STUDIES ON PUBLIC'S FIRST AID KNOWLEDGE LEARNING ON SOCIAL MEDIA: WILLINGNESS TO LEARN, KNOWLEDGE ACQUISITION, AND KNOWLEDGE ADOPTION

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PhD

The Hong Kong Polytechnic University

This programme is jointly offered by The Hong Kong Polytechnic

University and Harbin Institute of Technology

2023

The Hong Kong Polytechnic University

Department of Logistics and Maritime Studies

Harbin Institute of Technology

School of Management

Studies on Public's First Aid Knowledge Learning on Social Media: Willingness to Learn, Knowledge Acquisition, and Knowledge Adoption

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A thesis submitted in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

April 2023

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Abstract

In China, the low prevalence of first aid leads to low level of first aid knowledge among the public. With the advancement of information technology, people are growingly use social media to get information, which provides new opportunities for popularizing first aid knowledge. Although extant studies have richly investigated the application of social media in first aid popularization, gaps remain in exploring how to motivate individuals to actively learn first aid knowledge on social media. Noteworthy, active learning behavior determines whether using social media for first aid popularization is effective.

This thesis explores the three stages of public first aid knowledge learning on social media: formation of willingness to learn -> knowledge acquisition -> knowledge adoption. Further, this thesis defines first aid knowledge learning behavior as health behavior and information behavior with theoretical grounds, aiming to explain the influencing factors and mechanisms of first aid knowledge learning at different stages. Drawing on health behavior theory, information behavior theory, protective motivation theory, stimulus-organism-response (S-O-R) model, and information adoption model, this thesis analyzes first aid knowledge learning behavior from perspectives of individual motivation, social media technical characteristics, and information characteristics, respectively.

Firstly, from the perspective of individual motivation, the motivation for learning first aid knowledge and its influence on willingness to learn were explored. This thesis conceptualized first aid knowledge learning as a socialized health behavior with collective attributes. Through semi-structured interviews and combined with the protection motivation theory, this thesis identified the public's self-related cognitive motivation, collective-related cognitive motivation,

and emotional motivation to learn first aid knowledge. A theoretical model was constructed and empirically verified through qualitative interview and quantitative examination. The results showed that in the context of first aid knowledge learning, collective-related cognitive motivation plays a more critical role than self-related cognitive motivation and stimulates the public's willingness to learn by influencing emotional motivation.

Secondly, from the perspective of technical characteristics, this thesis explored the impacts of social media interactivity on first aid knowledge acquisition behavior. Individuals acquire first aid knowledge during the interaction with social media, and interactivity is the most significant feature distinguishing social media from traditional media. This thesis specifically examined three aspects of social media interactivity: human-information interaction, human-system interaction, and human-human interaction. Moreover, two individual experiences of the public on social media: involvement and telepresence, were identified. Employing the S-O-R model, we constructed a theoretical model to investigate how social media interactivity (S) affects individual experience (O), which in turn influences knowledge acquisition behavior (R). This study found that interactions of different dimensions affect knowledge acquisition behavior by affecting different personal experiences. Human-information interaction and human-human interaction showed more potent effects on individual experience than human-system interaction.

Finally, this thesis explored the influence of first aid knowledge information characteristics on the public’s adoption behavior. In accordance with information adoption model, informational cognitive characteristics (e.g., argument quality and source credibility) affect individuals' cognition (e.g., perceived information usefulness), and further influence behavior

of information adoption. Combining with the characteristics of first aid knowledge, this thesis explored how the cognitive characteristics, affective characteristics, and social characteristics of first aid knowledge jointly affect knowledge adoption behavior. This thesis identified affective factors (i.e., emotional arousal) and social factors (i.e., descriptive norms) that influence knowledge adoption. The findings suggest that the affective characteristics of first aid knowledge could affect knowledge adoption through arousal; social characteristics could affect knowledge adoption through descriptive norms. Descriptive norms showed the strongest effect on first aid knowledge adoption, while arousal and perceived information usefulness could synergistically affect knowledge adoption.

This thesis theoretically and practically contributes to promoting public's first aid knowledge learning on social media. Theoretically, this thesis, by subdividing the first aid knowledge learning process, explores the willingness to learn, knowledge acquisition behavior, and knowledge adoption behavior, gradually revealing the internal mechanism of how to motivate individuals to learn first aid knowledge on social media. Combined with health behavior theory and information behavior theory, this thesis explains antecedents and their influence mechanisms on first aid knowledge learning behavior from perspectives of individual motivation, social media characteristics, and information characteristics. Practically, this thesis provides guidance for the government and organizations to better stimulate motivation and willingness to learn first aid knowledge. This thesis also provides social media managers and first aid knowledge education practitioners with design optimization suggestions regarding function and content to promote knowledge acquisition and knowledge adoption through social media. Thus, this thesis can potentially upgrade first aid knowledge level of the public in China

with the theoretically-grounded learning mechanisms identified and empirically validated.

Keywords: first aid knowledge learning; social media; individual motivation; social media interactivity; information characteristics

Selected Publications of the Candidate

Published papers

[1] **Ma, X.**, Sun, Y., Guo, X., Lai, K. H., & Vogel, D. (2022). Understanding users' negative responses to recommendation algorithms in short-video platforms: a perspective based on the Stressor-Strain-Outcome (SSO) framework. *Electronic Markets*, 1-18.

[2] **Ma, X.**, Zhang, P., Meng, F., & Lai, K. H. (2022). How does physicians' educational knowledge-sharing influence patients' engagement? An empirical examination in online health communities. *Frontiers in Public Health*, 10.

[3] **Ma, X.**, Zhang, X., Guo, X., Lai, K. H., & Vogel, D. (2021). Examining the role of ICT usage in loneliness perception and mental health of the elderly in China. *Technology in Society*, 67, 101718.

[4] Liu, J., Liu, X., Lai, K. H., Zhang, X., & **Ma, X**. (2023). Exploring rumor behavior during the COVID-19 pandemic through an information processing perspective: The moderating role of critical thinking. Computers in Human Behavior, 107842.

[5] Luo, P., **Ma, X.**, Zhang, X., Liu, J., & He, H. (2021). How to make money with credit information? Information processing on online accommodation-sharing platforms. *Tourism Management*, 87, 104384.

[6] **Ma, X.**, Sun, Y., & Guo, X. (2022). From Cognition to Emotion: An Extended Information Adoption Model. The 21th Wuhan International Conference on E-Business (WHICEB2022), in Wuhan, China from May 28-29, 2022.

Working papers

[1] **Ma, X.**, Guo, X, & Lai, K. H. Understanding the dynamics of users' continuous use of mHealth services with a latent growth model. To be submitted to *Computers in Human Behavior*.

[2] **Ma, X.**, Luo, P, & Lai, K. H. Investigating the effect of AI awareness on service innovation behavior: the perspective of role theory. To be submitted to *Journal of Business Research*.

[3] **Ma, X.**, Wang L, & Lai, K. H. More capability, less creation? Dark side of ChatGPT's information processing capability. To be submitted to *International Journal of Information Management*.

Acknowledgments

I would like to sincerely express my greatest appreciation and gratitude to the following individuals. The thesis is finished under their help, guidance, and encouragement. I will not complete this thesis without their support.

First and foremost, I would like to express my deepest gratitude to my supervisors, Prof. Kee-hung Lai at PolyU and Prof. Xitong Guo at HIT. I benefited greatly from their excellent guidance throughout my whole Ph.D. study. Their readily available supervision, extensive expertise, and charismatic personality enabled me to learn a lot during the research period. In addition to selfless support and invaluable guidance, they also taught me a positive and optimistic attitude towards life, which makes my Ph.D. study enjoyable. Without their suggestions and support, I would not complete this thesis.

I would also like to express my heartfelt appreciation to all co-authors of my research papers. They are Prof. Yongqiang Sun at Wuhan University, Prof. Xiaofei Zhang at Nankai University, Prof. Fanbo Meng at Jiangnan University, Prof. Peng Luo at Sichuan University, and Prof. Jianwei Liu at Dalian University of Technology. I appreciate their beneficial help in research designing and academic writing.

Finally, I am very grateful for the love, support, and patience of my family. Their love is what keeps me moving forward. I would also like to thank my friends and classmates in both PolyU and HIT. Their companionship and support have enriched my doctoral life.

Table of Contents

List of Figures

List of Tables

Chapter 1 Introduction

1.1 Research Background

In recent years, many medical problems have been overcome due to the continuous advancement of medical technology. However, injuries to people caused by accidents and emergent diseases still occur frequently. According to the World Health Organization, nearly 5 million people lose their lives from sudden injuries every year. Among them, more than a quarter (29%) are caused by traffic injuries—the main cause of death among adolescents aged 5-27 (Zhou et al., 2019). Heart disease and stroke are two sudden diseases that rank first among the top ten causes of death. Particularly, the number of sudden cardiac death cases in China has exceeded 540,000 each year, while the survival rate is less than 1% (Shi & Ge, 2016).

