012; Chen & Dredze, 2018). All participants will be assigned to both topics. The following table lists the experiment treatments (Table 1):

Table 1: Experiment conditions and planned numbers of participants

Experiment Condition Name:	Planned Participant Count
G – gain frame only no image	200
GP – gain frame with positive image	200
GN – gain frame with negative image	200
L – loss frame only no image	200
LP – loss frame with positive image	200
LN – loss frame with negative image	200

Since the experiment was conducted online, techniques have been used to ensure all participants are randomly assigned to one of the six conditions to reduce individual differences.

4.2 Variables and Measurements

4.2.1 Independent Variables

Independent variables are the six treatments. They are categorical values. Current experiment's promotion messages are constructed based on previous research. Early studies have used a few different kinds of gain- and loss-framed text formats, summarized in Table 2. Examples of gain- and lost-framed texts in previous studies are listed in Table 3. In this current study, Type 2 (in Table 2) is used to conduct experiments. Because this experiment is an online survey, the messages are designed with concise and short sentence

length in mind, which can help maintain readers' attention. Gain- and loss-framed texts in this study are listed in Table 4.

Table 2: Gain- and loss-frames format

Type	Gain-framed	Loss-framed
1	Take action -> get benefits	Not take action -> Not get benefits
2	Take action -> get benefits	Not take action -> lead consequences
3	Take action -> avoid consequences	Not take action -> Not get benefits
4	Take action -> avoid consequences	Not take action -> lead consequences

Table 3: Example gain- and loss- framing phrases from published studies

Gain Frame	Loss Frame	Resource
<p>By doing BSE now, you can learn what your normal, healthy breasts feel like, so that you will be better prepared to notice any small, abnormal changes that might occur as you get older. Research shows that women who do BSE have an increased chance of finding a tumor in the early, more treatable stage of the disease.</p> <p>You can gain several potential health benefits by spending only 5 minutes each month doing BSE. Take advantage of this opportunity.</p>	<p>By not doing BSE now, you will not learn what your normal, healthy breasts feel like, so that you will be ill prepared to notice any small, abnormal changes that might occur as you get older. Research shows that women who do not do BSE have a decreased chance of finding a tumor in the early, more treatable stage of the disease. You can lose several potential health benefits by failing to spend only 5 minutes each month doing BSE. Do not fail to take advantage of this opportunity.</p>	Meyerowitz and Chaiken (1987)
<p>There are many benefits, or good things, you may experience if you get tested for HIV.</p> <p>If you decide to get HIV tested, you may feel the peace of mind that comes with knowing about your health.</p> <p>There are many problems, or bad things, you may not experience if you get tested for HIV. If you decide to get HIV tested, you may feel less anxious because you would not wonder if you are ill.</p>	<p>There are many benefits, or good things, you may not experience if you do not get tested for HIV. If you decide not to get HIV tested, you will not feel the peace of mind that comes with knowing about your health.</p> <p>There are many problems, or bad things, you may experience if you do not get tested for HIV. If you decide not to get HIV tested, you may feel more anxious because you may wonder if you are ill.</p>	Apanovitch et al. (2003)
<p>Flossing your teeth daily removes particles of food in the mouth, avoiding bacteria, which promotes great breath.</p>	<p>If you do not floss your teeth daily, particles of food remain in the mouth, collecting bacteria, which causes bad breath.</p>	Mann et al. (2004)

Table 4: Gain- and loss- frame phrases in the current study

Topic Area	Gain Frame	Loss Frame
Depression Disorder	Depression is a leading cause of disability globally, but around two-thirds of the cases are undiagnosed. Taking a screening test ensures early diagnosis of depression, increased treatment effectiveness, and higher quality of life.	Depression is a leading cause of disability globally, but around two-thirds of the cases are undiagnosed. Not taking the screening test could lead to untold suffering and even suicide.
Meningitis	Although uncommon, bacterial meningitis is serious and can be fatal. Vaccines are available. Taking the meningitis vaccine helps ensure your safety and saves your life.	Although uncommon, bacterial meningitis is serious and can be fatal. Vaccines are available. Not taking the meningitis vaccine could lead to severe sickness and endangers your life.

Gain- and loss-frame manipulation check is conducted in the current study with a 7-point Likert scale question. The question is derived from previous studies and adapted to current topics (Schneider et al., 2001; Quick & Bates, 2010; Zhao & Nan, 2010; Cho & Sands, 2011; Kim & Park, 2012).

Visual images used in this study are carefully selected to present positive or negative mood and are validated by other independent researchers to confirm their tone of emotions before pre-test conduction. Perceived emotion induction check with image is also evaluated with a single item measure 7-point Likert scale adapted from picture effective research (Kurdi, Lozano, & Banaji, 2017).

4.2.2 Dependent Variable

Behavior intention measures one's intention to perform a specific behavior. The higher intention, the more likely behavior will be performed (Ajzen, 1991). Behavior intention is widely used in gain- and loss-framing research to indicate the framing effect. A recent study summarized 249 ratings into a three-dimension multi-item Likert scale

measure of persuasion, which evaluates message persuasion power on users (Thomas, Masthoff, & Oren, 2019). The current study investigates the messages' compelling power on two behaviors: acting accordingly to the message recommendation and sharing the message to others. Because the new three-dimension measure of message persuasion not only covers the traditional behavior intention perspective but also adds in readers' assessment of the messages, it is more suitable to the current study. Therefore, the current study implements the three-dimension persuasion measure as proxy of message acceptance and tradition behavior intension measure as the proxy of sharing intention.

The Message Persuasive Scale (Thomas, Masthoff, & Oren, 2019) contains three dimensions with 9 items to evaluate the effectiveness, quality, and capability of the message. Message effectiveness (ME) relates to users' changes and attempts to the goal. Message quality (MQ) evaluates message trustworthiness and appropriateness. Message capability (MC) estimates potential effects on motivating or changing a reader's behavior (Thomas, Masthoff, & Oren, 2019). The 9 items are all 7-point Likert scales.

Sharing intention measurement (SH) uses 4-item 7-point Likert scale questions. This measure is adapted from several previous studies on information sharing, grouped highly related online actions, such as share, like, and comment (Lee & Ma, 2012; Hur, Kim, Karatepe, & Lee, 2017; Wojdynski & Evans, 2016; Keib et al., 2018).

4.2.3 Control Variables

Control variables included in this study are attitude (ATT), issue involvement (ISIN), prior sharing experience (PSE), and enjoyment of helping others (EHO). Attitude has long been proposed as behavior intention antecedent and positively affects behavior intention, but it is not always a good predictor of behavior pattern because of the attitude

behavior intention gap (Ajzen 2001). Sometimes, attitudes are inconsistent with behavior intentions. Also, attitude is a topic related factor. People have different attitude toward different behaviors. Therefore, we added ATT as one of the control variables. ATT is designed with a 4-item 7-point Likert scale, which has been adapted from existing research (Quick & Bates, 2010; Kim & Park 2012; Millar & Millar 1996)

In information processing literature, issue involvement is recognized as a factor that causes inconsistent findings of messages' persuasion effects. People would like to read what they care about and discuss the topic with others, so they are more likely to scrutiny messages through system processing than those who are not involved (Petty & Cacioppo, 1986). Also, issue involvement is found as one of the factors that influence people's retweeting behavior on Twitter (B Barhorst & Wilson 2017; Lahuerta-Otero et al., 2018). As such, issue involvement highlights one's subjective opinion on the recommended behaviors, and likely adds bias in results. Issue involvement is measured by a 4-item 7-point Likert scale, which is adapted from an early study (Flora & Maibach, 1990).

Prior sharing experience is another interesting factor to control because evidence from previously published papers has shown its impact on retweeting messages (Oeldorf-Hirsch & Sundar, 2015) and news sharing on social media (Lee & Ma, 2012). Although Internet users may choose to share some messages and not others with a reason, their probability to share next message could depend on their habits and personalities, which are unrelated to the message content. Therefore, previous sharing experience may be a factor that influences a reader's action on sharing message, which is an act that not tightly related to message content. A 3-items measure adapted from Lee and Ma's (2012) work is deployed to this study.

Enjoyment of helping others is an important motivation of sharing knowledge and information with others (Wasko & Faraj, 2000). Because people think the information can benefit others, they are more willing to pass it along. Social media makes sharing easier, such as clicking a button to retweet or repost. Therefore, this factor is also considered to be not associated with message topic. This study creates a 4-item 7-point Likert scale measure adapted from previous study (Wasko & Faraj, 2000; Lin, 2007; Lee 2014)

We introduce an ad-hoc control variable, which measures possible COVID-19 impact on readers' behaviors. During the past three years, the whole world was under influence of COVID-19 pandemic and focused on the control of the outbreak. A few research articles have replicated prospect theory study with the current pandemic. Their work has found loss-framed messages stir up strong negative emotions in the crisis (Ruggeri et al., 2020; Hameleers 2021). Because our experiment was conducted in the time when COVID19 was still a main topic in world news, a few COVID-19 related questions are asked to evaluate if this crisis has an impact on our experiment. Since one of our message topics is related to vaccination, which is a highly recommended method to prevent COVID, we designed three 7-Likert scale questions to measure COVID impact. All variables and their measurements with publication sources are listed in the Table 5 and Table 6.

Table 5: Variables list

Category	Variable Symbol	Questions	Source
Dependent Variable	SH_1	How likely would you be to:	Lee & Ma, 2012;
		share this post	Hur et al. 2017;
	SH_2	send this post to a friend	Chang, Yu, & Lu, 2015;
	SH_3	like this post	Wojdynski & Evans, 2016;
	SH_4	comment on this post	Keib et al 2018
	ME_1	This message will cause changes in my behavior	Thomas, Masthoff, & Orcn, 2019
	ME_2	This message causes me to make some changes in my behavior	
	ME_3	After viewing this message, I will make changes in my attitude	
	MQ_1	This message is accurate	
	MQ_2	This message is trustworthy	
	MQ_3	I believe this message is true	
	MC_1	This message has the potential to change a recipient's behavior	
	MC_2	This message has the potential to influence a recipient's behavior	
MC_3	This message has the potential to inspire a recipient to act		
Non-content related Control Variable	PSE1	I often post messages on social media	Lee & Ma, 2012
	PSE2	I often share pictures and videos	
	PSE3	I often share social media posts	
	EIO1	I enjoy helping others on social media	Wasko & Faraj, 2000; Lin, 2007; Lee 2014
	EHO2	It feels good to help others with my knowledge on social media	
	EHO3	I enjoy sharing important news or event information	
	EIO4	It feels good to pass along interesting information	
	COV1	COVID-19 led me to be more positive toward recommendations from governmental agency about healthcare.	
	COV2	COVID-19 led me to be more willing to follow recommendations from healthcare providers.	
	COV3	COVID-19 led me to be more positive toward vaccination.	

Table 6: Variables list (continue)

Category	Variable Symbol	Questions	Source
Content related Control Variable, Topic 1	T1AT2_1	Early diagnosis of depression disorder is beneficial	Quick & Bates, 2010;
	T1AT2_2	Early diagnosis of depression disorder is desirable.	Kim & Park 2012;
	T1AT2_3	Early diagnosis of depression disorder should be effective.	Millar & Millar 1996
	T1AT2_4	Early diagnosis of depression disorder is important.	
	T1ISIN_1	I think depression is a big deal	Flora & Maibach, 1990
	T1ISIN_2	I think I am at risk of getting depression	
	T1ISIN_3	I am actively seeking information on depression	
	T1ISIN_4	I think preventing depression is an important topic	
Content related Control Variable, Topic 2	T2AT2_1	Taking meningitis vaccine is beneficial	Quinn et al., 2017;
	T2AT2_2	Taking meningitis vaccine is desirable	Quick & Bates, 2010;
	T2AT2_3	Taking meningitis vaccine should be effective	Kim & Park 2012;
	T2AT2_4	Taking meningitis vaccine is important	Millar & Millar 1996
	T2ISIN_1	I think meningitis vaccination is a big deal	Flora & Maibach, 1990
	T2ISIN_2	I think I may be at risk of getting meningitis	
	T2ISIN_3	I am actively seeking information on meningitis vaccination	
	T2ISIN_4	I think meningitis vaccination is an important topic	

4.3 Participants and Sampling

All participants are recruited from Amazon Mechanical Turk (MTurk). MTurk is an online crowdsourcing labor market, rapidly adopted by academic researchers in recent years. Specifically, its use has shown an increase of 2117% in management research alone

from 2013 to 2019 (Aguinis, Villamor, & Ramani, 2021). MTurk has also been widely used in psychology, healthcare, education, and social science (Chan & Holosko, 2016). Studies of message persuasion have also been done on MTurk recently (Powell, Boomgaarden, De Swert, & de Vreese, 2019).

According to Cohen (1988), the rule of thumb for effect size summarized from previous literature has suggested 0.2, 0.5, 0.8 as small, medium, and large, respectively. Since previous meta-analyses on gain-loss framing effects show that only a marginal difference is found (O'Keefe & Jensen, 2008; 2012), we expect the effect size for this experiment could be much smaller than 0.2. There are two reasons that led to large sample size needed for this study. First, MTurk respondents' inattention rate is marginally higher than that of the student sample (Aguinis, Villamor, & Ramani, 2021). Second, there needs to be enough sample size to capture a small effect. The sample size is calculated with the online calculator G*Power, a popular statistic calculator created by Heinrich Heine University in Germany, with the small effect size 0.2 (found in most previous studies on gain-loss framing (O'Keefe & Jensen, 2008; 2012)), 95% confidence level, and 80% power. A few other online research sample size calculators are also used for validation. The final experiment sample size is decided to be 200 participants for each condition (6 conditions in total as stated earlier). The total calculated sample size is 1200.

4.4 Experiment Procedure

4.4.1 Measurement and Material Evaluation

The experiment vignette setup and questionnaires are distributed to 10 research scholars who are familiar with healthcare and information research for comments and

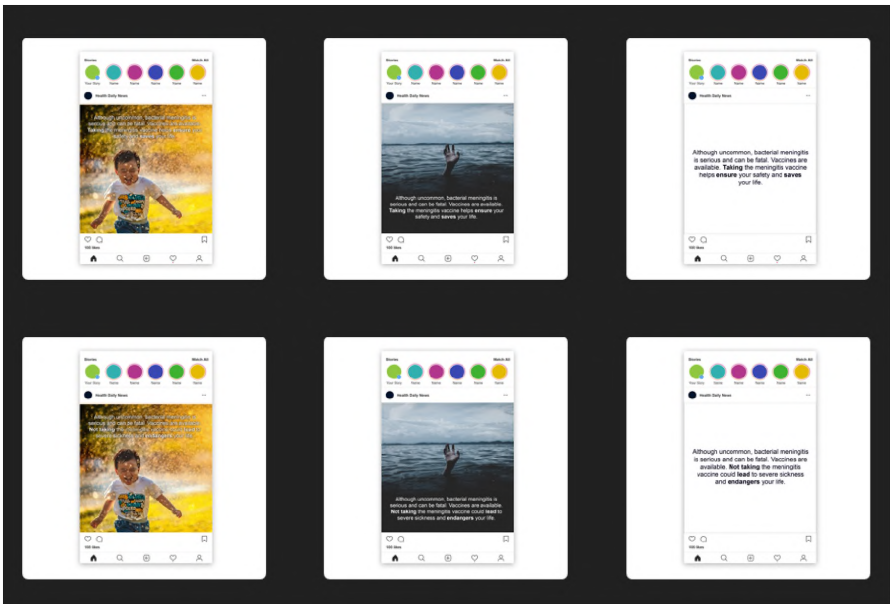
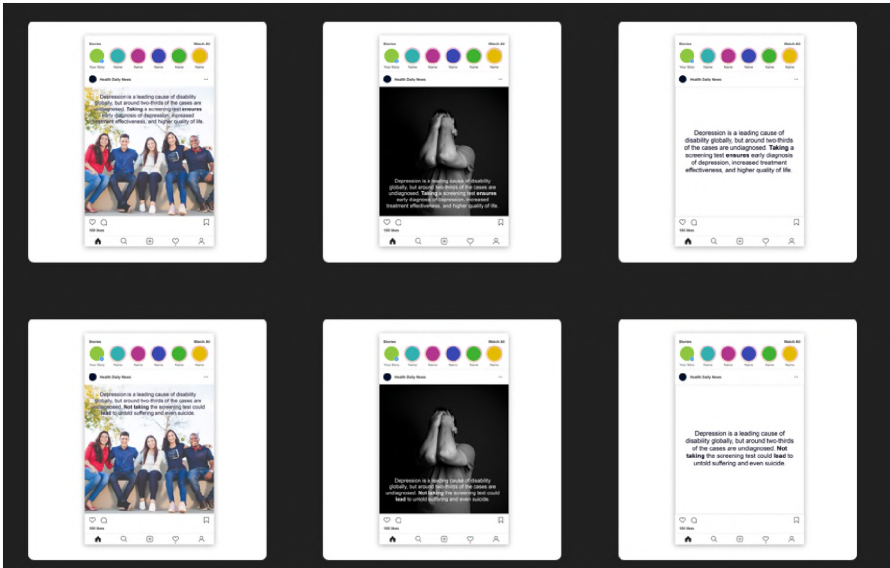
suggestions. The final materials of gain- and loss-framed messages and images are set upon the recommendations from these people.