First aid is a vital step in saving lives when an accident occurs. When accidental injury or sudden disease occurs, timely and effective first aid can greatly reduce casualties and improve the success rate of rescue (Wissenberg et al., 2013). As the first witnesses on the scene, the public with good first aid knowledge and skills can deal with emergencies promptly and efficiently before the professionals arrive, which can greatly reduce the harm caused by emergencies. Survival from sudden injury or illness is determined by both severity and availability of on-site first aid at the time of the accident (Fiske, 1999). Taking cardiac arrest as an example, as the pace of life quickens and the pressures of life increase, the frequency of cardiac arrest is gradually increasing. The optimal time for resuscitating cardiac arrest patients is 4 minutes, commonly known as "golden four minutes". The survival probability of patients will decrease by 8% to 10% every minute (Valenzuela et al., 1997; Weisfeldt & Becker, 2002). Therefore, before professionals arrive, timely and appropriate first aid of witnesses at the scene

means the continuation of life. Studies have shown that this rapid response to pre-hospital emergencies can greatly improve the survival rate of cardiac arrest reaching 50% (Weisfeldt & Becker, 2002).

As an important guarantee for saving lives, first aid knowledge and skills have always been valued by the international community. The International Red Cross designates the second Saturday of September as "World First Aid Day", calling on people to pay more attention to learning first aid knowledge. However, first aid awareness and first aid knowledge of the public in China are still very lacking. As far as cardiopulmonary resuscitation is concerned, less than 1% of the population in China has received cardiopulmonary resuscitation training, compared with 33% in the United States and 40% in France. As early as 2005, 50 million people had been trained for first aid in the United States, and the prevalence of first aid knowledge had reached 25%. In 2013, the prevalence of first aid knowledge among residents in Poland and Australia reached 75% and 50% respectively. In Japan, the popularization rate of first aid knowledge among middle school students alone has reached 92%. However, the statistics show that the popularization rate of first aid knowledge among Chinese public residents is less than 5%, as shown in Figure 1-1. The Chinese public is woefully lacking in first aid knowledge.

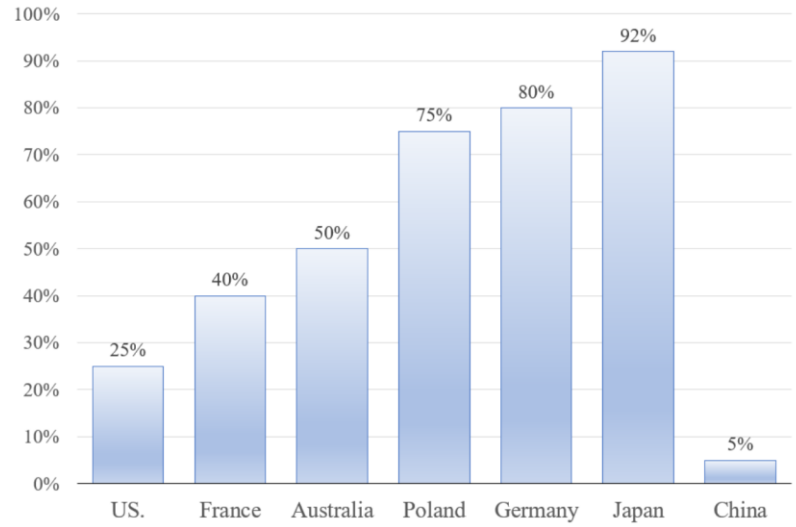

Figure 1-1 Prevalence of first aid knowledge in various countries

To narrow the gap with developed countries as soon as possible, it is necessary to enhance the public's first aid awareness and improve first aid knowledge level among the public in China. It is expected that everyone knows first aid knowledge, and the public is expected to become the main force of the scene first aid. Especially in rural areas with backward economic development, the time for professional paramedics to arrive at the scene and the emergency response time are longer than the national average, leading to a higher demand for first aid knowledge among the public. Therefore, converting on-site witnesses into rescuers plays a vital role in improving survival rates, thus first aid popularization is imperative. However, due to limited medical resources, the implementation of first aid popularization faces many difficulties and challenges. How to effectively popularize first aid knowledge for people in various regions and comprehensively improve their first aid awareness and knowledge level is an immediate issue to be addressed in China.

The speedy expansion of the Internet has narrowed the differences in information resources between regions and promoted the acquisition and dissemination of information. Social media, the current fast-growing content dissemination platform, has become an important channel for

first aid knowledge dissemination and popularization. Statistics show that the number of population active on social media has reached to one-third of population in the whole world. Taking Sina Weibo as an example, the overall coverage of Sina Weibo among netizens increased significantly. As of December 2022, there are 586 million active users per month on Weibo, a up 13 million from a year earlier. The growth trend is shown in Figure 1-2.

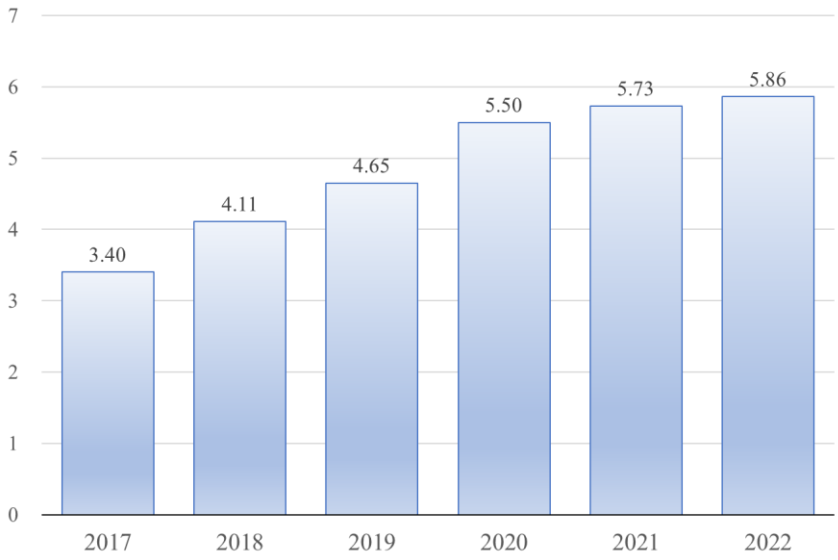

Figure 1-2 Monthly active users' growth in Weibo (100 million)

In addition to the high coverage rate, social media has grown as a major channel for individuals to get information. British Reuters "2016 Digital Information Research Report" showed that 64% of users aged 18-24 are very dependent on obtaining information from online media; 28% of users said that almost all of their online tools could be replaced by social media. Especially during the COVID-19 pandemic, most of people obtain epidemic-related information from social media. During the outbreak period from January to March 2020, the number of talked topics about the pandemic on Sina Weibo exceeded 100,000, where the total readings exceeded 400 billion. Averagely, over 200 million netizens follow the information about the pandemic on Sina Weibo every day.

Social media provides an effective channel for first aid knowledge dissemination and popularization. In addition to a huge number of users, the ecology and content of social media are diversified, which has brought a positive impact on users. Compared with traditional media, social media shows superiority in content richness, dissemination timelessness, and information acquisition convenience, enabling users to take full advantage of fragmented time to access information on social media. The huge number of users and convenience make it great potential to disseminate and popularize first aid knowledge through social media. In the past, first aid knowledge dissemination and popularizing were mainly through traditional media channels such as television, newspapers, and radio. In recent decades, social media has been the primary choice for first aid knowledge popularization due to its advantages. On October 15, 2015, the European Council of Cardiopulmonary Resuscitation released "New Guidelines for Cardiopulmonary Resuscitation". In this guideline, social media is suggested to act as an implementation tool to disseminate first aid knowledge. The "Healthy China" campaign launched by China in 2019 also emphasized that organizations and practitioners should take advantage of social media in health knowledge popularization and increase the public's enthusiasm for getting first aid knowledge. Social media is more inclusive and breaks the limitations of time and place and thus is of great potential to improve the public's first aid skills and levels.

Despite of tremendous potential and significance of popularizing first aid knowledge through social media, the status quo is not optimistic. Social media provides a favorable platform, however, the effectiveness of first aid knowledge popularization depends on the active learning willingness and behavior of the public. At present, individuals' willingness to

learn first aid knowledge and active learning behavior are extremely lacking. Therefore, it is crucial to explore public's motivation and willingness and understand how to promote their first aid knowledge learning behavior on social media. It helps to facilitate first aid popularization through social media and improve the popularization effectiveness.

1.2 Research Questions and Research Objectives

1.2.1 Research Questions

According to Gagne's definition, knowledge learning refers to the process of acquiring, processing, and utilizing knowledge, where the process involves several stages, such as stage of motivation, stage of acquisition, and stage of action (Gagne, 1962). Particularly, the motivation stage refers to whether the individual forms a willingness to learn; the acquisition stage refers to the search and acquisition of knowledge; and the action stage includes the behavior of processing and utilizing knowledge (such as knowledge adoption). Accordingly, this thesis aims to understand successive stages of first aid knowledge learning, including learning willingness, knowledge acquisition, and knowledge adoption.

In accordance with the definition, information behavior is defined as the behaviors of demand expression for information, information acquisition, and information utilization (Davenport & Prusak, 1997; Sun, 2019). Information behavior is influenced by individual, technological, and informational factors (Sun, 2019). First aid knowledge learning behavior (including willingness to learn, knowledge acquisition, and knowledge adoption) can be regarded as a kind of information behavior, thus it will be affected by individual, technological, and informational factors.

However, for different stages of first aid knowledge learning behavior, the main

influencing factors may be different. For example, the willingness to learn is mainly influenced by individual factors since it is usually formed before individuals interact with technology and information. First aid knowledge acquisition occurs in the interaction process between individuals and technology. Therefore, technical factors become the main reason affecting first aid knowledge acquisition. First aid knowledge adoption is the analysis, evaluation, and acceptance of knowledge, and it is the result of information processing. Therefore, informational factors become the main factors affecting first aid knowledge adoption. Specific to the research context of this thesis, this thesis aims to determine the individual factors, technological factors, and informational factors that affect three stages of first aid knowledge learning process, as shown in Figure 1-3.

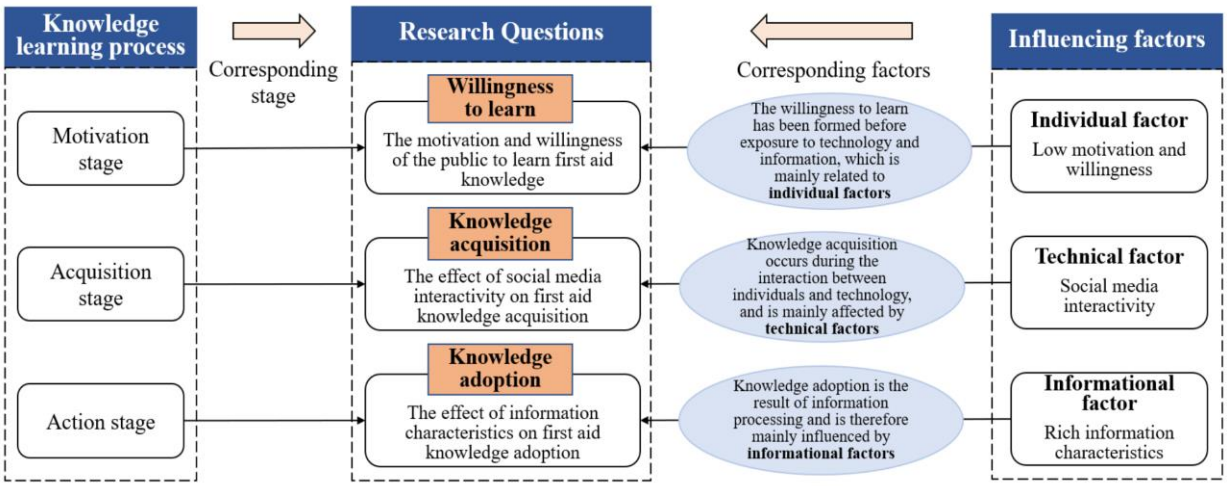

Figure 1-3 Research questions and ideas

In terms of individual factors, individual motivation becomes the main factor affecting the willingness to learn. individuals' motivation to learn is quite low due to the following characteristics of first aid knowledge: (1) For the vast majority of people, first aid knowledge is not necessary. The occurrence of first aid situations is accidental, and first aid knowledge learning cannot bring direct benefits and returns. (2) The utilization of first aid knowledge

occurs in the future and is uncertain. Unlike common medical knowledge and information (e.g., chronic disease management) that is used to solve current physical health problems, first aid knowledge is used to prevent future health threats. (3) Different from other medical and health knowledge, the study and use of first aid knowledge has social collective attributes and is used to help others rather than help themselves. The above points may weaken the publics' motivation to learn first aid knowledge, resulting in low willingness to learn. Therefore, this thesis mainly focuses on individual motivation and its influence on the willingness to learn first aid knowledge.

In terms of technical factors, interactivity is the most notable technical feature distinguishing social media from traditional media (e.g., TV, radio, magazines, etc.). Interactivity includes the multiple dimensions of interaction, such as human-systems interaction, human-information interaction, and human-human interaction. First aid knowledge acquisition occurs during the process where public interacts with social media to obtain information/knowledge. The interactivity of social media enables the public to obtain personalized information from social media more quickly and realize communication with others simultaneously. It helps to promote individual experience, thereby affecting the acquisition behavior. Therefore, this thesis mainly focuses on how social media interactivity affects first aid knowledge acquisition behavior.

In terms of informational factors, first aid knowledge on social media has rich information characteristics. Firstly, the inclusiveness and sociability of social media allow information from different sources to be displayed in different forms, making the information diverse and rich, and able to convey social influence with some social characteristics. Secondly, first aid

knowledge is usually accompanied by emergency events. Compared with general information, first aid knowledge will involve emotional factors and present some emotional characteristics. From this point of view, the rich characteristics of first aid knowledge on social media may affect users' evaluation and adoption behavior. Therefore, this thesis primarily pays attention to impacts of informational characteristics on public's first aid knowledge adoption.

To sum up, considering features of first aid knowledge and in combination with social media characteristics, this thesis investigates impacts of individual motivation, social media interactivity, and information characteristics on first aid knowledge learning at different stages (learning willingness -> knowledge acquisition -> knowledge adoption). The following are specific research questions:

RQ1: What are the motivations for individuals to learn first aid knowledge? And how do these motivations affect their willingness to learn?

RQ2: How does social media interactivity affect first aid knowledge acquisition behavior?

RQ3: How do first aid knowledge information characteristics affect first aid knowledge adoption behavior?

1.2.2 Research Objectives

Although popularizing first aid knowledge through social media shows great potential, it faces great challenges, especially in how to promote the public to actively and effectively use social media to learn first aid knowledge. To address this issue, this thesis explores the willingness to learn, knowledge acquisition, and knowledge adoption. The thesis gradually reveals the influencing factors and mechanism of first-aid knowledge learning behavior and provides theoretical and practical suggestions for promoting the public's learning behavior. The

following are specific research objectives:

(1) Explore motivations and willingness of the public to learn first aid knowledge based on first aid knowledge characteristics.

The learning and popularization of first aid knowledge is an effective measure to save medical resources and relieve medical pressure, and it is essential in improving the health of the whole people. However, Chinese residents still are weak in first aid awareness and in first aid knowledge reserve. Understanding public's learning motivations will help to take corresponding incentive measures to stimulate their first aid awareness and improve their willingness to learn. A literature review found that although individual motivations have been examined in various health behavior context, such as vaccination (Fall et al., 2018) and health checkups (Jones et al., 2019), there are still gaps in the motivation of learning first aid knowledge. Due to the characteristics of uncertainty and preventive and social collective attributes, the motivations and mechanisms of learning first aid knowledge may be different from other health behaviors. Therefore, it is an urgent problem to understand the motivation of learning first aid knowledge based on first aid features and explore how the motivation enhances the willingness to learn.

(2) Explore how technological characteristics of social media (e.g., interactivity) affect the public's first aid knowledge acquisition behavior.

Promoting the public to obtain first aid knowledge through social media is critical to improving the effectiveness of first aid popularization on social media. Interactivity is an important feature that distinguishes social media from traditional first aid knowledge dissemination media, and it is also a hot issue in social media research. The public interacts

with social media in the process of obtaining first aid knowledge through social media, thus their first aid knowledge acquisition behavior may be affected by the interactivity. Although the impacts of interactivity on user behavior have been examined in prior studies (Bozkurt et al., 2021), its role in first aid knowledge acquisition remains unclear. Therefore, this thesis explores how social media interactivity affects the public's first aid knowledge acquisition on social media and provides guidance and suggestions on better using social media to popularize first aid knowledge.

(3) Explore how the information characteristics of first aid knowledge affect first aid knowledge adoption.

The public pays less attention to first aid knowledge on social media. Therefore, how encouraging the public to adopt first aid knowledge has become an important issue in social media first aid popularization. Existing studies have shown that information characteristics are important factors influencing adoption behavior (Cheung et al., 2008b), such as information relevance and information timeliness. In addition to cognitive characteristics, first aid knowledge usually has affective characteristics due to the urgency and dangerous features of first aid, such as fear and regret. In addition, functions such as "like" and "comment" on social media give information some social characteristics. Thus, this thesis aims to explore how first aid knowledge information characteristics, including cognitive characteristics, affective characteristics, and social characteristics, influence first aid knowledge adoption comprehensively.