4.4.2 Experiment

MTURK and Qualtrics were used to set up this survey experiment. A few pilot tests were conducted to validate embedded randomization, attention check, and other utilities of the survey. Also, data from these pilot tests were used to further fine-tune survey instrument for question clarity and survey length.

The final design of gain- and loss-framed messages and their corresponding images are displayed below (Figure 3 & 4). The message format uses Instagram post template, which is popular. Also, the vignettes have been removed from all components that identify social media. The removal is to minimize bias from users of different social media.

The final experiment, which consists of six surveys of vignettes, was conducted on MTURK early 2022. Each survey presents one treatment. Final experiment included background procedures to prevent a participant to take more than one survey. The experiment was set to guarantee MTURK workers were randomly assigned to one experiment condition and one worker with one treatment only. All Participants had the ability to go back to previous questions if needed during the survey process. After all surveys were finished and submitted, all responses were collected from both MTurk and Qualtrics. Match tests were performed for MTurk and Qualtrics data link to ensure data accuracy. Any lining answers and incomplete results were discarded. Valid Survey results were combined and loaded into Microsoft SQL database.



CHAPTER V

RESULTS/FINDINGS

5.1 Overall Experiment Participants

This experiment was conducted on MTURK from April 4th to April 6th, 2022. All surveys were closed when successful submission counts were met, but survey takers could still submit their responses if they were in the middle of taking the surveys. Finally, there were a total of 1936 participants, including both successful and non-successful submissions. Many of them did not pass attention checks and their survey responses were discarded. After cleaning up invalid records, there were 1281 useful responses in total. The low completion rate (about 67%) aligned with previous research conclusion, which MTURK survey takers have less attention than students (Aguinis, Villamor, & Ramani, 2021). Most survey takers claimed to be white. There were more male survey takers in the overall participants. The majority of survey takers claimed to have higher education, like 4-years college. Detailed demographic information is listed in Table 7.

Table 7: Participants

Participants profile (Total n = 1281)						
Demographic	Message Treatment *					
	G	GN	GP	L	LN	LP
Sex						
Male	107	134	150	115	122	124
Femal	104	79	66	98	88	94
Race						
White	191	185	181	182	181	190
Black or African American	14	14	23	17	20	24
American Indian or Alaska Native	2	2	5	2	3	1
Asian	3	9	6	9	4	1
Native Hawaiian or Pacific Islander						1
Other	1	3	1	3	2	1
Age						
18-24	18	13	12	8	19	8
25-34	100	89	87	102	89	99
35-44	53	67	68	65	54	70
45-54	26	27	35	25	29	24
55-64	9	15	13	10	18	14
65-74	5	2	1	3	1	3
Education						
Less than high school				1		1
High School Graduate	10	5	11	17	18	13
Some Colledge	12	19	23	11	7	7
2-year Degree	11	11	7	9	4	8
4-year Degree	139	153	133	145	139	153
Professional Degree	38	21	41	30	40	34
Doctorate	1	4	1		2	2

* G - gain-frame without image; GN - gain-frame with negative image; GP - gain-frame with positive image

L - loss-frame without image; LN - loss-frame with negative image; LP - loss-frame with positive image

5.2 Factor Confirmation Analysis

This study has developed measurements of all dependent and control variables through adaptation from previous research. Factor loading was conducted to confirm the new measure instruments for chosen factors. All the analysis was performed in RStudio. Variables were classified into three categories: dependent variables, non-content related

control variables, and content related control variables. Loading analysis was done for each category separately. The analysis used the generalized least square (gls) method and rotation with Oblimin. Oblimin rotation method was chosen over Varimax because it was assumed that these measurements were correlated in the real world. Final loading results after removing unfitted items are shown in Table 8. All factors have Cronbach Alpha over 0.8 except issue involvement.

Table 8: Factors

	Factor Name	Factor Loading	Composite Reliability	Cronbach Alpha
SH (Sharing Intention)	SH_1	0.756	0.96	0.91
	SH_2	0.833		
	SH_3	0.807		
	SH_4	0.862		
ME (Message Effects)	ME_1	0.890	0.86	0.91
	ME_2	0.798		
	ME_3	0.759		
MQ (Message Quality)	MQ_1	0.749	0.78	0.83
	MQ_2	0.809		
	MQ_3	0.647		
MC (Message Capability)	MC_1	0.725	0.75	0.82
	MC_2	0.755		
	MC_3	0.624		
PSE (Previous Sharing Experience)	PSE1	0.858	0.89	0.89
	PSE2	0.834		
	PSE3	0.865		
COV (COVID-19 related factor)	COV1	0.806	0.88	0.88
	COV2	0.832		
	COV3	0.893		
ATT (Attitude toward content)	ATT_1	0.812	0.85	0.85
	ATT_2	0.738		
	ATT_3	0.767		
	ATT_4	0.729		
ISIN (Issue involvement)	ISIN_2	0.733	0.74	0.74
	ISIN_3	0.800		

The correlation of all variables was calculated with each testing topic because the two survey testing topics – depression detection and meningitis vaccination – are not related health topics and the correlation of variables may be influenced by the topic itself. The results show some variations but similar patterns overall. (Table 9 & 10)

Table 9: Correlation Matrix for Depression Detection

	ATT	MQ	MC	ISIN	COV	PSE	SH	ME
ATT	1.00							
MQ	0.60	1.00						
MC	0.58	0.67	1.00					
ISIN	0.33	0.41	0.41	1.00				
COV	0.33	0.43	0.42	0.51	1.00			
PSE	0.22	0.40	0.37	0.53	0.57	1.00		
SH	0.25	0.46	0.50	0.63	0.63	0.76	1.00	
ME	0.32	0.51	0.57	0.63	0.63	0.64	0.80	1.00

Table 10: Correlation Matrix for Meningitis Vaccination

	MC	MQ	ATT	COV	PSE	ISIN	SH	ME
MC	1.00							
MQ	0.70	1.00						
ATT	0.58	0.71	1.00					
COV	0.47	0.52	0.54	1.00				
PSE	0.37	0.36	0.34	0.57	1.00			
ISIN	0.43	0.42	0.40	0.59	0.66	1.00		
SH	0.50	0.48	0.41	0.68	0.76	0.76	1.00	
ME	0.58	0.51	0.44	0.63	0.64	0.73	0.80	1.00

5.3 Manipulation Checks

There are two framing manipulation checks: one for gain- and loss-framing, and the other for positive and negative imaging. Both manipulation checks were performed with t-tests on participants' responses of framing and visual evaluation. The two topics – depression detection and meningitis vaccination – were tested separately because two different sets of visuals and text phrases were used. The t-test results for both manipulations

– gain- and loss-framing and visual framing – are both statistically significant. Therefore, we conclude that gain- and loss-framing with positive and negative images worked as designed. Details are presented in Table 11 and Figure 5.

Table 11: Manipulation Check Results

Validation Category	Treatment	Depression Detection			Meningitis Vaccination		
		Mean ^a	p-Value	SC ^b	Mean	p-Value	SC
FRAMING	Gain-frame	5.7	<0.0001	***	5.9	<0.0001	***
	Loss-frame	4.8			4.9		
IMAGE	Positive	5.9	<0.0001	***	6.0	<0.0001	***
	Negative	5.7			4.9		

^a Likert Scale 1 - 7

^b SC (Significant Code): *** p < 0.0001, ** P < 0.001, * P < 0.01

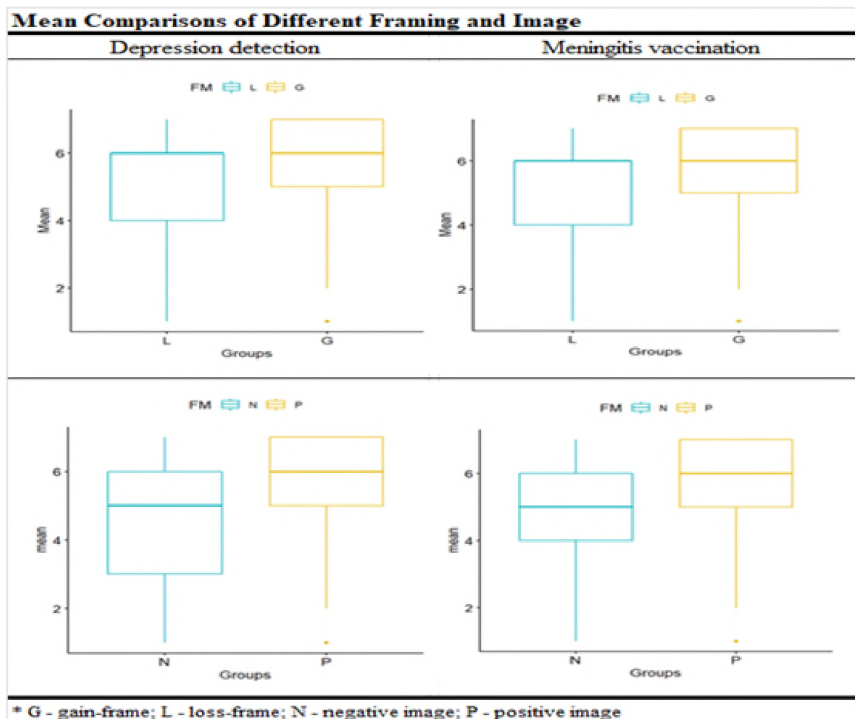


Figure 5: Means Comparison

5.4 Hypotheses Tests

Prior to performing tests on each hypothesis, the mean and standard deviation of sharing intention and message acceptance were summarized by treatment conditions. The three dimensions of message acceptance (message effectiveness, message quality, and message capabilities) have also been evaluated with their means and standard deviations by each treatment condition. Details shown in Table 12 and Table 13.

Table 12: Mean & Standard Deviation for Each Topic and Group

	Depression Detection		Meningitis Vaccination	
	Mean	SD	Mean	SD
SH (Sharing Intention)				
Gain-frame, No Image	5.6197	1.1778	5.6197	1.1287
Gain-frame, Negative Image	5.1068	1.4692	5.0716	1.5757
Gain-frame, Positive Image	5.1921	1.5684	5.1343	1.6985
Loss-frame, No Image	4.9613	1.6705	4.9730	1.6862
Loss-frame, Negative Image	5.2167	1.4119	5.2286	1.4473
Loss-frame, Positive Image	5.3349	1.5616	5.3658	1.5180
MA (Message Acceptance)				
Gain-frame, No Image	5.6477	0.8090	5.6567	0.8159
Gain-frame, Negative Image	5.2410	1.0098	5.2650	0.9859
Gain-frame, Positive Image	5.4321	0.9524	5.4270	1.0337
Loss-frame, No Image	5.1268	1.1086	5.0704	1.1622
Loss-frame, Negative Image	5.3270	1.1038	5.3101	1.1725
Loss-frame, Positive Image	5.4149	1.0833	5.5280	0.9798

Table 13: Mean & Standard Deviation for Each Topic and Group (continue)

	Depression Detection		Meningitis Vaccination	
	Mean	SD	Mean	SD
ME (Message effectiveness)				
Gain-frame, No Image	5.3871	1.1726	5.4708	1.0428
Gain-frame, Negative Image	4.8075	1.4949	4.7793	1.5479
Gain-frame, Positive Image	4.9321	1.6217	4.8843	1.7838
Loss-frame, No Image	4.8263	1.5637	4.6510	1.6798
Loss-frame, Negative Image	5.1016	1.4263	5.1016	1.3501
Loss-frame, Positive Image	5.0703	1.5827	5.1927	1.4523
MQ (Message Quality)				
Gain-frame, No Image	5.7551	0.8720	5.7567	0.8612
Gain-frame, Negative Image	5.5008	1.0756	5.5556	0.9967
Gain-frame, Positive Image	5.7160	1.0185	5.6975	1.1030
Loss-frame, No Image	5.3255	1.1171	5.2848	1.2300
Loss-frame, Negative Image	5.4540	1.1622	5.4524	1.2079
Loss-frame, Positive Image	5.6239	1.1369	5.6728	0.9997
MC (Message Capability)				
Gain-frame, No Image	5.8009	0.8251	5.7425	0.8876
Gain-frame, Negative Image	5.4147	1.0399	5.4601	1.0275
Gain-frame, Positive Image	5.6481	0.9887	5.6991	1.0041
Loss-frame, No Image	5.2285	1.1533	5.2754	1.1589
Loss-frame, Negative Image	5.4254	1.1352	5.3762	1.2204
Loss-frame, Positive Image	5.5505	1.1117	5.7187	0.9724

Hypothesis (H1) suggests that gain-framed messages are shared more than loss-framed messages. Therefore, we performed a t-test on the two treatment groups – gain-framed with no image and loss-framed with no image – for both topics. In Table 12, topic 1, the mean of sharing intention (SH) of gain-framed messages with no image treatment is 5.6197 and mean of loss-framed messages with no image treatment is 4.9613. For topic 2, the means of these two groups are 5.6197, and 4.9730 respectively. The t-value for depression detection message is 4.6864 and the t-value for meningitis vaccination is 4.6360. The p-values for both topics are less than 0.0001. Therefore, the means from the two treatment groups are significantly different, indicating that the readers are more likely

to share gain-framed message than loss-framed message. The results from both testing topics support H1.

Hypothesis (H2) suggests that loss-framed message is more acceptable or persuasive than gain-framed message. Message acceptance is measured with three dimensions. First, message effectiveness evaluates whether readers like to accept the recommendations independently. Second, message quality is how readers rate the message quality. Third, message capability is how readers weigh the message's effects on other people. We performed t-test on message acceptance (MA) level, which was the average of all three dimensions. Also, we did t-tests at all three-dimension levels. The mean of message acceptance for gain-framed message was 5.6477 for depression detection topic and 5.6567 for meningitis topic. They are significantly larger than their loss-framed message counterpart means, 5.1268 and 5.0704, with t-value as 5.523 and 6.006 respectively. Therefore, H2 is not supported. The results are opposite to our assumption. Gain-framed messages are more acceptable than loss-framed messages. The t-tests on each dimension measure show similar results. Gain-framed messages perform well in all three dimensions compared to loss-framed messages. All of the dimension results have confirmed that H2 is not supported. The t-test details are listed in Table 14.

Hypothesis (H3) has two sets of comparisons. Because gain-frame is the positive expression of content and positive image should reinforce the positive feature, H3 suggests gain-framed message with positive image should be more shareable than loss-framed message with negative image. T-test was performed on these two treatments for each testing topic. The results show no difference between these two-treatment groups. Both topics gave similar results. T-test was also performed on the second set of comparison,

gain-framed message with positive image versus gain-framed message with negative image. The results show that a positive image does not have any advantage on people's intention to share the posts they had just read with both topics. H3 is not supported (Table 15).

Hypothesis (H4) has two-pairs of comparisons of treatments on message acceptance. Loss-framed message with negative image is compared to gain-framed message with positive image and loss-framed message with positive image. Once again, message acceptance is measured by using the average of message effectiveness, message quality, and message capability. The means of the two groups, gain-frame with positive image and loss-frame with negative image are not indifferent for either depression detection or meningitis topics. The results are consistent with the two healthcare topics. Also, the means of the two groups, loss-frame with positive image and loss-frame with negative image have no significant difference in depression detection topic. However, loss-framed message with positive image is significantly more acceptable than loss-frame with negative image for meningitis vaccination topic. Each individual dimension of message acceptance was also analyzed using t-tests. The results do not show difference in message effectiveness in both topics, but message quality and message capability of gain-framed message with positive image are significantly better than those of loss-framed message with negative image. Since the results were mixed, we conclude that H4 is not supported (Table 16).