1.3 Significance of the Research

This thesis takes the first aid knowledge popularization through social media as the

research background and explores three stages of first aid knowledge learning on social media: formation of willingness to learn, knowledge acquisition, and knowledge adoption. The thesis clarifies individuals' motivations to learn first aid knowledge and explores influencing factors and mechanism of knowledge acquisition and adoption from the perspectives of social media technical characteristics and information characteristics. Theoretical models of first aid knowledge learning behavior are established and empirically verified, and the results are analyzed to provide theoretical and practical guidance for promoting the public's first aid knowledge learning through social media. This thesis shows significance in both theory and practice.

1.3.1 Theoretical Significance

First, from the perspective of individual behavior, this thesis enriches the research on first aid popularization by exploring the public's first aid knowledge learning behavior on social media. Existing research on first aid popularization mainly focuses on first aid training and education but ignores individual active learning behavior, which is precisely the key to determining the effectiveness of first aid popularization. By subdividing the first aid knowledge learning process, this thesis explores first aid knowledge learning willingness, knowledge acquisition, and knowledge adoption, extending the research on first aid popularization and providing new perspectives and ideas for future related research.

Second, this thesis extends the research on health behavior by identifying first aid knowledge learning. The current literature on health behaviors puts eyes on self-protective health behaviors, however, first aid knowledge learning is a health behavior with social collective attributes. In this thesis, by introducing the characteristics of first aid knowledge

learning, the first aid knowledge learning behavior is conceptualized as a kind of socialized health behavior, which fills in the deficiencies of the original health behavior research and extends the relevant research directions and perspectives.

Third, this thesis enriches the literature on social media technical characteristics and information characteristics in an information behavior context. First aid knowledge learning as an information behavior is still a research blank in current literature. By explaining how social media interactivity and information characteristics influence first aid knowledge learning behaviors, this thesis on the one hand extends studies on social media technical characteristics and information characteristics to the field of first aid knowledge learning, and on the other hand, complements the research gap of first aid knowledge learning behavior in information behavior studies.

Fourth, combined with this research context, this thesis extends both protective motivation theory and information adoption model. Because of the unique characteristics of this research context, the original theories cannot fully explain learning motivations and first aid knowledge adoption behavior. Therefore, by analyzing the characteristics of first aid knowledge and adding its characteristics to the research model, this thesis not only further explains the factors influencing the learning motivation of first aid knowledge and the adoption behavior, but also enriches and expands the original theoretical models.

1.3.2 Practical Significance

First, this thesis helps provide suggestions for motivating individuals to actively learn first aid knowledge as well as improving their willingness to learn. The findings in Study 1 can help the government and first aid popularizers to identify the internal motivation that effectively

drives the public to learn first aid knowledge so that they can appeal to and guide the public in a targeted manner. For example, the thesis found that perceived collectivity-related severity and collectivity-related vulnerability, as well as emotional anticipated regret, were strong motivators for increasing willingness to learn. Hence, the government and first aid popularizers should pay attention to emphasizing collective factors rather than individual factors when carrying out first aid publicity. They are also suggested to arouse public's expected regret to enhance the willingness to learn first aid knowledge.

Second, this thesis provides a reference for the management and design of social media interaction mechanisms, to promote the public's behavior of acquiring first aid knowledge through social media. The results in Study 2 can support social media managers and designers to understand how interactivity affects individual behavior, to develop interaction mechanisms that can enhance knowledge acquisition. A more detailed division of interaction dimensions (i.e., human-information interaction, human-system interaction, and human-human interaction) and the specific impact of different dimensions of interaction can provide references for the interactivity design and optimization of social media. In addition, the thesis found that different dimensions of interaction lead to different individual experiences, which can also provide suggestions for social media managers to improve user experience.

Third, this thesis provides guidance on how to optimize the content and presentation patten of first aid knowledge to promote individuals' knowledge adoption behavior. The results of investigating the influence of first aid knowledge information characteristics on first aid knowledge adoption can help first aid knowledge popularizers understand what characteristics of first aid knowledge are more acceptable to the public, including cognitive characteristics,

affective characteristics, and social characteristics. Moreover, the study also demonstrated how these characteristics influence individual first aid knowledge adoption behavior. Based on this, first aid knowledge content can be formulated and optimized to increase the adoption rate. Moreover, based on results of this thesis that information characteristics play significant roles, social media managers and designers can be guided to design and develop functions that highlight useful information features to better display first aid knowledge on social media.

1.4 Research Context

Kaplan and Haenlein (2010) summarized six types of social media in their literature review, which have been verified in multiple studies, namely online social networks, collaborative projects, blogs, content communities, virtual game worlds, and virtual social worlds. Among them, online social network emphasizes communication and connection among users, where the social relationship among users is usually two-way and relatively strong. The representative applications include Facebook and WeChat. Collaborative projects enable many users to collaborate and create content simultaneously, embodying the characteristics of social media user-generated content. The presentative media of collaborative projects is Wikipedia. Blogs is the earliest and fundamental pattern of social media, where content posted by a single person can be seen by everyone, and interactions can be generated through comments and other channels. Blogs focus on the speed of communication and the disclosure of content. They have a high speed and breadth of communication, such as Twitter, Weibo, etc. The purpose of the content community is to disseminate and share media content for users. It mainly focuses on content creation and has weak social attributes, such as YouTube, Zhihu, etc. The virtual game world means that users participate in massively multiplayer online role-playing games by

following strict rules. The virtual social world has no strict rules, and users appear in the form of avatars in three-dimensional interactions with others in environments such as Second Life.

According to the sociality and content dissemination features, this study summarizes and divides social media into six types, as shown in Figure 1-4. The virtual game world and the virtual social world have high sociality but low dissemination. On the contrary, the content community and collaborative projects mainly pay attention to content creation and content dissemination, while sociality is weak. In addition, although both social networks and blogs have high sociality, social networks are more private content exchanges, and the breadth and speed of content dissemination are low; the content generated in blogs can be used for all user groups, so it has relatively high transmissibility.

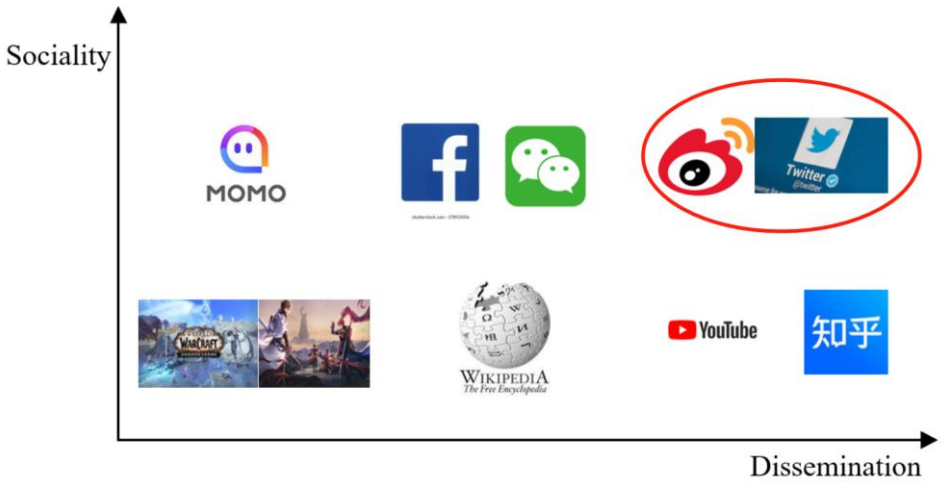

Figure 1-4 Classification of social media

Combined with research objectives of this thesis, we choose blogs as the target social media in this thesis, such as Twitter and Weibo, which have high communication and social attributes. This thesis chooses this social media for the following reasons: First of all, for the purpose of motivating the public's learning behavior and further promoting first aid knowledge popularization, social media with high communication attributes is necessary. Thus, blogs is

conducive to disseminating first aid knowledge among the public. Secondly, compared with the content community, the content on the blogs is mostly short and interactive, which is convenient for users to browse and read. Especially for professional knowledge such as first aid knowledge, the readability, interest, and interactivity of the content help to improve the effectiveness of popularization. Thirdly, as social media like Weibo has become the primary way for the public to access information, more and more professional doctors and science popularizers have participated in this platform for popularizing professional knowledge. Finally, the social attributes make blogs have a large number of users and use frequency, which provides a user base for the learning and dissemination of first aid knowledge. In short, representative blogs-based social media such as Weibo can provide a good research context for this thesis.

The focal community chosen for this research is called "Emergency Nighthawk". It is a specific community dedicated to popularizing first aid knowledge. The community was established and is hosted by a professional emergency doctor who works in a top hospital in China. This doctor has been certified as a first aid training instructor by the American Heart Association (AHA) and has been actively promoting first aid knowledge to the public for many years. The doctor's professional qualifications ensure that the knowledge shared in the community meets high healthcare standards. Additionally, the community has attracted nearly two million Weibo users who actively participate in acquiring and learning first aid knowledge. These users represent a large and diverse audience, providing a solid foundation for research.

1.5 Thesis Structure

Six consequent sections are included in this thesis.

Chapter 1, introduction. We first introduced research background of the thesis and then

proposed research questions and research objectives. Next, we discussed theoretical and practical implications of the thesis. Finally, we defined the research context, and brief described the thesis structure.

Chapter 2, literature review and theoretical background. Firstly, through analyzing previous literature, the gaps and deficiencies in the research were identified. Then, the concepts related to first aid knowledge learning were introduced. Combined with health behavior and information behavior, active knowledge learning behavior in this thesis was defined. Finally, the theoretical models involved in the research were introduced, including the protection motivation theory, the stimulus-organism-response framework, and the information adoption model.

Chapter 3, explore motivations to learn first aid knowledge and its influence on the willingness to learn. Firstly, using the semi-structured interviews method and referring to protection motivation theory, we identified motivations of individuals to learn first aid knowledge through step-by-step coding analysis, including individual-related cognitive motivation, collectivity-related cognitive motivation, and emotional motivation. Secondly, according to the interview results and employing the cognitive-affective-conative framework, a theoretical model and research hypothesis were constructed. Finally, the models and hypotheses were verified by collecting data through online surveys, revealing the mechanism of individual motivation on the willingness to learn first aid knowledge.

Chapter 4, explore impacts of social media interactivity on individuals' first aid knowledge acquisition. As the most significant feature distinguishing social media from traditional media, interactivity is considered to be a crucial factor affecting individual experience and behavioral

decision-making on social media and has been divided into three dimensions. Based on the S-O-R framework, a theoretical model was built to explore how different dimensions of interactivity affect the individual experience, which further affects the public's first aid knowledge acquisition on social media. In particular, the path coefficients between different dimensions of interaction and individual experience and between different individual experiences and knowledge acquisition are compared to identify the influence weights, clearly delineating the paths and a roadmap of how social media interactivity influences knowledge acquisition behavior.

Chapter 5, explore the influence of information characteristics on knowledge adoption behavior. This study extends information adoption model from affective and social aspects. First, the underlying affective and social factors that influence knowledge adoption behavior, namely, arousal and descriptive norms, were identified through a related literature review. Secondly, identify the affective characteristics of first aid knowledge that can affect arousal and the social characteristics that can cause descriptive norms. Factors were added to original theory model, and effects of cognitive, affective, and social factors on knowledge adoption were explored. Moreover, this study not only examined direct impacts of cognitive, affective, and social factors on knowledge adoption but also examined the interaction and relative influence weight of each factor, further revealing how different types of information characteristics affect knowledge adoption.

Chapter 6, conclusion. Summarize the main innovations, shortcomings, and future research directions.

Chapter 2 Literature Review and Theoretical Background

2.1 Review of Related Research

2.1.1 Review of Public First Aid Knowledge Learning

The current research on public first aid knowledge learning mainly focuses on understanding the status quo of first aid knowledge knowing, knowledge training, and knowledge education among the public as shown in Table 2-1. Scholars have conducted surveys on the status quo of first aid knowledge knowing of various occupational groups in many regions of the world, confirming the necessity for learning first aid knowledge of the public. For example, researchers surveying burn first aid knowledge in the New South Wales population found that only a minority knew the best time to cool burns and other appropriate steps in first aid for burns (Harvey et al., 2011). Moreover, the existing research explores the training and education of first aid knowledge to the public, clarifying the effectiveness of first aid knowledge training and demonstrating the tools and methods to promote effectiveness. For example, studies have shown that individuals who have been trained in first aid perform better when providing medical assistance (Van de Velde et al., 2009). Compared with educational games, the traditional lecture format is more effective in increasing first aid knowledge (Charlier & De Fraine, 2013). However, the current research mainly focuses on current situation of first aid knowledge popularization and effectiveness of first aid training but lacks the exploration on how to motivate first aid knowledge learning behavior from individual behavior perspective. In particular, first aid knowledge training is the passive acceptance of first aid knowledge by the public, while the public's active learning willingness and behavior is precisely the key to improving the level of first aid knowledge. However, what factors affect

active learning behavior and willingness are still unknown. Therefore, this thesis focuses on the public's active behavior and willingness to learn first aid knowledge through social media.

Table 2-1 Research on public first aid knowledge learning

Perspectives	Main contents/views	Studies
Status of first aid knowledge level	First aid knowledge level of kindergarten teachers and staff is low. It is necessary to consider establishing first aid courses in kindergarten teachers' courses to improve first aid awareness.	(Ganfure et al., 2018; Li et al., 2012)
	Teenagers and college students receive less first-aid education and have a lower level of first aid knowledge. It is necessary to strengthen their first aid education.	(Sharif et al., 2018)
	Many parents are not clear about pediatric first aid knowledge and measures. Further education on first aid knowledge is needed for parents.	(Singer et al., 2004)
Effectiveness of first aid knowledge training	After basic first aid training for children, many children have demonstrated their abilities in first aid scenarios.	(Bollig et al., 2011)
	First aid training for the public can effectively alleviate the tension of emergency medical assistance after natural disasters and contribute to the post-disaster medical response.	(Kano et al., 2005)
	Psychology first aid training significantly increases public knowledge of appropriate psychosocial responses in acute distress and improves awareness of psychology first aid skills.	(L. Wang et al., 2021)

2.1.2 Review of Social Media Application in First Aid

Social media has already got involved in people's daily lives and plays vital roles in first aid support, first aid knowledge dissemination, and first aid education. When a disaster strikes, social media plays an imperative and effective role in first aid support and emergency management. For example, in the pre-disaster preparation stage, social media can release warnings of dangerous situations in time to prevent emergencies, improve public awareness of first aid, and provide appropriate information and guidance (Knuth et al., 2016). During disaster emergency response and recovery, social media content provides community members and

institutions with timely information to satisfy information needs of various groups, which can facilitate communication and improve the emergency response (Irons et al., 2014). Social media is increasingly adopted by emergency services, governments, and some non-governmental organizations as a tool for emergency management and first aid support. On the one hand, emergency organizations coordinate activities during emergency response operations with social media. Further, the public can share information with victims via social media during an emergency.

The United States is an early adopter of social media in first aid knowledge dissemination and first aid education. Since 2009, the National Epilepsy Foundation, supported by the US Centers for Disease Control and Prevention, has used social media to carry out multi-level public education and publicity campaigns on epilepsy, providing community residents with first aid knowledge for medical epilepsy (Price et al., 2015). Social media has promoted the free and open access to emergency medicine education, enabling emergency-related initiatives, concepts, and knowledge to be introduced, discussed, and effectively disseminated in a timely manner. In a survey of first aid knowledge acquisition channels, the findings showed that social media was regarded as the most acceptable source (Alshammari, 2021; AlYahya et al., 2019).

Using social media for medicine education under emergencies is becoming common and shows extreme impacts on the development of the educational structure of emergency medicine. Ozkazanc and Yuksel (2015) surveyed the level of disaster first aid awareness among college students and found that social media was an important tool in first aid education, attracting more and more students' attention. In addition, studies have found that learning first aid through social media is more effective than traditional classroom instruction (Celik, 2013). Social

media brings new hope to first aid education as it enables more learners to join and deepens the engagement of existing learners.

Table 2-2 Research on the application of social media in first aid

Perspectives	Views	Studies
Social media in first aid support	Using social media for timely information exchange and contact during natural disasters can help with psychological reconstruction during disasters.	(Taylor et al., 2012)
	Social media can provide location information for individuals and emergency situations, facilitating emergency situational awareness and accurate, rapid, and effective first aid.	(Vieweg et al., 2010)
	Social media can reduce emergency waiting times and be used in hospital transfers.	(Yu et al., 2018)
Social media in first aid knowledge dissemination	Social media was the most popular source of burn knowledge, followed by hospitals and television.	(Alomar et al., 2016)
	Most people claim they obtain first aid knowledge and information through social media.	(Alshammari, 2021; AlYahya et al., 2019)
Social media in first aid education	Educating first aid knowledge and skills through social media can effectively improve the first aid awareness of nursing staff.	(Al-Dosary et al., 2022; Alomar et al., 2016)
	Significant difference exists between the first aid training course combined with social media and the first aid training course alone.	(Lippmann et al., 2011)
	Social media has been increasingly applied to first aid education of college students and has successfully attracted students' attention.	(Ozkazanc & Yuksel, 2015)

Table 2-2 summarizes the literature on social media application in first aid from three aspects: first aid support, first aid knowledge dissemination and first aid education. According to above analysis, social media is widely used in first aid but the role and effect of social media in first aid knowledge learning behavior still remain gaps. In particular, it remains to be explored how social media, as a first aid knowledge learning tool and environment, influences

individuals' active first aid knowledge learning behavior.