Table 14: T-test for Gain- and Loss-framing Without Image (H2)

Measure Name	Treatment	Depression Detection				Meningitis Vaccination			
		Mean ^a	t-Value	p-Value	SC ^b	Mean	t-Value	p-Value	SC
MA	Gain-frame	5.6477	5.5230	<0.0001	***	5.6567	6.0060	<0.0001	***
	Loss-frame	5.1268				5.0704			
ME	Gain-frame	5.3871	4.1747	<0.0001	***	5.4708	6.0306	<0.0001	***
	Loss-frame	4.8263				4.6510			
MQ	Gain-frame	5.7551	4.4116	<0.0001	***	5.7567	4.5723	<0.0001	***
	Loss-frame	5.3255				5.2848			
MC	Gain-frame	5.8009	5.8732	<0.0001	***	5.7425	4.6557	<0.0001	***
	Loss-frame	5.2285				5.2754			

^a Likert Scale 1 - 7

^b SC (Significant Code): *** p < 0.0001, ** p < 0.001, * p < 0.01

MA - message acceptance; ME - message effect; MQ - message quality; MC - message capability

Table 15: T-test of Sharing Intention (H3) - Gain- and Loss-framing With Image

Measure Name	Treatment	Depression Detection				Meningitis Vaccination			
		Mean ^a	t-Value	p-Value	SC ^b	Mean	t-Value	p-Value	SC
SH	Gain-frame Positive Image	5.1921	-0.1696	0.8654		5.1343	-0.6161	0.5382	
	Loss-frame Negative Image	5.2167				5.2286			
SH	Gain-frame Positive Image	5.1921	0.5813	0.5613		5.1343	0.3960	0.6923	
	Gain-frame Negative Image	5.1068				5.0716			

^a Likert Scale 1 - 7

^b SC (Significant Code): *** p < 0.0001, ** P < 0.001, * P < 0.01

SH - sharing intention

Table 16: T-test of Message Acceptance (H4) - Gain- and Loss-framing With Image

Measure Name	Treatment	Depression Detection				Meningitis Vaccination			
		Mean ^a	t-Value	p-Value	SC ^b	Mean	t-Value	p-Value	SC
MA	Gain-frame Positive Image	5.4321	1.05	0.2928		5.4270	1.09	0.2753	
	Loss-frame Negative Image	5.3270				5.3101			
MA	Loss-frame Positive Image	5.4149	0.83	0.4062		5.5280	2.09	0.0372	*
	Loss-frame Negative Image	5.3270				5.3101			
ME	Gain-frame Positive Image	4.9321	-1.14	0.2532		4.8843	-1.42	0.1578	
	Loss-frame Negative Image	5.1016				5.1016			
MQ	Gain-frame Positive Image	5.7160	2.47	0.0136	*	5.6975	2.19	0.0292	*
	Loss-frame Negative Image	5.4540				5.4524			
MC	Gain-frame Positive Image	5.6481	2.16	0.0312	*	5.6991	2.99	0.0030	**
	Loss-frame Negative Image	5.4254				5.3762			
ME	Loss-frame Positive Image	5.0703	-0.21	0.8304		5.1927	0.67	0.5024	
	Loss-frame Negative Image	5.1016				5.1016			
MQ	Loss-frame Positive Image	5.6239	1.53	0.1271		5.6728	2.06	0.0400	*
	Loss-frame Negative Image	5.4540				5.4524			
MC	Loss-frame Positive Image	5.5505	1.15	0.2502		5.7187	3.21	0.0014	**
	Loss-frame Negative Image	5.4254				5.3762			

^a Likert Scale 1 - 7

^b SC (Significant Code): *** p < 0.0001, ** P < 0.001, * P < 0.01

MA - message acceptance; ME - message effect; MQ - message quality; MC - message capability

5.5 Ad hoc Analysis

Gain-framed messages without images have notable advantages on both sharing and acceptance compared to loss-framed messages without images. A series of ANOVA was conducted to evaluate the image's influence on message. First, an unbalanced ANOVA was conducted for the image overall influence without distinguishing the image type. Unbalanced ANOVA used due to different sample size in each group. Messages with both positive and negative images were grouped together as message with image. We conducted unbalanced ANOVA on factor 1 – gain- and loss-frame, and factor 2 – with and without image. ANOVA was performed on both depression detection and meningitis topics. Also, five measures were tested. Two measures are estimate overall message sharing and acceptance intentions. Three measures are the dimensional measurements for acceptance intension – message effectiveness, message quality, and message capability. ANOVA outputs have shown remarkable interaction between gain- and loss-framing and image with all five measurements. Results from ANOVA tests of both topics are consistent. Adding images to gain-framed messages reduce the messages' sharing and acceptance but adding images to loss-framed messages increases their sharing and acceptance. ANOVA results of sharing and acceptance intentions are listed in Table 17. ANOVA results of acceptance dimensional measures are listed in Table 18. The interaction between the two factors is more clearly depicted in the charts for the 5 measures. Charts are listed in Figure 6 and Figure 7.

To further analyze if image type can influence the interaction, we did ANOVA test with gain- and loss-framing with three image treatments – no image, negative, and positive.

Since the responses from each group were not the same numbers, unbalanced ANOVA tests were applied. The results have also shown significant interaction with framing and image. Also, the negative images reduce sharing and message acceptance of the message. Detailed ANOVA testing results are listed in Table 19 and Table 20. Interaction charts are listed in Figure 8 and Figure 9.

Table 17: ANOVA Results of Interaction of Gain-and Loss-framing and Image without Type (Sharing and Acceptance Intentions)

Depression Detection						Meningitis Vaccination					
SH	Sum Sq	Df	F Value	Pr(>F)	SC ^b	SH	Sum Sq	Df	F Value	Pr(>F)	SC
(Intercept)	11377.1	1	5156.48	< 0.0001	***	(Intercept)	11172.1	1	4824.52	< 0.0001	***
FM	3.5	1	1.57	0.2102		FM	8.2	1	3.53	0.0605	.
Img	31.2	1	14.15	0.0002	***	Img	37.7	1	16.30	< 0.0001	***
FM:Img	43.8	1	19.83	< 0.0001	***	FM:Img	50.3	1	21.71	< 0.0001	***
Residuals	2817.5	1277				Residuals	2957.1	1277			
MA	Sum Sq	Df	F Value	Pr(>F)	SC ^b	MA	Sum Sq	Df	F Value	Pr(>F)	SC
(Intercept)	12220.4	1	11793.80	< 0.0001	***	(Intercept)	12263.2	1	11468.47	< 0.0001	***
FM	0.3	1	0.25	0.6195		FM	1.2	1	1.11	0.2916	
Img	13.6	1	13.16	0.0003	***	Img	13.6	1	12.72	0.0004	***
FM:Img	21.9	1	21.12	< 0.0001	***	FM:Img	31.0	1	28.96	< 0.0001	***
Residuals	1323.2	1277				Residuals	1365.5	1277			

b SC (Significant Code): *** p < 0.0001, ** P < 0.001, * P < 0.01

SH – sharing intention; MA – message acceptance; ME – message effectiveness; MQ – message quality; MC – message capability

Table 18: ANOVA Results of Interaction of Gain-and Loss-framing and Image without Type (Acceptance Intention Dimension Details)

ME	Sum Sq	Df	F Value	Pr(>F)	SC^b	ME	Sum Sq	Df	F Value	Pr(>F)	SC
(Intercept)	10175.6	1	4613.0660	< 0.0001	***	(Intercept)	10017.1	1	4473.7830	< 0.0001	***
FM	9.9	1	4.5077	0.0339	*	FM	21.4	1	9.5433	0.0021	**
Img	37.8	1	17.1256	< 0.0001	***	Img	57.7	1	25.7608	< 0.0001	***
FM:Img	42.7	1	19.3683	< 0.0001	***	FM:Img	91.4	1	40.8402	< 0.0001	***
Residuals	2816.8	1277				Residuals	2859.3	1277			

MQ	Sum Sq	Df	F Value	Pr(>F)	SC^b	MQ	Sum Sq	Df	F Value	Pr(>F)	SC
(Intercept)	13497.5	1	11778.8800	< 0.0001	***	(Intercept)	13583.7	1	11738.1900	< 0.0001	***
FM	1.0	1	0.8817	0.3479		FM	0.8	1	0.7208	0.3960	
Img	3.0	1	2.6297	0.1051		Img	2.4	1	2.0552	0.1519	
FM:Img	9.2	1	8.0628	0.0046	**	FM:Img	11.9	1	10.2758	0.0014	**
Residuals	1463.3	1277				Residuals	1477.8	1277			

MC	Sum Sq	Df	F Value	Pr(>F)	SC^b	MC	Sum Sq	Df	F Value	Pr(>F)	SC
(Intercept)	13129.9	1	11896.5600	< 0.0001	***	(Intercept)	13129.9	1	11896.5600	< 0.0001	***
FM	0.4	1	0.3614	0.5478		FM	0.4	1	0.3614	0.5478	
Img	10.2	1	9.2526	0.0024	**	Img	10.2	1	9.2526	0.0024	**
FM:Img	19.9	1	18.0021	< 0.0001	***	FM:Img	19.9	1	18.0021	< 0.0001	***
Residuals	1409.4	1277				Residuals	1409.4	1277			

^b SC (Significant Code): *** p < 0.0001, ** P < 0.001, * P < 0.01

SH sharing intention; MA message acceptance; ME message effectiveness; MQ message quality; MC message capability

Table 19: ANOVA Results of Interaction of Gain-and Loss-framing and Image with Type (Sharing and Acceptance Intentions)

Depression Detection						Meningitis Vaccination					
SH	Sum Sq	Df	F Value	Pr(>F)	SC ^b	SH	Sum Sq	Df	F Value	Pr(>F)	SC
(Intercept)	5554.9	1	2515.7620	< 0.0001	***	(Intercept)	5478.6	1	2364.1060	< 0.0001	***
FM	1.3	1	0.5780	0.4472		FM	2.6	1	1.1244	0.2891	
Img	32.0	2	7.2487	0.0007	***	Img	38.2	2	8.2324	0.0002	***
FM:Img	43.7	2	9.9060	< 0.0001	***	FM:Img	50.5	2	10.8964	< 0.0001	***
Residuals	2815.3	1275				Residuals	2954.7	1275			
MA	Sum Sq	Df	F Value	Pr(>F)	SC ^b	MA	Sum Sq	Df	F Value	Pr(>F)	SC
(Intercept)	5850.7	1	5657.8760	< 0.0001	***	(Intercept)	5904.4	1	5545.1820	< 0.0001	***
FM	0.8	1	0.7560	0.3847		FM	0.2	1	0.2016	0.6535	
Img	17.6	2	8.4865	0.0002	***	Img	16.4	2	7.7084	0.0005	***
FM:Img	22.4	2	10.8247	< 0.0001	***	FM:Img	31.0	2	14.5694	< 0.0001	***
Residuals	1318.5	1275				Residuals	1357.6	1275			

Significant codes: 0.0001 '****' 0.001 '***' 0.01 '**' 0.05 '.' 0.1 '.' 1

SH – sharing intention; MA – message acceptance; ME – message effectiveness; MQ – message quality; MC – message capability

Table 20: ANOVA Results of Interaction of Gain-and Loss-framing and Image with Type (Acceptance Dimension Details)

Depression Detection						Meningitis Vaccination					
ME	Sum Sq	Df	F Value	Pr(>F)	SC ^b	ME	Sum Sq	Df	F Value	Pr(>F)	SC
(Intercept)	4922.9	1	2229.6870	< 0.0001	***	(Intercept)	4865.4	1	2171.1160	< 0.0001	***
FM	9.1	1	4.1419	0.0420	*	FM	11.0	1	4.9000	0.0270	*
Img	39.4	2	8.9317	0.0001	***	Img	58.9	2	13.1330	< 0.0001	***
FM:Img	44.0	2	9.9626	< 0.0001	***	FM:Img	91.4	2	20.3840	< 0.0001	***
Residuals	2815.1	1275				Residuals	2857.2	1275			
MQ	Sum Sq	Df	F Value	Pr(>F)	SC ^b	MQ	Sum Sq	Df	F Value	Pr(>F)	SC
(Intercept)	6445.1	1	5646.7060	< 0.0001	***	(Intercept)	6574.1	1	5700.4030	< 0.0001	***
FM	0.2	1	0.2030	0.6523		FM	1.1	1	0.9761	0.3233	
Img	8.0	2	3.4971	0.0306	*	Img	4.5	2	1.9683	0.1401	
FM:Img	9.3	2	4.0704	0.0172	*	FM:Img	12.2	2	5.2716	0.0052	**
Residuals	1455.3	1275				Residuals	1470.4	1275			
MC	Sum Sq	Df	F Value	Pr(>F)	SC ^b	MC	Sum Sq	Df	F Value	Pr(>F)	SC
(Intercept)	6245.0	1	5679.8030	< 0.0001	***	(Intercept)	6350.1	1	5753.4200	< 0.0001	***
FM	0.0	1	0.0110	0.9166		FM	0.7	1	0.6745	0.4116	
Img	16.1	2	7.3014	0.0007	***	Img	9.8	2	4.4578	0.0117	*
FM:Img	20.4	2	9.2853	< 0.0001	***	FM:Img	14.0	2	6.3546	< 0.0017	**
Residuals	1401.9	1275				Residuals	1407.2	1275			

Significant codes: 0.0001 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

SH – sharing intention; MA – message acceptance; ME – message effectiveness; MQ – message quality; MC – message capability

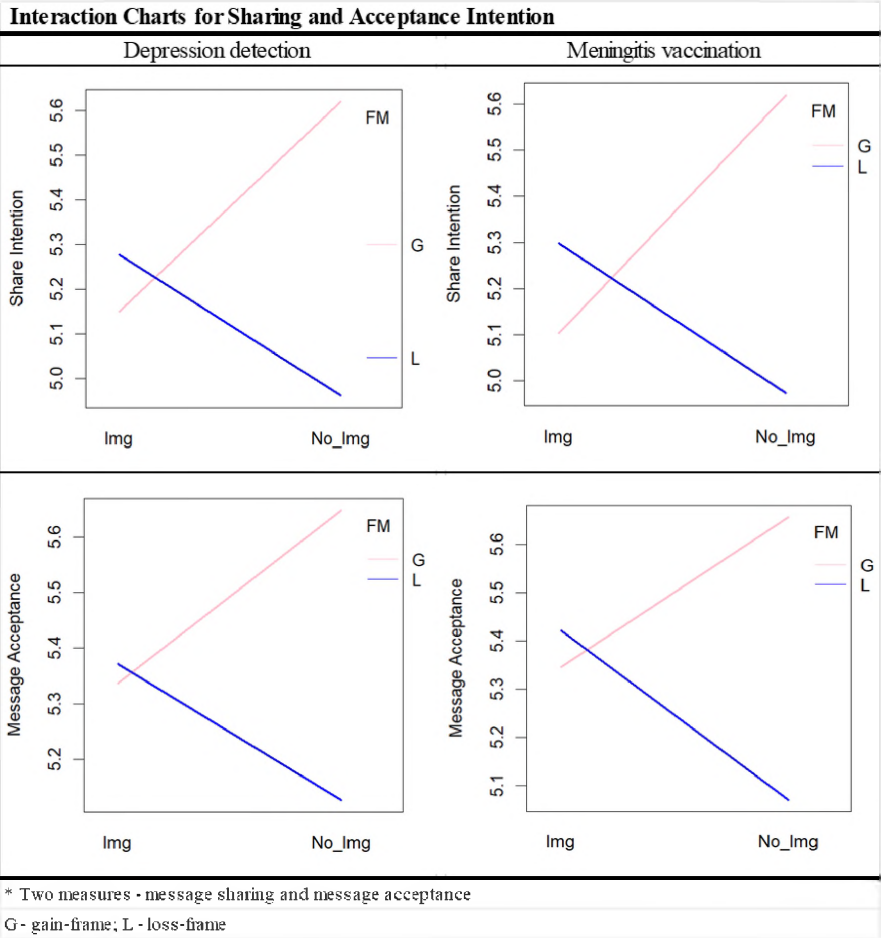
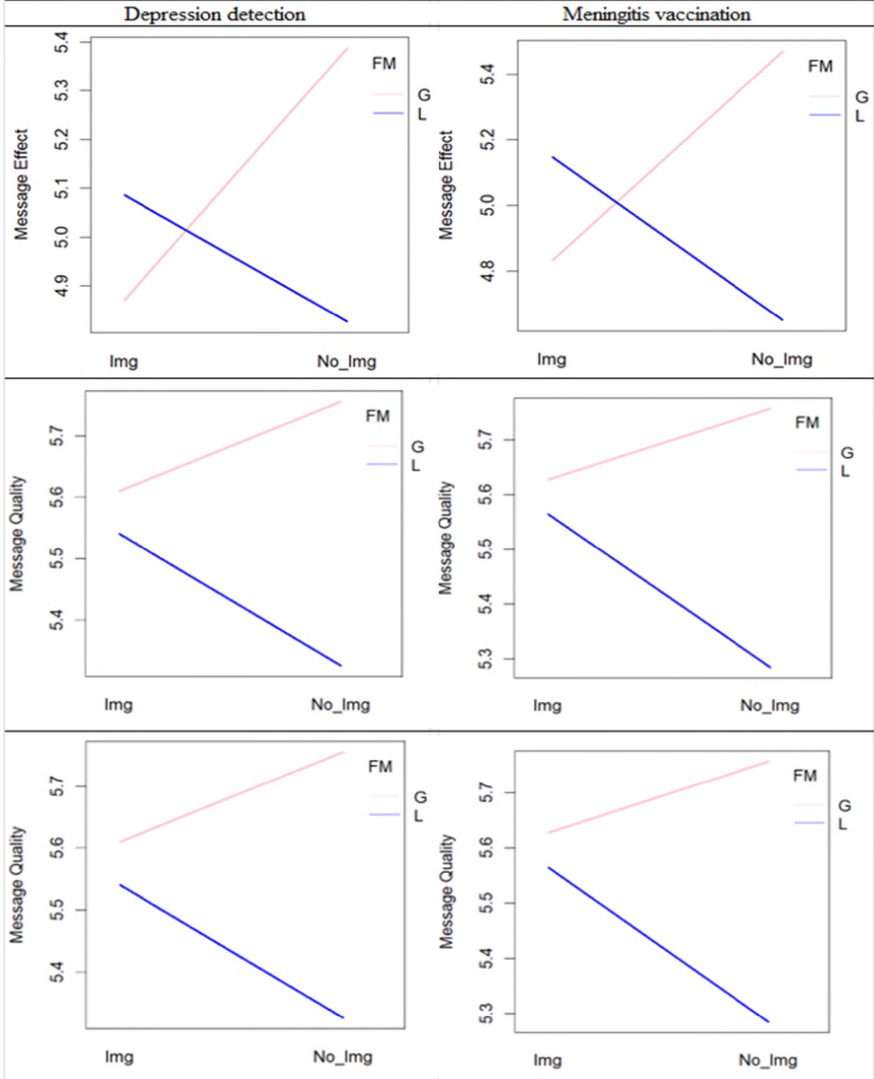


Figure 6: Interaction Without Image Type

Interaction Charts for Acceptance Intention Dimension Details



* - three detailed measures for message acceptance (Message Effect, Message Quality, and Message Capability)
 G - gain-frame; L - loss-frame

Figure 7: Interaction Without Image Type Continue

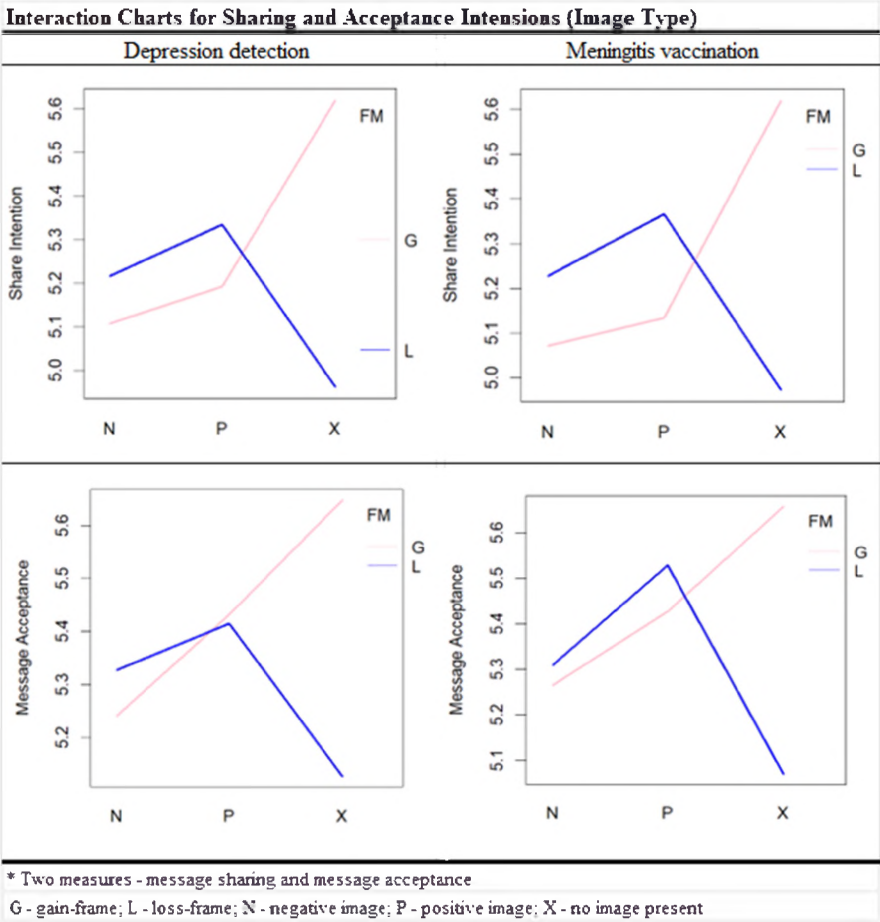


Figure 8: Interaction With Image Type

Interaction Charts for Acceptance Intension Dimension Details (Image Type)

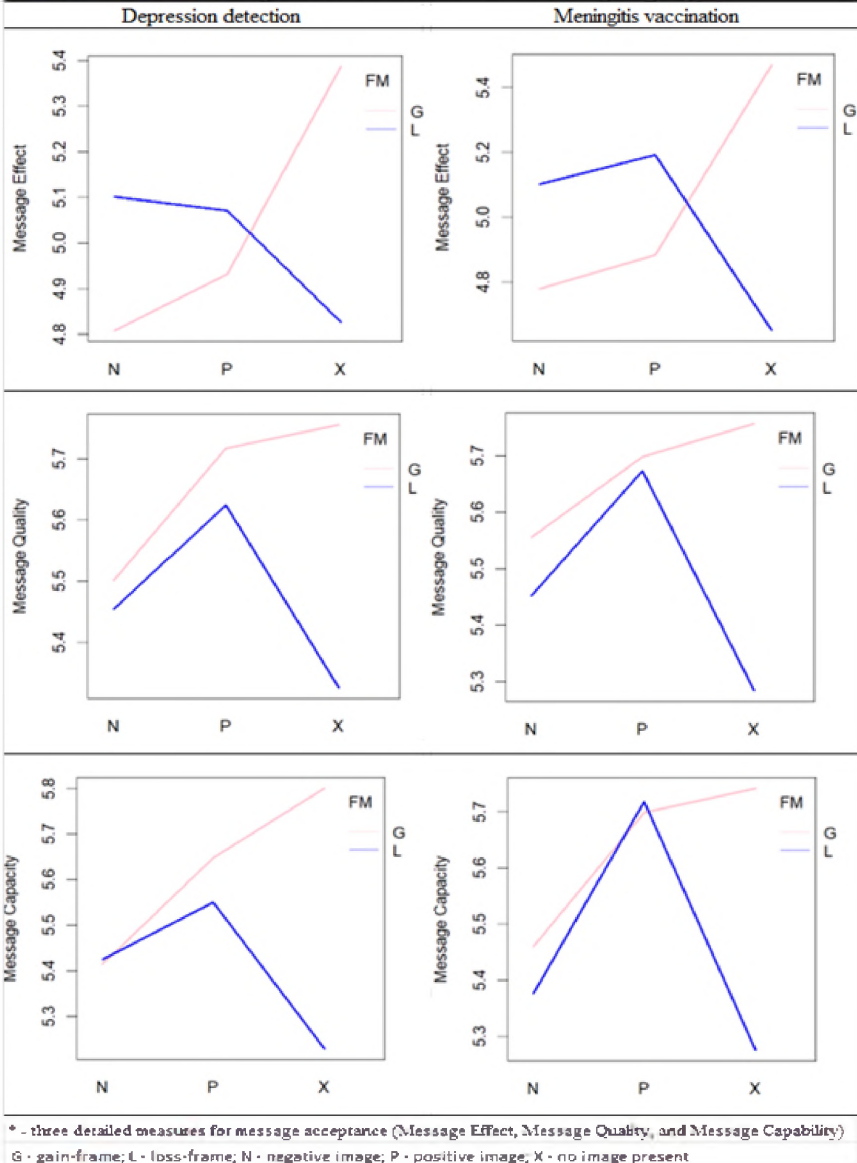


Figure 9: Interaction With Image Type Continue

5.6 Summary of Results

Current study has done hypotheses testing with t-test and checked the interaction of text and image factors with unbalanced ANOVA because the different sample sizes were found in the experiments for the six treatment conditions. Table 21 summarized test results at a high level.

Table 21: Summary of Results

Summary of test results	
Test Name	Results
Hypothesis 1	Support
Hypothesis 2	Not Support; Opposite to hypothesis
Hypothesis 3	Not Support; No significant detected
Hypothesis 4	Not Support; Mixed output
Text Framing and Image interaction:	
Gain-and loss-framing *with and without Image	Significant interaction, but opposite to proposed model
Gain-and loss-framing *Positive, Negative, and without Image	Significant interaction, but opposite to proposed model

CHAPTER VI

DISCUSSION

6.1 Discussion

The results from our experiments show that gain-framed messages perform better than loss-framed messages regardless of message sharing or acceptance. Such finding is consistent with previous studies in that positive contents are more popular online (Berger & Milkman, 2012), further confirming that users like to share positive information on social media (Choi & Toma, 2014). We proposed that message sharing and the message acceptance are two different behaviors because they are driven by different motivations.

One's online sharing behaviors are generally driven by self-centered motivations, such as gaining respect and recognition, increasing social ties, augmenting self-esteem, engaging in community activities, and enhancing reciprocal exchange (Gretzel & Yoo, 2008). Further, one's decision to perform activities suggested by the health promotion messages is presumably linked to the person's evaluations of the effectiveness of adopted behaviors and the efforts to adopt. The health risk and self-efficacy of the person play major roles in the decision of adoption of healthier behavior (Robberson & Rogers, 1988).

Therefore, a reader is likely to be convinced by a health promotion message because the reader assumes the promoted health behavior is beneficial to himself or herself. Additionally, if the reader finds the promotion may benefit others, then the reader will pass along the promotion. Our study attempted to differentiate the situations where the reader would perform one behavior - sharing or accepting targeted behavior – though not the other, but the experimental results failed to provide such evidence. Our findings indicate that an individual likes to share information with the contents in which he or she agrees and intends to try because the individual believes the information is useful. The result supports the study by Munar and Jacobsen (2014), who argued that helping others is one of the primary reasons behind sharing messages. It also aligns with an earlier survey of Twitter users' motivations of sharing health information. The survey indicated that users shared information because they personally found it useful (De Choudhury, Morris, & White, 2014), By the same token the readers in our study like to share because they personally want to try.

The sharing and accepting targeted behaviors are highly correlated. The correlation can be explained by the readers' intention to share something they believe. However, the finding that gain-framed messages are more persuasive than loss-framed messages contradicts the second hypothesis. Although we have purposely chosen both health promotion topics in a riskier domain as suggested by previous health researchers (Rothman & Salovey, 1997), loss-framed messages did not urge people to gravitate towards the relatively riskier choice, such as taking depression diagnosis exam or taking meningitis vaccine. A recent meta-analysis of gain- and loss-framing showed that framing effects are

optimal when emotions are provoked by the framing structure (Nabi et al., 2020). Gain- and loss-frames are equivalent in presenting a topic, though the different effects of the two frames in persuasion are likely caused by other factors, which moderate the relationships between gain- and loss-framing and persuasion (Nan, Daily, & Qin, 2018; Nabi et al., 2020). We did tests on our control variables. There was no significant difference of any control variables among the treatment groups. Therefore, attitude, issue involvement, and other control variables in this study should not be the source of conflicting outcomes. Loss-framing does not always have advantages in promoting healthier behaviors. For example, an earlier meta-analysis suggested that gain-framed messages were better than loss-framed messages with measures of actual behaviors, such as taking a Pap test, in illness prevention, but not with the behavior assessments, such as intention to take a Pap test. Another study was not able to confirm loss-framing advantages in disease detection domain (Gallagher, & Updegraff, 2012). Additionally, Van't Riet al (2016) argued that gain- and loss-framing had not been based on a reference value as they were in the prospect theory. With Asia disease example, “zero lives lost” or “200 lives saved” is a clear data point. They suggested missing reference value was one of the reasons for the failure of consistent results of gain- and loss-framing research (Van't Riet et al., 2016). A previous study also found that people who were less affected by depression were more easily attracted to positive cues (Lueck, 2017). Although we did not verify if our survey takers had depression, we can safely assume most of survey takers are not depression patients. Also, in recent years, depressive disorder has been widely acknowledged, taking its detection test may not be viewed as a risk or stigmatized behavior as before. Therefore, gain-framed messages, which present

information in a positive manner, are more likely to be accepted by the readers. In the meantime, COVID-19 has made vaccination a normalized and well-known method (or the only method in some situations) to prevent an epidemic. These reasons could lead people to view gain-framed messages of depression detection and being vaccinated as reassured benefits from healthcare organizations. Also, the fact that positive messages are more welcomed on social media (Berger & Milkman, 2012) could be part of the reason that they are more acceptable to readers. In the meantime, we also confirmed that gain- and loss-framing effects are small (O'Keefe & Jensen, 2008; O'Keefe & Wu, 2012) and can be modified by other factors, such as image.

The current study found that images have a significant interaction with gain- and loss-framing in general, regardless of image type – positive or negative. Images reduce the gain-framed message's effectiveness on message sharing and acceptance. However, images increase the loss-framed message's effectiveness on message sharing and acceptance. The image interactions with gain- and loss-framing are opposite. On the surface, this partially contradicts with a time-tested concept that "A picture is worth a thousand words". Imaging has long been established as a trigger to fast learning process (Grabe & Bucy, 2009) and a resemblance for real life (Messaris & Abraham, 2001). Since human brains extract information from visuals faster than from texts only (Graber 1996), images are assumed to generally help the readers to understand texts. Sometimes, images even reduce readers' uncertainty of online text content (Zinko, Stolk, & Furner, 2020) and are widely shared by social media (Strekalova & Krieger, 2017; Chen & Dredze, 2018; Casas & Williams, 2019). However, some researchers have given solid evidence that image

(or visual) does not add or even give negative effects on learners' comprehension in some situations (Ardasheva et al., 2018; Hayes & Reinking, 1991). The general assumption is that images in messages can serve as a cue for text processing. However, Hayes and Reinking (1991) argued that cues should be effective when they are specific. In other words, visuals are helpful when they can facilitate mental model building. Otherwise, they could be a source of distraction (Khoii, & Forouzesh, 2010). Further, different types of visuals have shown different results on comprehension (Sung & Mayer, 2012). The reason visuals did not provide advantages in gain-framed messages in current experiments is that the messages in the experiments have no obvious link between texts and images. In contrast, loss-framed messages benefited from positive visuals in that positive image provoked positive emotions, which led the readers' better attention and improvement of motivation to analyze message contents (Li, Gow, & Zhou, 2020).

The current study has also done a detailed analysis of the three dimensions of message acceptance. All three dimensions have been tested as individual independent variables in the test, and the results have provided more insights. Loss-framed messages have lower message quality (MQ) (mean = 5.33, 5.28 for depression detection and meningitis vaccination topics respectively) than gain-framed messages (mean = 5.75, 5.76 for depression detection and meningitis vaccination topics respectively). It is odd at first, because the two frames express the same content and same sentence structure. However, studies in survey design provided a reasonable explanation. These studies pointed out that negatively worded statements increase readers' cognitive complexity and lead to more error responses from survey takers (Hodge, & Gillespie, 2003). Loss-framed messages are

recognized as lower quality probably because their negative wordings are hard to process by human brain. This is because negatively worded statements provoke negative emotions, which are less likely to motivate interests to learn (Li, Gow, & Zhou, 2020), the loss-framed messages may discourage readers from processing the message. Therefore, the readers in our experiment with loss-framed messages and no visual may be unwillingly to put in more time to analyze the statements. Therefore, with the positive image's help to provoke positive emotions, the loss-framed message become much easier to the readers.