2.1.3 Review of Knowledge Acquisition on Social Media

Social media has great potential for information transmission and dissemination. Due to its openness, interactivity, and convenience, more and more people are utilizing social media for knowledge and information. Some research has shown that acquiring knowledge or information from social media can help individuals make better judgments and decisions, especially in the environment requiring intensive information (Yang et al., 2021). By embedding social media into the prediction market and obtaining information from social media, the prediction error can be reduced, and better prediction results can be produced (Qiu et al., 2013). Public using different social media to obtain politically related information would lead to significant differences in political knowledge and voting (Stephens et al., 2014). In addition, patients' communication and information acquisition on social media can enhance patients' trust in doctors, thus improving the doctor-patient relationship (Liu & Jiang, 2021).

In addition to discovering the influence of acquiring knowledge through social media on individual behavioral decision-making, existing research mainly pays attention to antecedents of knowledge acquisition behavior. Using social media to get knowledge and information is affected by many factors, including information systems, personal characteristics, and their information needs, perceptions, and evaluations. The following Table 2-3 summarized relevant literature.

Table 2-3 Research on factors influencing knowledge acquisition on social media

Perspectives	Influencing factors	Studies
Individual characteristics	Age; gender; incomes; education; experience	(O'Hare & Erdelez, 2017; Threats & Bond, 2021; L. Zhang et al., 2020)
	Race; cultural background	(Lin & Ho, 2018)
	Cognitive ability; self-efficacy	(Sharit et al., 2008)
Individual perceptions and beliefs	Perceived usefulness; perceived ease of use; satisfaction	(Al-Maroof et al., 2021)
	Trust on social media and on the content source	(Lin et al., 2016; Zhao et al., 2022)
	Perceived risk; subjective norms	(Hwang & Jeong, 2020; Lutz & Reilly, 1974)
Content on social media	Content richness; content presentation form	(Al-Maroof et al., 2021; Rockwell & Singleton, 2007)

In terms of personal characteristics, studies have found that individual cultural characteristics (e.g., machismo, socialism, and uncertainty prevention) can significantly affect individuals' behaviors in obtaining health knowledge from social media (Lin & Ho, 2018). In addition, factors such as the individual's cognitive ability and self-efficacy will also affect the individual's information acquisition behavior. Sharit et al. (2008) showed that due to the decline in cognitive reasoning ability, the elderly generally performed poorly in acquiring information from social media. In addition to personal characteristics, individual perceptions, evaluations, and beliefs are also significant affecting social media knowledge acquisition behavior. Particularly, individuals' perception on usefulness and perception on ease of use of social media are widely considered to influence knowledge acquisition (Garay et al., 2017; Lin & Ho, 2018). Individuals' trust in social media also significantly affects knowledge and information acquisition behavior (Zhao et al., 2022). In addition, information acquisition on social media will also be affected by contents on social media. For example, some studies have confirmed

that social media content richness and content presentation forms significantly affect knowledge acquisition (Al-Maroof et al., 2021; Rockwell & Singleton, 2007). However, few research explores antecedents of knowledge acquisition behavior from the point view of social media technological characteristics, which need to be further expanded.

2.1.4 Review of Knowledge Adoption on Social Media

Knowledge adoption refers to users' recognition of the validity of knowledge and includes a process of evaluating and utilizing knowledge. Knowledge/information adoption on social media has received extensive attention from researchers, involving e-commerce, knowledge management systems, and health management. Research on knowledge adoption on social media mainly focuses on exploring the influencing factors. Some studies have found that individual-related factors, like individual motivation (Chaoguang et al., 2018) and personal experience (Hsu, 2021), will have an significant impact on knowledge adoption. Since knowledge adoption mainly involves interactions between social media users and the content, informational factors (i.e., informational characteristics) are the main factors that have been widely proven to influence knowledge adoption behavior. In particular, Sussman and Siegal (2003) came up with information adoption model (also known as knowledge adoption model) to explain knowledge adoption behavior. They pointed out that two characteristics of information, argument/information quality and source credibility, influence perceived information usefulness, which further affects knowledge adoption behavior.

In recent decade, more and more scholars have conducted research on social media knowledge adoption behavior and identified how different factors affect knowledge adoption. For example, in research on online reviews adoption, Cheung et al. (2008b) subdivided the

argument quality and source credibility into relevance of information, timeliness, comprehensiveness, source professionalism, and source credibility, and proved that each factor affects consumer adoption of online reviews by affecting information usefulness. The information quality and source credibility of word-of-mouth could also affect adoption behavior by influencing individuals' attitudes towards word-of-mouth information. In the field of medical and health knowledge, Azeez et al. (2021) found that argument quality as well as information support can influence the adoption of health knowledge through individuals' perceived benefits. In addition, the information quality, source credibility, website quality, and individual experience will also affect individuals' trust on the website, and thus affect the information adoption behavior (Filieri et al., 2015).

Table 2-4 summarizes the research on influencing factors and its influencing paths on knowledge adoption on social media. In existing research, information characteristics are widely recognized as significant influencing factors of knowledge adoption behavior, which can provide theoretical support for this thesis. It is also found that information characteristics factors generally affect knowledge adoption through individual perception, such as perceived information usefulness, attitude and trust. However, most studies only focus on impacts of informational cognitive factors, but rarely explore affective and social factors and their influence on knowledge adoption.

Table 2-4 Research on knowledge adoption on social media

Influencing path	Influencing factors	Studies
Influencing factors->perceived information usefulness-> adoption	Information quality; information credibility; information demand;	(Erkan & Evans, 2016)
	Information relevance; timeliness; comprehensiveness; comprehensiveness; source professionalism; source credibility	(Cheung et al., 2008b)
	Argument quality; source credibility; website quality	(Salehi-Esfahani et al., 2016)
	Argument quality; source credibility; connection strength	(Georgi & Tuzovic, 2016; Zhu et al., 2016)
Influencing factors->attitude-> adoption	Information usefulness; information credibility; personal experience; product involvement	(Hsu, 2021)
	Knowledge usefulness; knowledge ease of use; network connection; reciprocity norms	(Liao & Chou, 2012)
Influencing factors->trust-> adoption	Argument quality; perceived usefulness of information; information source; website quality; personal experience	(Filieri et al., 2015; Khwaja & Zaman, 2020)
Influencing factors ->adoption	Argument quality; source credibility; emotional support	(Jin et al., 2016)
	Content credibility; source credibility; institutional trust	(Jin et al., 2021)

2.2 Concepts Related to First Aid Knowledge Learning

2.2.1 First Aid and First Aid Knowledge

First aid refers to the immediate medical helping behaviors and health care interventions provided from others to a person in health emergencies (Pellegrino et al., 2017). First aid is carried out when accidents or emergencies occur. It means that the rescuers use the materials available at the scene to provide preliminary rescue and nursing care for the wounded and sick, so as to assist the wounded and sick timely and appropriately to reduce more serious trauma. It can be seen from the definition of first aid that the place where first aid occurs is usually outside the hospital, the recipient of first aid is the injured or sick person, and the sender of first aid is

the witness at the scene. The main goals of first aid can be summarized in three points (Zideman et al., 2015): (1) To maintain life. Since first aid is usually faced with an urgently dangerous situation, its primary purpose is to save life; (2) To prevent further injury. Using first aid techniques to prevent illness exacerbations become critical; (3) Facilitate recovery, and in less severe cases complete treatment and recovery through first aid.

Knowledge is a kind of high-value information that can help people make decisions and actions (Davenport et al., 1998). First aid knowledge is described as the information indicating that administering appropriate first aid soon after the accident occurs (Başer et al., 2007). Thus, first aid knowledge in this thesis can be regarded as systematic and useful information to guide and support the correct implementation of first aid measures and procedures.

2.2.2 First Aid Knowledge Learning Behavior

Numerous psychologists and theorists have defined the knowledge learning behavior. For example, Gagne (1962) defined knowledge learning from the perspective of information processing model, believed that knowledge learning is a process of information input-encoding-processing-storage-extraction-output, and divided the knowledge learning process into different stages, including motivation phase, acquisition phase, recall phase, action phase, and feedback phase, etc. Meyer and Land (2003) proposed a simplified knowledge learning process model, which regards knowledge learning as an individual's observable or measurable behavioral response to new knowledge caused by external stimuli (new knowledge). Goldie (2016) argues that the learning process is cyclical, where learners discover and acquire new information, use the information to modify their beliefs, and then discover further information. In addition, knowledge learning is also considered as a process of connecting specific

information sources, a behavioral process of obtaining relevant information, accepting, and utilizing the information. From the above definition, knowledge learning is a series of behavioral processes aimed at the acquiring, processing, and utilizing the information to obtain new understanding, knowledge, behavior, and skills.

Knowledge learning are categorized as formal learning behavior and informal learning behavior. Formal learning takes place in specific educational institutions (e.g., schools), centered on teachers, and aims at understanding and mastering knowledge and principles, and is a series of organized and systematic behaviors. Informal learning usually takes place outside educational institutions and is organized by learners. It is a conscious and unconscious learning behavior that the learner completes spontaneously through continuous participation and interaction. In this thesis, the first aid knowledge learning behavior occurs in the daily life of individuals using social media. It is initiated by the individual and is not taught by others. It enables people to acquire first aid knowledge by reading first aid related information on social media. Therefore, first aid knowledge learning behavior in this thesis belongs to informal learning behavior, which can be defined as the behavior of acquiring, processing and utilizing first aid knowledge through social media.

Decius et al. (2019) divided informal learning behavior into four components, namely learning willingness/intention, learning action, feedback and reflection. Since feedback and reflection are difficult to observe and measure, and this article mainly focuses on how to promote public's first aid knowledge learning willingness and learning action. Specific to the research context of this thesis, first aid knowledge learning actions includes searching, finding, and acquiring first aid knowledge from social media (namely first aid knowledge acquisition),

as well as accepting and utilizing first aid knowledge (namely first aid knowledge adoption). Combined with Gagne's division of the learning process stages, the willingness to learn first aid knowledge, knowledge acquisition, and knowledge adoption in this thesis correspond to the motivation stage, acquisition stage and action stage in the learning process respectively. Exploring the three stages can completely summarize the first aid knowledge learning behavior and achieve objectives of this thesis.

2.2.3 First Aid Knowledge Learning and Health Behavior

Due to the increased burden of disease and need for health improvement, health behavior has drawn great attention from scholars globally and has widely been defined. Broadly, health behavior is defined as "the actions of individuals, groups, and organizations, as well as their determinants, correlates, and consequences, including social change, policy development and implementation, improved coping skills, and enhanced quality of life" (Glanz et al., 2008; Parkerson Jr et al., 1993). In the definition, health behaviors are multi-level related. Most frequently, health behaviors are discussed as individual-level behaviors and refer to actions taken by individuals that affect their health and mortality. With the different purposes, health behavior includes three aspects. First, preventive health behavior, which refers to "any activity undertaken by an individual who believes himself (or herself) to be healthy, for the purpose of preventing or detecting illness in an asymptomatic state" (Glanz et al., 2008). Such of behavior includes of screening programmers, vaccination, and belt use, aiming to prevent potential diseases and threats in future. Second, illness behavior, which refers to "any activity undertaken by an individual who perceives himself to be ill, to define the state of health, and to discover a suitable remedy" (Glanz et al., 2008; Kasl & Cobb, 1966). Thus, this kind of health behavior

mainly focuses on the diagnose, such as consulting physicians and searching and communicating disease-related information. Third, sick-role behavior, which refers to "any activity undertaken by an individual who considers himself to be ill, for the purpose of getting well." (Glanz et al., 2008; Kasl & Cobb, 1966), involving treatment behaviors. Usually, chronic diseases management belongs to sick-role behavior.

Based on the definitions of health behaviors, we can conclude that any activity for health maintenance, health enhancement and illness prevention within or outside the medical care system, even if just searching and learning health related information, can be called health behavior. In this thesis, we focus on the first aid knowledge learning behavior. The behavior means that individuals actively learn first aid knowledge to cope with medical emergencies occurring in the future and further to prevent the damage caused by sudden disease and emergencies. Based on the categories of health behavior, we can conclude that first aid knowledge learning behavior belongs to preventive health behavior since its purpose is to prevent illness damage rather than diagnosing or treatment.

Being considered as cost-effective, preventive health behavior has been regarded as an alternative to traditional medical solution, particularly the curative model (Kirscht, 1983). Differencing from other two categories of health behaviors, people take preventive health behavior in the absence of health problems. Further, it follows the purpose of alleviating the impact of potential risks and warding off the threats to health in future. Because of the feature of prevention rather than diagnosing and treatment, the motivation of preventive health behavior among individuals is usually low. Recently, scholars have put more attention on motivation of preventive health behavior. As shown in Table 2-5, existing studies involve

ranges of preventive health behaviors (e.g., vaccination, health examination, use of seat belts, and protective behavior during Covid-19). However, the existing studies are limited due to only focusing on behaviors protecting one's own health rather than others'. That is to say, the behavior originator and the object of protection is consistent. For example, the vaccination behavior of individuals is for avoiding themselves catching the flu (Ling et al., 2019). Similarly, preventive behaviors during Covid-19 and travel aim to protect themselves from harm (Kowalski & Black, 2021; Zheng et al., 2021). A preventive health behavior which is conducted to protect other people has not been examined.

Table 2-5 Literature on preventive health behaviors

Preventive health behaviors	**Object of protection**	**Theoretical foundation**	**Studies**
Influenza vaccination	behavior originator	Protection motivation theory/ health belief model	(Fall et al., 2018; Ling et al., 2019)
Covid-19 preventive behaviors	behavior originator	Protection motivation theory	(Kowalski & Black, 2021; Rad et al., 2021)
HIV testing	behavior originator	Health belief model	(Jones et al., 2019)
Cancer screening	behavior originator	Protection motivation theory	(Moeini et al., 2019)
Seat belt usage	behavior originator	—	(Ghaffari et al., 2018)
Risk prevention during travel	behavior originator	Protection motivation theory	(Wang et al., 2019; Zheng et al., 2021)

First aid knowledge learning, as discussed as above, is a preventive health behavior. However, it is distinguishing from behaviors in Table 2-5 where the behavior originator and the object of protection is inconsistent. Specifically, the originator is individual who learns first aid knowledge while the object of protection is someone who is in medical emergencies. In the first aid context, people in medical emergencies can hardly help themselves but need help from

others who are equipped with first aid knowledge. Thus, the major purpose of studying first aid knowledge is to help surrounding people in need. In this regard, people's motivations of first aid knowledge learning are likely to be different from other preventive health behaviors due to such collective attributes. Accordingly, theories such as protection motivation theory that was widely used for explaining preventive health behavior may need to be extended in this context.

2.2.4 First Aid Knowledge Learning and Information Behavior

The concept of information behavior was proposed in 1948, which aims to understand how people use information at work, especially in science and technology. Regarding the definition of information behavior, different scholars have defined it differently. Davenport and Prusak (1997) believes that information behavior is the behavior of individuals acquiring and processing information, such as retrieving, correcting, sharing, and storing information. Pirolli and Card (1999) regards information behavior as a series of behaviors such as searching, acquiring, utilizing, and sharing that people conduct in order to satisfy information needs. Wilson (2000) thinks that all information source related behaviors are information behavior, including both active information-seeking and passive information-acceptance. Spink and Cole (2006) defines that information behavior is an unified process involving searching, foraging, constructing, organizing, and using information on a single or multiple topics.

Based on the definition of information behavior by the above-mentioned scholars, combined with the social media network environment, this thesis believes that user information behavior in social media refers to the behaviors of expressing information needs, obtaining information, processing information, and utilizing information performed by users using social media platforms. First aid knowledge learning from social media here refers to users'

acquisition and adoption of useful information of guiding first aid implementation through social media. Therefore, first aid knowledge learning in this thesis is an information behavior.

For a long time, many scholars have investigated influencing factors of information behavior and constructed information models to reveal the constituent elements and mechanism of information behavior. Particularly, Wilson (1981) proposed the Wilson Information Model in 1981, which still has great influence and argued that the information behavior of individuals originated from people's demand for information. Then Wilson in 1999 summarized the interference variables that affect information behavior, including psychological factors, personal background characteristics, role characteristics, environmental factors, and information source characteristics (Wilson, 1999). In addition, social cognitive theory points out the interaction of individuals, environment, and behavior. It argues that information behavior can be determined by the interaction between environment and individuals (Bandura, 2001).

It can be seen from the above that individuals and environment are widely recognized as important affecting factors on information behavior. This thesis further subdivides the environmental dimension into two dimensions, namely technology and information. Constructing the four-dimensional research framework of information behavior as shown in Figure 2-1, this thesis aims to explore impacts of individuals, technology and information on information behavior (i.e., first aid knowledge learning).