The result of an image not giving any advantage to the gain-framed message is similar to a recent finding that content without images in corporate account on social media is more effective than content with images (Johnston & Davis, 2019). Healthcare promotions are run by health organizations. These messages share some characteristics with the content in social media health corporation accounts. The goal for these messages is to motivate people to act on healthier behaviors. As Johnston al. (2019) mentioned in the article, the readers are more focused on the content itself. Well-written content is more effective. Gain-framed messages are well structured and easier to understand than loss-framed messages. Images with these messages could distract readers instead of providing useful information.

Consistent with the message quality measure (MQ), the message capability (MC) measure has also shown significantly lower capability in loss-framed message without image. The message capability measures the reader's opinion on how the reader thinks of other people's view of the message. Thus, if the message is viewed as low quality, the reader is unlikely to share or accept. Also, in the correlation analysis, message quality and

capability are highly correlated. The image's function on message capability in gain- and loss-frame have behaved the same as message quality.

The current study has also tried to determine if image valance type can influence gain- and loss-framing. From interaction charts in Figure 8, we found the positive images showed higher sharing intention and message acceptance than the negative images did when used with loss-framed messages. Although both types of images reduce sharing intention and message acceptance when used with gain-framed messages, the negative images reduced more than positive images did. These findings seem to conflict with the general assumption that word-image congruency should be more effective than the word-image incongruent message on persuasion. The reason that the congruency of text and image in a message is effective could be that easy information processing leads to readers' positive or favorable attitudes (Winkielman & Cacioppo, 2001). However, the recent study on word-image congruency in marketing research sheds light on the opposite of this suggestion. The research found that word-image congruency is not always better than incongruency. The study also suggested that the in-congruency was better in some situations because it attracted more attention from readers, especially in a low involvement environment, such as advertisement (Van Rompay, De Vries, & Van Venrooij, 2010). Health promotion is simply a special kind of advertising and could have low involvement from the readers.

Additionally, images in this experiment were selected for its congruency with the messages' valance, not content. The images themselves did not supplement any information regarding the contents. Seo's (2020) meta-analysis of image's influences on

text message's persuasion found that positive images increased persuasion power in a small number of studies and negative images had no significant effects. Zillmann's exemplification theory suggests that images increase the effectiveness of a text through exemplifying the text's topic or content in visual or realistic ways (Zillmann, 1999; 2002). We intended to use images to arouse positive or negative emotions to match the valance of gain- and loss-frame. The selected images did not have the characteristics to exemplify. In our research, word-image congruency was shown in a gain-framing situation. Although it is only marginal, messages with positive images performed better than with negative ones. In loss-framing situation, the message quality increased significantly with the positive image. This could be caused by positive images reducing the reader's negative emotion from the message's negative wording. Double negative statements make a positive sentence to affirm the message's idea. The present of positive images confirm the overall positive idea of the message. Therefore, people viewed the message as good quality. In the meantime, positive images reduced negative tone, leading readers to feel less reluctant to pass along the message. Negative images add more negative emotions, which are congruent with loss-framing valance. Congruence could help readers to process the information as shown in the increase of messages' effect. However, the negative valance still made readers feel that the message was not in good quality. Therefore, readers' evaluation of the quality of a multi-modal message includes valance in their criteria.

6.2 Research Implications

Beyond the immediate content of this research, the current study offers four research implications. First, this study confirmed that positive expression is preferred on

social media. Our experiments have clearly indicated that positive expression, such as gain-framed promotions, are more acceptable and transmittable. Loss-framing advantage has already been questioned by some researchers. Our study shows that readers consider loss-framed expressions as low-quality arguments. Future studies can further investigate if negative expressions attract less consideration or scrutinization.

Second, this study is the first to analyze gain- and loss-framing and image congruency using a multi-dimensional persuasive measure, instead of behavioral intentions or actual behaviors. Multi-modal messages are major communication media formats on social networking sites. It is important for publishers to understand how multiple framing techniques work together. By looking at different angles of a reader's evaluation of a message, we discovered that the readers' decision after reading a promotion message not only depends on message content (benefits or consequences in our case), but also on its tone, emotion aroused, or other factors that are not related to content. This study shows that readers perceive loss-framing messages as low-quality messages. The finding is not topic-specific because results from both testing topics in current experiments are consistent. That is, where and how to implement words with negative connotations may affect the efficacy of loss-framing messages. This could help explain why effects of gain- and loss-framing are inconsistent from decades of research.

Third, the current research also found that text-image congruency is far more complicated. The congruency can be exhibited in more than one angle. Although previous studies have shown text-image congruency increases message effects (Munar & Jacobsen 2014; Van Rompay, De Vries, & Van Venrooij, 2010), the measures of text-image

congruency differ from one research to another. This research indicated that stimulating readers' positive emotions may be more important than the content itself. That is, our non-content related positive image enlarged loss-framing effects. This study provides strong evidence in that text-image congruency should be treated at a more detailed level in future studies, such as valance congruency or content congruency.

Fourth, this study attempted to differentiate two conceptually different behaviors, message sharing and targeted behavior acceptance, which were not adequately explored in the previous literature. Counterintuitively, our study failed to show that the two behaviors would be different with certain conditions. As such, even though the motivations behind the two behaviors are different, one is for the benefits of self while the other is for benefits of others. This result could be unique to health promotion topics. Since staying healthy is everyone's common desire, people would not want to share a health promotion if they did not think it would benefit themselves. Future studies in health promotion area may treat the two behaviors as one to simplify designs.

6.3 Practical Implication

Thousands of health promotion messages are published on the Internet daily. Each health organization has its own focus and limited budgets. To maximize the effectiveness of the messages, healthcare practitioners try to walk through the maze of trying to pick up the most intriguing characteristics of a topic to compose the paragraph. With the findings from the current study, three practical implications are concluded.

First, healthcare messages should avoid message presentation in a strongly negative connotation. Although many healthcare articles argue that negative consequences would

provoke readers' fear and therefore promote them to take actions, motivated by the desire to avoid negative results, readers may not react the way as the message creators wished. This is because negative words and tunes could irritate others and their willingness to continue the reading or follow recommendation will be reduced. Therefore, message creators need to carefully present negative consequences to avoid people resistance.

Second, when healthcare organizations demonstrate health-related promotions, their messages will be viewed as the true source of information. Since the words in messages from authority parties are scrutinized more carefully, the message creators from health organizations should concentrate on how to present their topic in easy understanding and attracting attention words. Pictures should only be added for the purpose of improving understanding of the content. Also, message creators should keep away images that may provoke strong valance, because this kind of images can attract attention and distract readers from contents, which defeats the creators' purpose.

Third, this study found that message sharing is highly correlated with the readers' acceptance of the message. Readers like to share something they like to try themselves. Therefore, when health practitioners create the promotion, the focus should be on how to make the readers willing to try the recommendations. As simple requirements or actions are more acceptable to people, the health promotion messages should make an effort to reduce the complexity of the recommended actions. When the message can invoke people's interests to experiment with the suggestions, the sharing of the message should be automatically achieved.

In summary, this research has expanded the investigation in gain- and loss-framing and word-image congruency studies. The research questions are focused on how to make health promotions more effective on social media. The research findings have narrowed the broader spectrum of factors in promotions' design. We have pointed out a few areas to be focused on, such as message structure and image selection.

CHAPTER VII

LIMITATION AND FUTURE RESEARCH

This research has limitations regarding resources and technological perspectives. First, the sample population in this research was collected from MTurk. Although MTurk is a widely used data collection platform in recent years and it attracts researchers because its ability to recruit large size of survey takers in a short amount of time, the quality of survey participants is still in question. This platform is well-known to many people as a source of income and the survey takers treat surveys as their work. Because of this, these survey takers may not fully represent the population that receives health promotion messages in the real world.

Second, attention check is commonly used in MTurk surveys. Attention check is a special question and appears at odd places in a survey's question flow. The question and its position are designed to identify if a participant truly read the question. Failure to answer attention checker suggests that the participant did not read the question carefully before they give the answers. By the same token, this kind questions may interrupt the readers'

attention and affect their answer to the next question. Therefore, it would be valuable if we could include effectiveness evaluation of survey design in future studies.

Third, this study has chosen images that are available online and free. This limitation restricted the experiment in that it can only focus on valance congruency, because it is difficult to find pictures with the correct valance that also have links to text contents. Future studies could organize visuals in more categories and compare their functions in different angles, so as to consider more factors that impact the message sharing and persuasion.

Lastly, this study has chosen two health promotion topics: depression detection and meningitis vaccination. Depression is a well-known disorder and meningitis is a less known disease. Results show that readers' message sharing and acceptance behaviors are not topic specific. However, these two health topics cannot represent all health topics, such as cancer treatment, heart disease prevention, or exercises. More studies need to be done in other health topics.

CHAPTER VIII

CONCLUSION

The current research goal is to expand our understanding of how social media posts influence user behaviors, more specifically, how multi-modal posts persuade users and affect their actions to share the message. To narrow down the scope further, our research evaluated how gain- and loss-framing messages with visuals would affect message persuasion power and influence user behaviors in sharing messages. Our research started with two questions. The first research question is how gain- and loss- framing influence two human behaviors: sharing information and taking recommendation. The results indicate that these two behaviors are highly correlated to each other. Although the two behaviors have different motivations behind them; taking recommendations is to gain benefits to themselves and sharing is to build relations, trusts, and reputations with others, the results show that the two behaviors go hand in hand. In the health promotion realm, our current research did not find any evidence that gain- and loss-framed messages would be able to differentiate the two behaviors in different treatments. Instead, our results indicate that people like to share what they would like to try themselves.

The current results also support how the gain- and loss-framing effects could be moderated by many unmeasured factors. We found that gain-frames perform better than loss-frame regardless of topics in the health behavior domain, contradicting some previous studies. Gain- and loss-framing is sourced from prospect theory, which proposed that different effects of framing come from the difference in reference values while people project gain or loss. We found that influences on people's behaviors from projected gain and loss could be affected by many unmeasured variables, including sentence structure. Therefore, future studies on gain- and loss-framing need to isolate other factors as much as possible.

The second research question is how images interact with gain- and loss-framing to influence the readers' behaviors. We found significant interactions between gain- and loss-framing and images. Image superior effects and dual system theories suggest that images add value to social media posts. However, our results showed that visual-text effects are much more complicated. In fact, in some situations, visual advantages could become disadvantages, suggesting that visual-text framing interaction effects are not necessarily universal. As such, images weaken gain-frame effects on sharing and acceptance behaviors regardless of the image type in a gain-framing context. Specifically, negative images decrease the efficacy of gain-frames more than positive images. On the other hand, images increase readers' tendency to share and accept the recommendations regardless of the image type in a loss-framing context. Positive images increase the readers' tendency more than negative images.

This research highlights that a variety of components in multi-modal messages are important for human brain processing in addition to text contents. In a social media heavy environment, people are deeply influenced by what others read and what others do. Posts on social media have the power to change their behaviors. The research results have expanded the research to a more detailed level beyond the text content and image valance.

REFERENCE

- Abhyankar, P., O'connor, D. B., & Lawton, R. (2008). The role of message framing in promoting MMR vaccination: Evidence of a loss-frame advantage. *Psychology, Health and Medicine*, 13(1), 1-16.
- Abraham, L. (1998). *A dictionary of alchemical imagery* (p. 137). Cambridge: Cambridge University Press.
- Abraham, L. (2009). Effectiveness of cartoons as a uniquely visual medium for orienting social issues. *Journalism & Communication Monographs*, 11(2), 117-165.
- Aghdaie, S. F. A., Sanayei, A., & Etebari, M. (2012). Evaluation of the consumers' trust effect on viral marketing acceptance based on the technology acceptance model. *International Journal of Marketing Studies*, 4(6), 79.
- Aguinis, H., Villamor, I., & Ramani, R. S. (2021). MTurk research: Review and recommendations. *Journal of Management*, 47(4), 823-837.
- Ahuja, M. K., & Galvin, J. E. (2003). Socialization in virtual groups. *Journal of Management*, 29(2), 161-185.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, 50(2), 179-211.
- Ajzen, I. (2001). Nature and operation of attitudes. *Annual review of psychology*, 52(1), 27-58.
- Apanovitch, A. M., McCarthy, D., & Salovey, P. (2003). Using message framing to motivate HIV testing among low-income, ethnic minority women. *Health Psychology*, 22(1), 60.

- Ardasheva, Y., Wang, Z., Roo, A. K., Adesope, O. O., & Morrison, J. A. (2018). Representation visuals' impacts on science interest and reading comprehension of adolescent English learners. *The Journal of Educational Research*, 111(5), 631-643.
- Aruguete, N., & Calvo, E. (2018). Time to #protest: Selective exposure, cascading activation, and framing in social media. In *Journal of Communication* (Vol. 68). <https://doi.org/10.1093/joc/jqy007>
- B Barhorst, J., & Wilson, A. (2017). Retweeting brand experiences: factors motivating receivers to proliferate brand image disruptions.
- Babin, L. A., & Burns, A. C. (1997). Effects of print ad pictures and copy containing instructions to imagine on mental imagery that mediates attitudes. *Journal of advertising*, 26(3), 33-44.
- Bail, C. A. (2016). Emotional feedback and the viral spread of social media messages about autism spectrum disorders. *American journal of public health*, 106(7), 1173-1180.
- Bakhshi, S., Shamma, D. A., & Gilbert, E. (2014, April). Faces engage us: Photos with faces attract more likes and comments on instagram. In *Proceedings of the SIGCHI conference on human factors in computing systems* (pp. 965-974).
- Banks, S. M., Salovey, P., Greener, S., Rothman, A. J., Moyer, A., Beauvais, J., & Epel, E. (1995). The effects of message framing on mammography utilization. *Health psychology*, 14(2), 178.
- Barry, A. M. (1997). *Visual intelligence: Perception, image, and manipulation in visual communication*. SUNY Press.

- Baumeister, R. F., & Hutton, D. G. (1987). Self-presentation theory: Self-construction and audience pleasing. In *Theories of group behavior* (pp. 71-87). Springer, New York, NY.
- Baumeister, R. F., Maranges, H. M., & Vohs, K. D. (2018). Human self as information agent: Functioning in a social environment based on shared meanings. *Review of General Psychology*, 22(1), 36-47.
- Bazarova, N. N., Choi, Y. H., Schwanda Sosik, V., Cosley, D., & Whitlock, J. (2015, February). Social sharing of emotions on Facebook: Channel differences, satisfaction, and replies. In *Proceedings of the 18th ACM conference on computer supported cooperative work & social computing* (pp. 154-164).
- Becker, M. H. (1974). The health belief model and personal health behavior. *Health Education*
- Berger, J., & Milkman, K. L. (2012). What makes online content viral?. *Journal of marketing research*, 49(2), 192-205.
- Bernstein, P. L., & Bernstein, P. L. (1996). *Against the gods: The remarkable story of risk* (pp. 1269-1275). New York: Wiley.
- Berry, T. R., McCarville, R. E., & Rhodes, R. E. (2008). Getting to know the competition: A content analysis of publicly and corporate funded physical activity advertisements. *Journal of Health Communication*, 13(2), 169-180.
- Block, L. G., & Keller, P. A. (1995). When to accentuate the negative: The effects of perceived efficacy and message framing on intentions to perform a health-related behavior. *Journal of marketing research*, 32(2), 192-203.

- Blondé, J., & Girandola, F. (2016). Revealing the elusive effects of vividness: a meta-analysis of empirical evidences assessing the effect of vividness on persuasion. *Social Influence*, 11(2), 111-129.
- Boehmer, J., & Tandoc, E. C. (2015). Why we retweet: Factors influencing intentions to share sport news on Twitter. *International Journal of Sport Communication*, 8(2), 212-232.
- Bohner, G., Moskowitz, G. B., & Chaiken, S. (1995). The interplay of heuristic and systematic processing of social information. *European review of social psychology*, 6(1), 33-68.
- Boomgaarden, H., Boukes, M., & Iorgoveanu, A. (2016). Image versus text: How newspaper reports affect evaluations of political candidates. *International Journal of Communication*, 10, 27.
- Borah, P., & Xiao, X. (2018). The importance of 'likes': The interplay of message framing, source, and social endorsement on credibility perceptions of health information on Facebook. *Journal of health communication*, 23(4), 399-411.
- Boyd, Danah, Scott Golder, and Gilad Lotan. "Tweet, tweet, retweet: Conversational aspects of retweeting on twitter." In 2010 43rd Hawaii International Conference on System Sciences, pp. 1-10. IEEE, 2010.
- Brantner, C., Lobinger, K., & Wetzstein, I. (2011). Effects of visual framing on emotional responses and evaluations of news stories about the Gaza conflict 2009. *Journalism & Mass Communication Quarterly*, 88(3), 523-540.

- Brewer, P. R., & Gross, K. (2005). Values, framing, and citizens' thoughts about policy issues: Effects on content and quantity. *Political Psychology, 26*(6), 929-948.
- Butler, J. B., & Mautz Jr, R. D. (1996). Multimedia presentations and learning: A laboratory experiment. *Issues in Accounting Education, 11*(2), 259.
- Cacciatore, M. A., Scheufele, D. A., & Iyengar, S. (2016). The end of framing as we know it... and the future of media effects. *Mass Communication and Society, 19*(1), 7-23.
- Cameron, L. D., & Chan, C. K. (2008). Designing health communications: Harnessing the power of affect, imagery, and self-regulation. *Social and Personality Psychology Compass, 2*(1), 262-282.
- Casas, A., & Williams, N. W. (2019). Images that matter: Online protests and the mobilizing role of pictures. *Political Research Quarterly, 72*(2), 360-375.
- Centers for Disease Control and Prevention. (2011). *The health communicator's social media toolkit*. Atlanta, GA: Centers for Disease Control and Prevention.
- Chaiken, S. (1980). Heuristic versus systematic information processing and the use of source versus message cues in persuasion. *Journal of personality and social psychology, 39*(5), 752.
- Chaiken, S. (1987). The heuristic model of persuasion. In *Social influence: the ontario symposium* (Vol. 5, pp. 3-39).
- Chaiken, S., & Eagly, A. H. (1983). Communication modality as a determinant of persuasion: The role of communicator salience. *Journal of personality and social psychology, 45*(2), 241.

- Chaiken, S., & Maheswaran, D. (1994). Heuristic processing can bias systematic processing: effects of source credibility, argument ambiguity, and task importance on attitude judgment. *Journal of personality and social psychology*, 66(3), 460.
- Chan, C., & Holosko, M. J. (2016). A review of information and communication technology enhanced social work interventions. *Research on Social Work Practice*, 26(1), 88-100.
- Chang, B., Xu, T., Liu, Q., & Chen, E. H. (2018). Study on information diffusion analysis in social networks and its applications. *International Journal of Automation and Computing*, 15(4), 377-401.
- Chang, H. H., & Chuang, S. S. (2011). Social capital and individual motivations on knowledge sharing: Participant involvement as a moderator. *Information & management*, 48(1), 9-18.
- Chang, Y. T., Yu, H., & Lu, H. P. (2015). Persuasive messages, popularity cohesion, and message diffusion in social media marketing. *Journal of Business Research*, 68(4), 777-782.
- Chau, M., & Xu, J. (2012). Business intelligence in blogs: Understanding consumer interactions and communities. *MIS quarterly*, 1189-1216.
- Chen, C. J., & Hung, S. W. (2010). To give or to receive? Factors influencing members' knowledge sharing and community promotion in professional virtual communities. *Information & management*, 47(4), 226-236.
- Chen, H., & Wang, Y. (2012). Threshold-based heuristic algorithm for influence maximization. *Jisuanji Yanjiu Yu Fazhan/Computer Research and Development*,

49(10), 2181–2188. Retrieved from http://en.cnki.com.cn/Article_en/CJFDTotal-JFYZ201210019.htm

- Chen, T., & Dredze, M. (2018). Vaccine images on twitter: analysis of what images are shared. *Journal of medical Internet research*, 20(4), e130.
- Cheng, J. H. (2011). Inter-organizational relationships and information sharing in supply chains. *International Journal of Information Management*, 31(4), 374-384.
- Cheng, J. H., & Fu, Y. C. (2013). Inter-organizational relationships and knowledge sharing through the relationship and institutional orientations in supply chains. *International Journal of Information Management*, 33(3), 473-484.
- Cho, H., & Sands, L. (2011). Gain-and loss-frame sun safety messages and psychological reactance of adolescents. *Communication Research Reports*, 28(4), 308-317.
- Cho, S., Huh, J., & Faber, R. J. (2014). The influence of sender trust and advertiser trust on multistage effects of viral advertising. *Journal of Advertising*, 43(1), 100-114.
- Choi, M., & Toma, C. L. (2014). Social sharing through interpersonal media: Patterns and effects on emotional well-being. *Computers in Human Behavior*, 36, 530-541.
- Christophersen, E. R., & Gyulay, J. E. (1981). Parental compliance with car seat usage: A positive approach with long-term follow-up. *Journal of Pediatric Psychology*, 6(3), 301-312.
- Chung, E., & Yoon, J. (2011). Image needs in the context of image use: An exploratory study. *Journal of Information Science*, 37(2), 163–177.
- Chung, E., & Yoon, J. (2013). An analysis of image use in Twitter message. *Journal of the Korean BIBLIA Society for library and Information Science*, 24(4), 75-90.

- Chung, J. E. (2017). Retweeting in health promotion: Analysis of tweets about Breast Cancer Awareness Month. *Computers in Human Behavior*, 74, 112-119.
- Chung, N., Koo, C., & Park, S. B. (2012, March). Why people share information in social network sites? Integrating with uses and gratification and social identity theories. In *Asian Conference on Intelligent Information and Database Systems* (pp. 175-184). Springer, Berlin, Heidelberg.
- Clark, J. M., & Paivio, A. (1991). Dual coding theory and education. *Educational psychology review*, 3(3), 149-210.
- Cohen, J. (1988). The effect size index: d. *Statistical power analysis for the behavioral sciences*, 2(1).
- Colley, K. L., & Collier, A. (2009). An overlooked social media tool? Making a case for wikis. *Public Relations Strategist*, 19(2), 110-122.
- Constant, D., Kiesler, S., & Sproull, L. (1994). What's mine is ours, or is it? A study of attitudes about information sharing. *Information systems research*, 5(4), 400-421.
- Covey, J. (2014). The role of dispositional factors in moderating message framing effects. *Health Psychology*, 33(1), 52.
- de Alcantara, M., Ares, G., de Castro, I. P. L., & Deliza, R. (2020). Gain vs. loss-framing for reducing sugar consumption: Insights from a choice experiment with six product categories. *Food Research International*, 109458.
- De Choudhury, M., Morris, M. R., & White, R. W. (2014, April). Seeking and sharing health information online: comparing search engines and social media. In

- Proceedings of the SIGCHI conference on human factors in computing systems (pp. 1365-1376).
- Delp, C., & Jones, J. (1996). Communicating information to patients: the use of cartoon illustrations to improve comprehension of instructions. *Academic Emergency Medicine*, 3(3), 264-270.
- Denis, M., & Le Ny, J. F. (1984). Centering on figurative features during the comprehension of sentences describing scenes. Paris: ERA 235 (No. 220). Mimeo.
- Dewan, S., & Ramaprasad, J. (2014). Social media, traditional media, and music sales. *Mis Quarterly*, 38(1), 101-122.
- DHHS, CDC, Od, Ocoo, Ocio, & Maso. (2011). CDC ENTERPRISE SOCIAL MEDIA POLICY Sections: 1. PURPOSE AND SCOPE 2. BACKGROUND 3. POLICY 4.
- Dibble, J. L. (2018). It's more than self-presentation: Mum effects can reflect private discomfort and concern for the recipient. *Communication Research Reports*, 35(2), 112-120.
- Dibble, J. L., & Levine, T. R. (2010). Breaking good and bad news: Direction of the MUM effect and senders' cognitive representations of news valence. *Communication Research*, 37(5), 703-722.
- Dibble, J. L., & Levine, T. R. (2013). Sharing good and bad news with friends and strangers: Reasons for and communication behaviors associated with the MUM effect. *Communication Studies*, 64(4), 431-452.

- Dibble, J. L., & Sharkey, W. F. (2017). Before breaking bad news: Relationships among topic, reasons for sharing, messenger concerns, and the reluctance to share the news. *Communication Quarterly*, 65(4), 436-455.
- Donovan, R. J., & Jalleh, G. (2000). Positive versus negative framing of a hypothetical infant immunization: The influence of involvement. *Health Education & Behavior*, 27(1), 82-95.
- Druckman, J. N. (2001). The implications of framing effects for citizen competence. *Political behavior*, 23(3), 225-256.
- Durcikova, A., & Gray, P. (2009). How knowledge validation processes affect knowledge contribution. *Journal of Management Information Systems*, 25(4), 81-108.
- Durso, F. T., & Johnson, M. K. (1980). The effects of orienting tasks on recognition, recall, and modality confusion of pictures and words. *Journal of Verbal Learning and Verbal Behavior*, 19(4), 416-429.
- Emery, L. F., Romer, D., Sheerin, K. M., Jamieson, K. H., & Peters, E. (2014). Affective and cognitive mediators of the impact of cigarette warning labels. *Nicotine & Tobacco Research*, 16(3), 263-269.
- Entman, R. M. (1993). Framing: Toward clarification of a fractured paradigm. *Journal of communication*, 43(4), 51-58.
- Fahmy, S., Bock, M., & Wanta, W. (2014). *Visual communication theory and research: A mass communication perspective*. Springer.

- Fang, Z. (1996). Illustrations, text, and the child reader: what are pictures in children's storybooks for?. *Reading Horizons: A Journal of Literacy and Language Arts*, 37(2), 3.
- Finn, A. (1988). Print ad recognition readership scores: An information processing perspective. *Journal of Marketing Research*, 25(2), 168-177.
- Flora, J. A., & Maibach, E. W. (1990). Cognitive responses to AIDS information: The effects of issue involvement and message appeal. *Communication research*, 17(6), 759-774.
- Forman, C., Ghose, A., & Wiesenfeld, B. (2008). Examining the relationship between reviews and sales: The role of reviewer identity disclosure in electronic markets. *Information systems research*, 19(3), 291-313.
- Foss, N. J., Minbaeva, D. B., Pedersen, T., & Reinholt, M. (2009). Encouraging knowledge sharing among employees: How job design matters. *Human resource management*, 48(6), 871-893.
- Gagné, M. (2009). A model of knowledge-sharing motivation. *Human Resource Management: Published in Cooperation with the School of Business Administration, The University of Michigan and in alliance with the Society of Human Resources Management*, 48(4), 571-589.
- Gallagher, K. M., & Updegraff, J. A. (2012). Health message framing effects on attitudes, intentions, and behavior: a meta-analytic review. *Annals of behavioral medicine*, 43(1), 101-116.

- Gan, S. L., Hill, J. R., Pschernig, E., & Zillmann, D. (1996). The Hebron massacre, selective reports of Jewish reactions, and perceptions of volatility in Israel.
- Ganzach, Y., & Karsahi, N. (1995). Message framing and buying behavior: A field experiment. *Journal of Business Research*, 32(1), 11-17.
- Gerend, M. A., & Magloire, Z. F. (2008). Awareness, knowledge, and beliefs about human papillomavirus in a racially diverse sample of young adults. *Journal of Adolescent Health*, 42(3), 237-242.
- Giacobe, N. A., & Soule, P. J. (2014). Social media for the emergency manager in disaster planning and response. In 11th International Conference on Information Systems for Crisis Response and Management, ISCRAM 2014 (pp. 570-574). The Pennsylvania State University.
- Gibson, R., & Zillmann, D. (2000). Reading between the photographs: The influence of incidental pictorial information on issue perception. *Journalism & Mass Communication Quarterly*, 77(2), 355-366.
- Gitlin, Todd (1980). *The whole world is watching*. Berkeley: University of California
- Gochman, D. S. (1988). Health behavior. In *Health behavior* (pp. 3-17). Springer, Boston, MA
- Goffman, E. (1959). The moral career of the mental patient. *Psychiatry*, 22(2), 123-142.
- Goffman, E. (1974). *Frame analysis: An essay on the organization of experience*. Harvard University Press.

- Gonzales, A. L., & Hancock, J. T. (2011). Mirror, mirror on my Facebook wall: Effects of exposure to Facebook on self-esteem. *Cyberpsychology, behavior, and social networking*, 14(1-2), 79-83.
- Gough, A., Hunter, R. F., Ajao, O., Jurek, A., McKeown, G., Hong, J., ... & Kee, F. (2017). Tweet for behavior change: using social media for the dissemination of public health messages. *JMIR public health and surveillance*, 3(1), e14.
- Grabe, M. E., & Bucy, E. P. (2009). *Image bite politics: News and the visual framing of elections*. Oxford University Press.
- Graber, D. A. (1996). Say it with pictures. *The annals of the American academy of political and social science*, 546(1), 85-96.
- Gretzel, U., & Yoo, K. H. (2008). Use and impact of online travel reviews. *Information and communication technologies in tourism 2008*, 35-46.
- Groshek, J., & Koc-Michalska, K. (2017). Helping populism win? Social media use, filter bubbles, and support for populist presidential candidates in the 2016 US election campaign. *Information, Communication & Society*, 20(9), 1389-1407.
- Hall, R., & Artwick, C. (2012). Body found on Twitter : The role of alternative sources in social media agenda setting. *International Communication Association Conference*, 1–29. Retrieved from <http://home.wlu.edu/~artwick/artwickICA12.pdf>
- Hameleers, M. (2021). Prospect theory in times of a pandemic: The effects of gain versus loss framing on risky choices and emotional responses during the 2020 coronavirus outbreak—Evidence from the US and the Netherlands. *Mass Communication and Society*, 24(4), 479-499.

- Harrington, N. G., & Kerr, A. M. (2017). Rethinking risk: Prospect theory application in health message framing research. *Health communication*, 32(2), 131-141.
- Hayes, D. A., & Reinking, D. (1991). Good and poor readers' use of graphic aids cued in texts and in adjunct study materials. *Contemporary Educational Psychology*, 16(4), 391-398.
- Hodge, D. R., & Gillespie, D. (2003). Phrase completions: An alternative to Likert scales. *Social Work Research*, 27(1), 45-55.
- Homer, P. M., & Yoon, S. G. (1992). Message framing and the interrelationships among ad-based feelings, affect, and cognition. *Journal of Advertising*, 21(1), 19-33.
- Houts, P. S., Doak, C. C., Doak, L. G., & Loscalzo, M. J. (2006). The role of pictures in improving health communication: a review of research on attention, comprehension, recall, and adherence. *Patient education and counseling*, 61(2), 173-190.
- Howard, P. N., Duffy, A., Freelon, D., Hussain, M. M., Mari, W., & Maziad, M. (2011). Opening closed regimes: what was the role of social media during the Arab Spring?. Available at SSRN 2595096.
<https://doi.org/10.1177/0165551511400951>
- Hughes, A. L., & Palen, L. (2009). Twitter adoption and use in mass convergence and emergency events. *International journal of emergency management*, 6(3-4), 248-260.

- Hung, S. Y., Durcikova, A., Lai, H. M., & Lin, W. M. (2011). The influence of intrinsic and extrinsic motivation on individuals' knowledge sharing behavior. *International Journal of Human-Computer Studies*, 69(6), 415-427.
- Hur, K., Kim, T. T., Karatepe, O. M., & Lee, G. (2017). An exploration of the factors influencing social media continuance usage and information sharing intentions among Korean travellers. *Tourism Management*, 63, 170-178.
- Iyer, A., & Oldmeadow, J. (2006). Picture this: Emotional and political responses to photographs of the Kenneth Bigley kidnapping. *European Journal of Social Psychology*, 36(5), 635-647.
- Jalilehvand, M. (2012). The effects of text length and picture on reading comprehension of Iranian EFL students. *Asian Social Science*, 8(3), 329.
- Jensen, J. D., Ratcliff, C. L., Yale, R. N., Krakow, M., Scherr, C. L., & Yeo, S. K. (2018). Persuasive impact of loss and gain frames on intentions to exercise: A test of six moderators. *Communication Monographs*, 85(2), 245-262.
- Jian, G., & Jeffres, L. W. (2006). Understanding employees' willingness to contribute to shared electronic databases: A three-dimensional framework. *Communication Research*, 33(4), 242-261.
- Joffe, H. (2008). The power of visual material: Persuasion, emotion and identification. *Diogenes*, 55(1), 84-93.
- Johnston, C., & Davis, W. E. (2019). Motivating exercise through social media: Is a picture always worth a thousand words?. *Psychology of Sport and Exercise*, 41, 119-126.

- Kahneman, D., & Tversky, A. (1979). On the interpretation of intuitive probability: A reply to Jonathan Cohen.
- Kahneman, D., & Tversky, A. (1982). The psychology of preferences. *Scientific American*, 246(1), 160-173.
- Kapoor, K. K., Tamilmani, K., Rana, N. P., Patil, P., Dwivedi, Y. K., & Nerur, S. (2018). Advances in social media research: Past, present and future. *Information Systems Frontiers*, 20(3), 531-558.
- Katzvand, E., & Lazarsfeld, P. (1955). Personal Influence, The Part Played by People in the Flow of Mass Communications.
- Keib, K., Espina, C., Lee, Y. I., Wojdyski, B. W., Choi, D., & Bang, H. (2018). Picture this: The influence of emotionally valenced images, on attention, selection, and sharing of social media news. *Media Psychology*, 21(2), 202-221.
- Khoii, R., & Forouzesh, Z. (2010). Using comic strips with reading texts: Are we making a mistake. *Literacy Information and Computer Education Journal*, 1(3), 168-177.
- Kilduff, M., & Brass, D. J. (2010). Organizational social network research: Core ideas and key debates. *Academy of management annals*, 4(1), 317-357.
- Kim, E., Hou, J., Han, J. Y., & Himelboim, I. (2016). Predicting retweeting behavior on breast cancer social networks: Network and content characteristics. *Journal of health communication*, 21(4), 479-486.
- Kim, J. N., & Grunig, J. E. (2011). Problem solving and communicative action: A situational theory of problem solving. *Journal of Communication*, 61(1), 120-149.

- Kim, J., & Park, H. A. (2012). Development of a health information technology acceptance model using consumers' health behavior intention. *Journal of medical Internet research*, 14(5), e133.
- Kirmani, A., & Shiv, B. (1998). Effects of source congruity on brand attitudes and beliefs: The moderating role of issue-relevant elaboration. *Journal of Consumer Psychology*, 7(1), 25-47.
- Kisielius, J., & Sternthal, B. (1984). Detecting and explaining vividness effects in attitudinal judgments. *Journal of marketing research*, 21(1), 54-64.
- Klimes-Dougan, B., Klingbeil, D. A., & Meller, S. J. (2013). The impact of universal suicide-prevention programs on the help-seeking attitudes and behaviors of youths. *Crisis*.
- Koçoğlu, İ., İmamoğlu, S. Z., İnce, H., & Keskin, H. (2011). The effect of supply chain integration on information sharing: Enhancing the supply chain performance. *Procedia-social and behavioral sciences*, 24, 1630-1649.
- Korda, H., & Itani, Z. (2013). Harnessing social media for health promotion and behavior change. *Health promotion practice*, 14(1), 15-23.
- Kordzadeh, N. (2019). Investigating bias in the online physician reviews published on healthcare organizations' websites. *Decision Support Systems*, 118, 70-82.
- Kordzadeh, N., & Young, D. K. (2018). Exploring hospitals' use of Facebook: thematic analysis. *Journal of medical Internet research*, 20(5), e190.

- Kosonen, M., Gan, C., Vanhala, M., & Blomqvist, K. (2014). User motivation and knowledge sharing in idea crowdsourcing. *International Journal of Innovation Management*, 18(05), 1450031.
- Krämer, N. C., & Winter, S. (2008). Impression management 2.0: The relationship of self-esteem, extraversion, self-efficacy, and self-presentation within social networking sites. *Journal of media psychology*, 20(3), 106-116.
- Kurdi, B., Lozano, S., & Banaji, M. R. (2017). Introducing the open affective standardized image set (OASIS). *Behavior research methods*, 49(2), 457-470.
- Lahuerta-Otero, E., Cordero-Gutiérrez, R., & De la Prieta-Pintado, F. (2018). Retweet or like? That is the question. *Online Information Review*.
- Laranjo, L., Arguel, A., Neves, A. L., Gallagher, A. M., Kaplan, R., Mortimer, N., ... & Lau, A. Y. (2015). The influence of social networking sites on health behavior change: a systematic review and meta-analysis. *Journal of the American Medical Informatics Association*, 22(1), 243-256.
- Lee, C. S., & Ma, L. (2012). News sharing in social media: The effect of gratifications and prior experience. *Computers in human behavior*, 28(2), 331-339.
- Lee, C. S., Ma, L., & Goh, D. H. L. (2011, September). Why do people share news in social media?. In *International Conference on Active Media Technology* (pp. 129-140). Springer, Berlin, Heidelberg.
- Lee, J., & Cho, M. (2021). The (in) congruency effects of message framing and image valence on consumers' responses to green advertising: Focus on issue involvement as a moderator. *Journal of Marketing Communications*, 1-20.

- Lee, S. (2014). What makes Twitterers retweet on Twitter? Exploring the roles of intrinsic/extrinsic motivation and social capital. *Journal of the Korea Academia-Industrial Cooperation Society*, 15(6), 3499-3511.
- Lee-Won, R. J., Abo, M. M., Na, K., & White, T. N. (2016). More than numbers: Effects of social media virality metrics on intention to help unknown others in the context of bone marrow donation. *Cyberpsychology, Behavior, and Social Networking*, 19(6), 404-411.
- Lee-Won, R. J., Shim, M., Joo, Y. K., & Park, S. G. (2014). Who puts the best “face” forward on Facebook?: Positive self-presentation in online social networking and the role of self-consciousness, actual-to-total Friends ratio, and culture. *Computers in Human Behavior*, 39, 413-423.
- Lei, S., Maniu, S., Mo, L., Cheng, R., & Senellart, P. (2015, August). Online influence maximization. In *Proceedings of the 21th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining* (pp. 645-654).
- Leung, X., Tanford, S., & Jiang, L. (2017). Is a picture really worth a thousand words?. *Journal of Hospitality and Tourism Technology*.
- Levin, I. P., Schneider, S. L., & Gaeth, G. J. (1998). All frames are not created equal: A typology and critical analysis of framing effects. *Organizational behavior and human decision processes*, 76(2), 149-188.
- Li, L., Gow, A. D. I., & Zhou, J. (2020). The role of positive emotions in education: a neuroscience perspective. *Mind, Brain, and Education*, 14(3), 220-234.

- Li, M., Wang, X., Gao, K., & Zhang, S. (2017). A survey on information diffusion in online social networks: Models and methods. *Information*, 8(4), 118.
- Lin, H. F. (2007). Effects of extrinsic and intrinsic motivation on employee knowledge sharing intentions. *Journal of information science*, 33(2), 135-149.
- Lin, T. C., & Huang, C. C. (2008). Understanding knowledge management system usage antecedents: An integration of social cognitive theory and task technology fit. *Information & management*, 45(6), 410-417.
- Lin, T. C., & Huang, C. C. (2010). Withholding effort in knowledge contribution: The role of social exchange and social cognitive on project teams. *Information & Management*, 47(3), 188-196.
- Liu, B. Q., & Goodhue, D. L. (2012). Two worlds of trust for potential e-commerce users: Humans as cognitive misers. *Information Systems Research*, 23(4), 1246-1262.
- Liu, J., & Scheufele, D. A. (2016). A revisionist perspective on framing effects. In *Oxford research encyclopedia of politics*.
- Long, S. A., Winograd, P. N., & Bridge, C. A. (1989). The effects of reader and text characteristics on imagery reported during and after reading. *Reading Research Quarterly*, 353-372.
- Lottridge, D., & Bentley, F. R. (2018, April). Let's Hate Together: How People Share News in Messaging, Social, and Public Networks. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (pp. 1-13).

- Lu, Y., Kim, Y., Dou, X. Y., & Kumar, S. (2014). Promote physical activity among college students: Using media richness and interactivity in web design. *Computers in Human Behavior*, 41, 40-50.
- Lueck, J. A. (2017). Matching message design and depressed cognition: An exploration of attention patterns for gain-and loss-framed depression help-seeking messages. *Journal of health communication*, 22(7), 593-603.
- Luna, D., & Peracchio, L. A. (2001). Moderators of language effects in advertising to bilinguals: A psycholinguistic approach. *Journal of Consumer Research*, 28(2), 284-295.
- Luna, D., Peracchio, L. A., & de Juan, M. D. (2003). The impact of language and congruity on persuasion in multicultural e-marketing. *Journal of Consumer Psychology*, 13(1-2), 41-50.
- Luo, X. R., Zhang, W., Burd, S., & Seazzu, A. (2013). Investigating phishing victimization with the Heuristic–Systematic Model: A theoretical framework and an exploration. *Computers & Security*, 38, 28-38.
- Ma, W. W., & Chan, A. (2014). Knowledge sharing and social media: Altruism, perceived online attachment motivation, and perceived online relationship commitment. *Computers in Human Behavior*, 39, 51-58.
- MacKenzie, S. B. (1986). The role of attention in mediating the effect of advertising on attribute importance. *Journal of Consumer Research*, 13(2), 174-195.
- Macskassy, S. A., & Michelson, M. (2011, July). Why do people retweet? anti-homophily wins the day!. In *ICWSM* (pp. 209-216).

- Maheswaran, D., & Chaiken, S. (1991). Promoting systematic processing in low-motivation settings: Effect of incongruent information on processing and judgment. *Journal of personality and social psychology*, 61(1), 13.
- Maheswaran, D., & Meyers-Levy, J. (1990). The influence of message framing and issue involvement. *Journal of Marketing research*, 27(3), 361-367.
- Maheswaran, D., Mackie, D. M., & Chaiken, S. (1992). Brand name as a heuristic cue: The effects of task importance and expectancy confirmation on consumer judgments. *Journal of consumer psychology*, 1(4), 317-336.
- Majchrzak, A. N. N., & More, P. H. (2011). Emergency! Web 2.0 to the rescue!. *Communications of the ACM*, 54(4), 125-132.
- Mann, T., Sherman, D., & Updegraff, J. (2004). Dispositional motivations and message framing: a test of the congruency hypothesis in college students. *Health Psychology*, 23(3), 330.
- Mayer, R. E., & Gallini, J. K. (1990). When is an illustration worth ten thousand words?. *Journal of educational psychology*, 82(4), 715.
- McNamara, L. A., Shumate, A. M., Johnsen, P., MacNeil, J. R., Patel, M., Bhavsar, T., ... & Garon, D. (2015). First use of a serogroup B meningococcal vaccine in the US in response to a university outbreak. *Pediatrics*, 135(5), 798-804.
- Media, S., & York, F. N. (2013). Campaigns Use Social Media to Lure Younger Voters. Retrieved October 23, 2019, from <https://www.nytimes.com/2012/10/08/technology/campaigns-use-social-media-to-lure-younger-voters.html>

- Messaris, P., & Abraham, L. (2001). The role of images in framing news stories. In *Framing public life* (pp. 231-242). Routledge.
- Meyerowitz, B. E., & Chaiken, S. (1987). The effect of message framing on breast self-examination attitudes, intentions, and behavior. *Journal of personality and social psychology*, 52(3), 500.
- Miah, S. J., Hasan, N., Hasan, R., & Gammack, J. (2017). Healthcare support for underserved communities using a mobile social media platform. *Information Systems*, 66, 1-12.
- Millar, M. G., & Millar, K. U. (1996). Effects of message anxiety on disease detection and health promotion behaviors. *Basic and Applied Social Psychology*, 18(1), 61-74.
- Miniard, P. W., Bhatla, S., Lord, K. R., Dickson, P. R., & Unnava, H. R. (1991). Picture-based persuasion processes and the moderating role of involvement. *Journal of consumer research*, 18(1), 92-107.
- Monographs, 2, 324–508.
- Montazeri, A., & McEwen, J. (1997). Effective communication: perception of two anti-smoking advertisements. *Patient Education and Counseling*, 30(1), 29-35.
- Morley, D. D., & Walker, K. B. (1987). The role of importance, novelty, and plausibility in producing belief change. *Communications Monographs*, 54(4), 436-442.
- Mozafari, N., & Hamzeh, A. (2015). An enriched social behavioural information diffusion model in social networks. *Journal of Information Science*, 41(3), 273-283.
- Munar, A. M., & Jacobsen, J. K. S. (2014). Motivations for sharing tourism experiences through social media. *Tourism management*, 43, 46-54.

- Nabi, R. L., Walter, N., Oshidary, N., Endacott, C. G., Love-Nichols, J., Lew, Z. J., & Aune, A. (2020). Can emotions capture the elusive gain-loss framing effect? A meta-analysis. *Communication Research*, 47(8), 1107-1130.
- Nan, X., Daily, K., & Qin, Y. (2018). Relative persuasiveness of gain-vs. loss-framed messages: a review of theoretical perspectives and developing an integrative framework. *Review of Communication*, 18(4), 370-390.
- Nan, X., Xie, B., & Madden, K. (2012). Acceptability of the H1N1 vaccine among older adults: the interplay of message framing and perceived vaccine safety and efficacy. *Health Communication*, 27(6), 559-568.
- Neiger, B. L., Thackeray, R., Burton, S. H., Giraud-Carrier, C. G., & Fagen, M. C. (2013). Evaluating social media's capacity to develop engaged audiences in health promotion settings: use of Twitter metrics as a case study. *Health promotion practice*, 14(2), 157-162.
- Newberry, K. J., Reckers, P. M., & Wyndelts, R. W. (1993). An examination of tax practitioner decisions: The role of preparer sanctions and framing effects associated with client condition. *Journal of Economic Psychology*, 14(2), 439-452.
- Newman, A. A. (2011). Brands now direct their followers to social media. *The New York Times*, 3.
- Niu, Z., Jeong, D. C., Brickman, J., Nam, Y., Liu, S., & Stapleton, J. L. (2020). A Picture Worth a Thousand Texts? Investigating the Influences of Visual Appeals in a Text Message-Based Health Intervention. *Journal of Health Communication*, 1-10.

- Nouri, H., & Shahid, A. (2005). The effect of PowerPoint presentations on student learning and attitudes. *Global Perspectives on Accounting Education*, 2, 53.
- O'Keefe, D. J., & Jensen, J. D. (2006). The advantages of compliance or the disadvantages of noncompliance? A meta-analytic review of the relative persuasive effectiveness of gain-framed and loss-framed messages. *Annals of the International Communication Association*, 30(1), 1-43.
- O'Keefe, D. J., & Jensen, J. D. (2007). The relative persuasiveness of gain-framed loss-framed messages for encouraging disease prevention behaviors: A meta-analytic review. *Journal of health communication*, 12(7), 623-644.
- O'Keefe, D. J., & Jensen, J. D. (2008). Do loss-framed persuasive messages engender greater message processing than do gain-framed messages? A meta-analytic review. *Communication Studies*, 59(1), 51-67.
- O'Keefe, D. J., & Wu, D. (2012). Gain-framed messages do not motivate sun protection: A meta-analytic review of randomized trials comparing gain-framed and loss-framed appeals for promoting skin cancer prevention. *International journal of environmental research and public health*, 9(6), 2121-2133.
- Oeldorf-Hirsch, A., & Sundar, S. S. (2015). Posting, commenting, and tagging: Effects of sharing news stories on Facebook. *Computers in human behavior*, 44, 240-249.
- Oh, S., & Syn, S. Y. (2015). Motivations for sharing information and social support in social media: A comparative analysis of Facebook, Twitter, Delicious, YouTube, and Flickr. *Journal of the Association for Information Science and Technology*, 66(10), 2045-2060.

- O'Keefe, D. J., & Jensen, J. D. (2009). The relative persuasiveness of gain-framed and loss-framed messages for encouraging disease detection behaviors: A meta-analytic review. *Journal of Communication*, 59(2), 296-316.
- Ollerenshaw, A., Aidman, E., & Kidd, G. (1997). Is an illustration always worth ten thousand words? Effects of prior knowledge, learning style and multimedia illustrations on text comprehension. *International journal of instructional media*, 24(3), 227.
- Ormerod, F., & Ivanič, R. (2002). Materiality in children's meaning-making practices. *Visual communication*, 1(1), 65-91.
- Paivio, A. (1991). Dual coding theory: Retrospect and current status. *Canadian Journal of Psychology/Revue canadienne de psychologie*, 45(3), 255.
- Paivio, A., & Clark, J. M. (2006). Dual coding theory and education. Pathways to literacy achievement for high poverty children, 1-20.
- Pan, Z., & Kosicki, G. M. (1993). Framing analysis: An approach to news discourse. *Political communication*, 10(1), 55-75.
- Pența, M. A., & Băban, A. (2018). Message framing in vaccine communication: A systematic review of published literature. *Health communication*, 33(3), 299-314.
- Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. In *Communication and persuasion* (pp. 1-24). Springer, New York, NY.
- Pope, J. P., Pelletier, L., & Guertin, C. (2018). Starting off on the best foot: A review of message framing and message tailoring, and recommendations for the

- comprehensive messaging strategy for sustained behavior change. *Health communication*, 33(9), 1068-1077.
- Powell, T. E., Boomgaarden, H. G., De Swert, K., & de Vreese, C. H. (2015). A clearer picture: The contribution of visuals and text to framing effects. *Journal of communication*, 65(6), 997-1017.
- Powell, T. E., Boomgaarden, H. G., De Swert, K., & de Vreese, C. H. (2019). Framing fast and slow: A dual processing account of multimodal framing effects. *Media Psychology*, 22(4), 572-600.
- Prentice-Dunn, S., & Rogers, R. W. (1986). Protection motivation theory and preventive health: Beyond the health belief model. *Health education research*, 1(3), 153-161.
- Qi, J., Liang, X., Wang, Y., & Cheng, H. (2018). Discrete time information diffusion in online social networks: micro and macro perspectives. *Scientific reports*, 8(1), 1-15.
- Quick, B. L., & Bates, B. R. (2010). The use of gain-or loss-frame messages and efficacy appeals to dissuade excessive alcohol consumption among college students: A test of psychological reactance theory. *Journal of health communication*, 15(6), 603-628.
- Rachlinski, J. J. (1996). Gains, losses, and the psychology of litigation. *S. Cal. L. Rev.*, 70, 113.
- Ratcliff, C. L., Jensen, J. D., Scherr, C. L., Krakow, M., & Crossley, K. (2019). Loss/gain framing, dose, and reactance: A message experiment. *Risk Analysis*, 39(12), 2640-2652.

- Reber, R., Schwarz, N., & Winkielman, P. (2004). Processing fluency and aesthetic pleasure: Is beauty in the perceiver's processing experience?. *Personality and social psychology review*, 8(4), 364-382.
- Reis, H. T., Smith, S. M., Carmichael, C. L., Caprariello, P. A., Tsai, F. F., Rodrigues, A., & Maniaci, M. R. (2010). Are you happy for me? How sharing positive events with others provides personal and interpersonal benefits. *Journal of personality and social psychology*, 99(2), 311.
- Robberson, M. R., & Rogers, R. W. (1988). Beyond fear appeals: Negative and positive persuasive appeals to health and self-esteem. *Journal of Applied Social Psychology*, 18(3), 277-287.
- Rohlinger, D. A., & Bunnage, L. (2017). Did the Tea Party movement fuel the Trump-train? The role of social media in activist persistence and political change in the 21st century. *Social Media+ Society*, 3(2), 2056305117706786.
- Rosen, S., & Tesser, A. (1970). On reluctance to communicate undesirable information: The MUM effect. *Sociometry*, 253-263.
- Rothman, A. J., & Salovey, P. (1997). Shaping perceptions to motivate healthy behavior: the role of message framing. *Psychological bulletin*, 121(1), 3.
- Rothman, A. J., Desmarais, K. J., & Lenne, R. L. (2020). Moving from research on message framing to principles of message matching: The use of gain-and loss-framed messages to promote healthy behavior. In *Advances in Motivation Science* (Vol. 7, pp. 43-73). Elsevier.

- Rothman, A. J., Martino, S. C., Bedell, B. T., Detweiler, J. B., & Salovey, P. (1999). The systematic influence of gain-and loss-framed messages on interest in and use of different types of health behavior. *Personality and Social Psychology Bulletin*, 25(11), 1355-1369.
- Rothman, A. J., Salovey, P., Antone, C., Keough, K., & Martin, C. D. (1993). The influence of message framing on intentions to perform health behaviors. *Journal of experimental social psychology*, 29(5), 408-433.
- Rothman, A. J., Salovey, P., Antone, C., Keough, K., & Martin, C. D. (1993). The influence of message framing on intentions to perform health behaviors. *Journal of experimental social psychology*, 29(5), 408-433.
- Rubin, R. B., Perse, E. M., & Barbato, C. A. (1988). Conceptualization and measurement of interpersonal communication motives. *Human Communication Research*, 14,602-628.
- Ruggeri, K., Ali, S., Berge, M. L., Bertoldo, G., Bjørndal, L. D., Cortijos-Bernabeu, A., ... & Folke, T. (2020). Replicating patterns of prospect theory for decision under risk. *Nature human behaviour*, 4(6), 622-633.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist*, 55(1), 68.
- Samson, A., & Voyer, B. G. (2012). Two minds, three ways: dual system and dual process models in consumer psychology. *AMS review*, 2(2-4), 48-71.

- Sarafino, E. P., & Smith, T. W. (2014). *Health psychology: Biopsychosocial interactions*. John Wiley & Sons.
- Scanfeld, D., Scanfeld, V., & Larson, E. L. (2010). Dissemination of health information through social networks: Twitter and antibiotics. *American journal of infection control*, 38(3), 182-188.
- Scheufele, D. A., & Tewksbury, D. (2007). Framing, agenda setting, and priming: The evolution of three media effects models. *Journal of communication*, 57(1), 9-20.
- Schiuma, G., Vuori, V., & Okkonen, J. (2012). Knowledge sharing motivational factors of using an intra-organizational social media platform. *Journal of knowledge management*.
- Schneider, T. R., Salovey, P., Pallonen, U., Mundorf, N., Smith, N. F., & Steward, W. T. (2001). Visual and Auditory Message Framing Effects on Tobacco Smoking 1. *Journal of Applied Social Psychology*, 31(4), 667-682.
- Schnotz, W., & Bannert, M. (1999). Influence of the type of visualization on the construction of mental models during picture and text comprehension. *Zeitschrift für Experimentelle Psychologie: Organ der Deutschen Gesellschaft für Psychologie*, 46(3), 217-236.
- Schols, J. M., & de Veer, A. J. (2005). Information exchange between general practitioner and nursing home physician in the Netherlands. *Journal of the American Medical Directors Association*, 6(3), 219-225.
- Scott, L. M. (1994). Images in advertising: The need for a theory of visual rhetoric. *Journal of consumer research*, 21(2), 252-273.

- Sedrak, M. S., Cohen, R. B., Merchant, R. M., & Schapira, M. M. (2016). Cancer communication in the social media age. *JAMA Oncology*, 2(6), 822–823. <https://doi.org/10.1001/jamaoncol.2015.5475>
- Seo, B. K. (2020). Meta-Analysis on Visual Persuasion—Does Adding Images to Texts Influence Persuasion?. *Athens Journal of Mass Media and Communications*, 6(3), 177-190.
- Seo, K., & Dillard, J. (2019). The persuasive effects of two stylistic elements: Framing and imagery. *Communication Research*, 46(7), 891-907.
- Seo, K., Dillard, J. P., & Shen, F. (2013). The effects of message framing and visual image on persuasion. *Communication Quarterly*, 61(5), 564-583.
- Shahab, L., Hall, S., & Marteau, T. (2007). Showing smokers with vascular disease images of their arteries to motivate cessation: a pilot study. *British journal of health psychology*, 12(2), 275-283.
- Shi, J., Hu, P., Lai, K. K., & Chen, G. (2018). Determinants of users' information dissemination behavior on social networking sites. *Internet Research*.
- Smith, S. M., & Shaffer, D. R. (2000). Vividness can undermine or enhance message processing: The moderating role of vividness congruency. *Personality and Social Psychology Bulletin*, 26(7), 769-779.
- Soeters, H. M., McNamara, L. A., Blain, A. E., Whaley, M., MacNeil, J. R., Hariri, S., & Mbaeyi, S. A. (2019). University-based outbreaks of meningococcal disease caused by serogroup B, United States, 2013–2018. *Emerging infectious diseases*, 25(3), 434.

- Sontag, J. M. (2018). Visual framing effects on emotion and mental health message effectiveness. *Journal of Communication in Healthcare*, 11(1), 30-47.
- Steward, W. T., Schneider, T. R., Pizarro, J., & Salovey, P. (2003). Need for Cognition Moderates Responses to Framed Smoking-Cessation Messages 1. *Journal of Applied Social Psychology*, 33(12), 2439-2464.
- Strekalova, Y. A., & Krieger, J. L. (2017). A picture really is worth a thousand words: Public engagement with the National Cancer Institute on social media. *Journal of Cancer Education*, 32(1), 155-157.
- Suka, M., Yamauchi, T., & Yanagisawa, H. (2018). Comparing responses to differently framed and formatted persuasive messages to encourage help-seeking for depression in Japanese adults: a cross-sectional study with 2-month follow-up. *BMJ open*, 8(11).
- Sundar, S. S. (2008). The MAIN model: A heuristic approach to understanding technology effects on credibility (pp. 73-100). MacArthur Foundation Digital Media and Learning Initiative.
- Sung, E., & Mayer, R. E. (2012). When graphics improve liking but not learning from online lessons. *Computers in human behavior*, 28(5), 1618-1625.
- Susarla, A., Oh, J. H., & Tan, Y. (2012). Social networks and the diffusion of user-generated content: Evidence from YouTube. *Information Systems Research*, 23(1), 23-41.

- Tetlock, P. C., Saar-Tsechansky, M., & Macskassy, S. (2008). More than words: Quantifying language to measure firms' fundamentals. *The Journal of Finance*, 63(3), 1437-1467.
- Thackeray, R., Neiger, B. L., Hanson, C. L., & McKenzie, J. F. (2008). Enhancing promotional strategies within social marketing programs: use of Web 2.0 social media. *Health promotion practice*, 9(4), 338-343.
- Thornton, B., Kirchner, G., & Jacobs, J. (1991). Influence of a photograph on a charitable appeal: A picture may be worth a thousand words when it has to speak for itself. *Journal of Applied Social Psychology*, 21(6), 433-445.
- Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, 211, 453-458.
- Tykcinski, O., Higgins, E. T., & Chaiken, S. (1994). Message framing, self-discrepancies, and yielding to persuasive messages: The motivational significance of psychological situations. *Personality and Social Psychology Bulletin*, 20(1), 107-115.
- Updegraff, J. A., & Rothman, A. J. (2013). Health message framing: Moderators, mediators, and mysteries. *Social and Personality Psychology Compass*, 7(9), 668-679.
- Van Rompay, T. J., De Vries, P. W., & Van Venrooij, X. G. (2010). More than words: on the importance of picture-text congruence in the online environment. *Journal of Interactive Marketing*, 24(1), 22-30.

- Van Walraven, C., Taljaard, M., Bell, C. M., Etchells, E., Zarnke, K. B., Stiell, I. G., & Forster, A. J. (2008). Information exchange among physicians caring for the same patient in the community. *Cmaj*, 179(10), 1013-1018.
- Van't Riet, J., Cox, A. D., Cox, D., Zimet, G. D., De Bruijn, G. J., Van den Putte, B., ... & Ruiter, R. A. (2016). Does perceived risk influence the effects of message framing? Revisiting the link between prospect theory and message framing. *Health Psychology Review*, 10(4), 447-459.
- Veil, S. R., Buehner, T., & Palenchar, M. J. (2011). A work-in-process literature review: Incorporating social media in risk and crisis communication. *Journal of contingencies and crisis management*, 19(2), 110-122.
- Verhiac, J. F., Chappé, J., & Meyer, T. (2011). Do Threatening Messages Change Intentions to Give Up Tobacco Smoking? The Role of Argument Framing and Pictures of a Healthy Mouth Versus an Unhealthy Mouth 1. *Journal of Applied Social Psychology*, 41(9), 2104-2122.
- Villarroel Ordenes, F., Grewal, D., Ludwig, S., Ruyter, K. D., Mahr, D., & Wetzels, M. (2019). Cutting through content clutter: How speech and image acts drive consumer sharing of social media brand messages. *Journal of Consumer Research*, 45(5), 988-1012.
- Vranken, S., Geusens, F., Meeus, A., & Beullens, K. (2020). The Platform is the Message? Exploring the Relation Between Different Social Networking Sites and Different Forms of Alcohol Use. *Health & New Media Research*, 4(2), 135-168.

- Vuori, V., & Okkonen, J. (2012). Refining information and knowledge by social media applications: Adding value by insight. *Vine*, 42(1), 117-128.
- Wang, W. T., & Hou, Y. P. (2015). Motivations of employees' knowledge sharing behaviors: A self-determination perspective. *Information and Organization*, 25(1), 1-26.
- Wasko, M. M., & Faraj, S. (2000). "It is what one does": why people participate and help others in electronic communities of practice. *The journal of strategic information systems*, 9(2-3), 155-173.
- Waterloo, S. F., Baumgartner, S. E., Peter, J., & Valkenburg, P. M. (2018). Norms of online expressions of emotion: Comparing Facebook, Twitter, Instagram, and WhatsApp. *new media & society*, 20(5), 1813-1831.
- Wattal, S., Schuff, D., Mandviwalla, M., & Williams, C. B. (2010). Web 2.0 and politics: the 2008 US presidential election and an e-politics research agenda. *MIS quarterly*, 669-688.
- Webb, T., Joseph, J., Yardley, L., & Michie, S. (2010). Using the internet to promote health behavior change: a systematic review and meta-analysis of the impact of theoretical basis, use of behavior change techniques, and mode of delivery on efficacy. *Journal of medical Internet research*, 12(1), e4.
- Westerman, D., Spence, P. R., & Van Der Heide, B. (2014). Social media as information source: Recency of updates and credibility of information. *Journal of computer-mediated communication*, 19(2), 171-183.

- Westman, S., & Oittinen, P. (2006). Image retrieval by end-users and intermediaries in a journalistic work context. *ACM International Conference Proceeding Series*, 176, 102–110. <https://doi.org/10.1145/1164820.1164843>
- Wiener, H. J. (2017). *Conversation Pieces: The Role of Products in Facilitating Conversation* (Doctoral dissertation, Duke University).
- Wilson, D. K., Wallston, K. A., & King, J. E. (1990). Effects of Contract Framing, Motivation to Quit, and Self-Efficacy on Smoking Reduction 1. *Journal of Applied Social Psychology*, 20(7), 531-547.
- Winkielman, P., & Cacioppo, J. T. (2001). Mind at ease puts a smile on the face: psychophysiological evidence that processing facilitation elicits positive affect. *Journal of personality and social psychology*, 81(6), 989.
- Wojdyski, B. W., & Evans, N. J. (2016). Going native: Effects of disclosure position and language on the recognition and evaluation of online native advertising. *Journal of Advertising*, 45(2), 157-168.
- Yang, T. M., & Maxwell, T. A. (2011). Information-sharing in public organizations: A literature review of interpersonal, intra-organizational and inter-organizational success factors. *Government Information Quarterly*, 28(2), 164-175.
- Yechiam, E., Telpaz, A., & Hochman, G. (2014). The complaint bias in subjective evaluations of incentives. *Decision*, 1(2), 147.
- Yoo, W., Yang, J., & Cho, E. (2016). How social media influence college students' smoking attitudes and intentions. *Computers in Human Behavior*, 64, 173-182.

- Yoon, J., & Chung, E. (2016). Image use in social network communication: A case study of tweets on the Boston marathon bombing. *Information Research*, 21(1), 2016. Retrieved from http://scholarcommons.usf.edu/qmb_facpubhttp://scholarcommons.usf.edu/qmb_facpub/
- Zhang, J., & Ghorbani, A. A. (2004, October). Familiarity and Trust: Measuring Familiarity with a Web Site. In *PST* (pp. 23-28).
- Zhang, K. Z., Zhao, S. J., Cheung, C. M., & Lee, M. K. (2014). Examining the influence of online reviews on consumers' decision-making: A heuristic–systematic model. *Decision Support Systems*, 67, 78-89.
- Zhang, Y., Moe, W. W., & Schweidel, D. A. (2017). Modeling the role of message content and influencers in social media rebroadcasting. *International Journal of Research in Marketing*, 34(1), 100-119.
- Zhao, F., Schnotz, W., Wagner, I., & Gaschler, R. (2014). Eye Tracking Indicators of Reading Approaches in Text-Picture Comprehension. *Frontline Learning Research*, 2(5), 46-66.
- Zhao, X., & Nan, X. (2010). Influence of self-affirmation on responses to gain-versus loss-framed antismoking messages. *Human communication research*, 36(4), 493-511.
- Zillmann, D. (1999). Exemplification theory: Judging the whole by some of its parts. *Media Psychology*, 1(1), 69-94.
- Zillmann, D. (2002). Exemplification theory of media influence. *Media effects: Advances in theory and research*, 2, 19-41.

Zinko, R., Stolk, P., Furner, Z., & Almond, B. (2020). A picture is worth a thousand words: how images influence information quality and information load in online reviews. *Electronic Markets*, 30(4), 775-789.