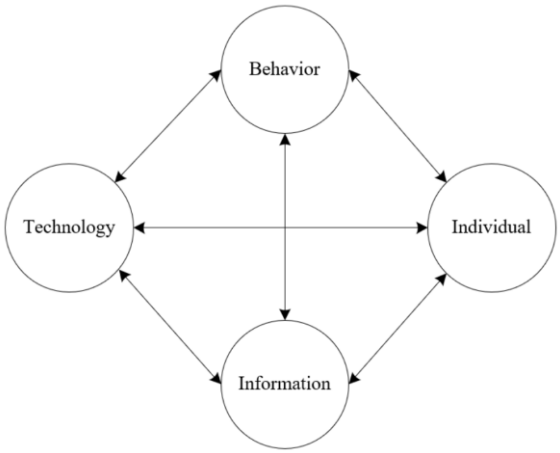

Figure 2-1 4-dimensional framework of information behavior

2.3 Related Theories

2.3.1 Protection Motivation Theory

Originating from fear appeal, Rogers (1975) firstly introduced the protection motivation theory (PMT), which focuses on informative communication about threats to individuals' well-being. PMT predicts individuals' protection motivation and behavior in coping with potential risks and has widely been adopted as a theoretical framework in various scenarios, including cybersecurity behavior (Li et al., 2019), organizational information asset protection (Posey et al., 2015), self-protection against health risks during travel (Wang et al., 2019), and threat prevention behavior during ride-sharing (Chen & Lu, 2021).

PMT illustrates that individuals decide to take protection behaviors after experience two cognitive appraisal processes, threat appraisal and coping appraisal (Rogers, 1975; Rogers & Prentice-Dunn, 1997). Threat appraisal concerns the process by which an individual evaluates their perception of how threatened they feel, including perceived severity and perceived vulnerability. Specifically, perceived severity is defined as how individuals believe there is a serious threat to their life, while vulnerability is the individual's perceived probability that they

will experience this threat. Coping appraisal involves response efficacy and self-efficacy. Specifically, response efficacy indicates to individuals' perception on the efficiency of the suggested coping responses in decreasing threats, while self-efficacy is individuals' beliefs about their abilities to engage in the suggested responses. Meta-analyses and plenty of empirical studies have demonstrated that predictions derived from PMT are largely confirmed in preventive health behaviors (Milne et al., 2000). Examples includes participation in seasonal influenza vaccinations (Ling et al., 2019), skin cancer prevention (Moeini et al., 2019), and preventive behaviors during Covid-19 (Kowalski & Black, 2021).

Studies have claimed that each context for potential application of the theory presents unique challenges, while PMT factors are found to have different effects in studies with different contexts (Sun et al., 2020). In this context of first aid knowledge learning, with its collective attributes, the applicability of PMT may need to be confirmed and there is also a need to explore how PMT constructs perform. Meanwhile, the four constructs of PMT (i.e., perceived severity, perceived vulnerability, response efficacy and self-efficacy) are all individual-related cognition types and assessments and do not involve collective cognition. Evidence from previous studies has demonstrated that self-related and collective related beliefs and cognition are distinct and have different impacts on behavior (Chen & Bliese, 2002; Ybarra & Trafimow, 1998). Considering the uniqueness of collectivity in this research context, collective cognition may show significant impacts on first aid knowledge learning behavior. Moreover, PMT has focused on the effect of cognitive appraisal without considering emotional factors, which have also been proven to motivate health behaviors (Chapman & Coups, 2006). Incorporating emotions not only complements conventional PMT to develop a richer

perspective that involves both cognition and emotion, but it also helps reveal the underlying mechanism.

Altogether, PMT as a basic theory for exploring preventive health behaviors gives a theoretical support for the thesis, but at the same time there are still some research gaps in the background of this thesis. This thesis extends PMT to the research background of first aid knowledge learning, helps to understand motivations and willingness to learn first aid knowledge, and expands PMT at the same time.

2.3.2 Stimulus-Organism-Response Framework

The stimulus-organism-response (S-O-R) model was proposed by Mehrabian and Russell (1974), indicating that various aspects of environment stimulate people's internal or organismic feelings, which further shape people's behavior response to the stimuli. Stimulus (S) refers to factors which can stimulate individual's psychological arousal. It is external to the person and may emerge in diverse formats such as technology characteristics, website environment, and sensory variables (Jacoby, 2002). Organism (O) represents individual's internal psychological experience which respond to environmental stimulus and facilitate behavior response. Research identified organism as cognitive and affective states, whereby cognitive states reflect the rational evaluation and affective states reflect individual's feeling or emotion raised during the interaction with stimulus. Response (R) refers to individual's final behavior or outcome to the stimulus and is induced directly by organism experience. The response comes in many forms such as attitude, intention, and behavior (Jacoby, 2002). In this thesis, knowledge acquisition is the outcome of environmental cues (e.g., social media interactivity) through influencing individual's psychological states (e.g., involvement and telepresence).

The S-O-R framework has universally been adopted in the field of Information Systems research to investigate how environment cues influence individual's behavior. For example, Eroglu et al. (2001) applied this model to consumer behavior research for the first time and extended it to build a research model of online shopping atmosphere. Zhao et al. (2020) used the model in the study of online classroom participation, taking technical characteristics of online classrooms as external stimuli, the virtual experience of learners as organism, and the intention to continue participating in online classrooms as the final response, explaining the influence and mechanism of technical features of online classroom on learners' continuous participation by adopting the S-O-R. Drawing on the S-O-R model, Xu et al. (2021) explained how the technical features of video games (external stimuli) affect user experience (organism) and further influence user engagement (response).

Here, the technical characteristics of social media (i.e., interactivity) can be regarded as external stimuli, and the experience of individuals learning first aid knowledge on social media can be conceptualized as the individual's organism, while the individual's first aid knowledge acquisition reflects the response results caused by the stimulus and the organism. Therefore, we build the research framework with the support of S-O-R to explore how social media technical characteristics influences individuals' first aid knowledge acquisition behavior. The framework helps to explain how technical characteristics affect first aid knowledge learning by affecting individual experience, revealing its internal influence mechanism.

2.3.3 Information Adoption Model

Sussman and Siegal (2003) proposed the information adoption model to describe information/knowledge adoption behavior of individuals. As shown in Figure 2-2, the model

involves four core concepts (i.e., argument quality, source credibility, perceived information usefulness, and information adoption), whereby the key principle suggests that information quality and source credibility together determine individuals' perception on information usefulness, which further predict the adoption behavior (Sussman & Siegal, 2003). In particular, perceived information usefulness is individuals' belief on the information they received, and it is regarded as a salient determinant of adoption intention and behavior (Davis, 1989). Argument quality and source credibility serve as informational indicators and are used to assess information from perspectives of content and information source, respectively (Watts & Zhang, 2008). Specifically, argument quality refers to how individuals evaluate information as integrated, logical, and faultless, while source credibility reflects how individuals perceive the information source is reliable (Bailey & Pearson, 1983; Petty & Cacioppo, 1986). The IAM indicates that when people tend to think the information is useful when they see the information is high-quality and come from credible sources; then their intention to adopt the information will increase (Sussman & Siegal, 2003). Thus, the mechanism of IAM bas been considered as a cognitive process based on informational influence.

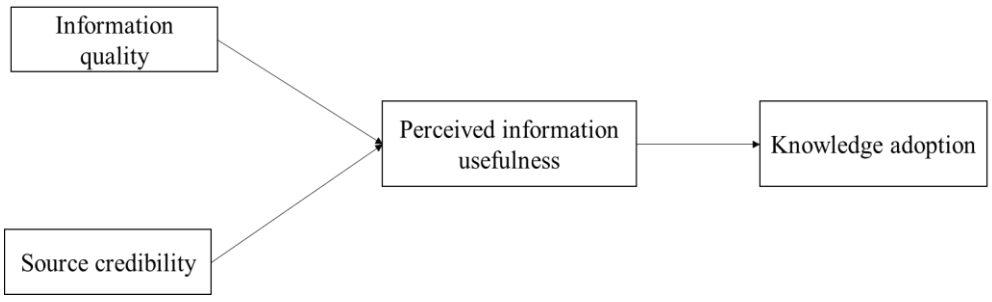

Figure 2-2 Information adoption model

As the IAM discloses how people process persuasive information, it has been generally applied in studies on information and knowledge adoption, such as online product review

(Hussain et al., 2017), knowledge adoption on Wikipedia (Shen et al., 2013), and social groups (Sun et al., 2019) . Studies has extended the IAM in several ways. First, argument quality and source credibility have been specified into different circumstantial dimensions. For example, Cheung et al. (2008a) drew on and expanded the IAM to explore online reviews adoption through subdividing argument quality into four dimensions and subdividing source credibility into two dimensions. Second, IAM has been extended through involving moderating factors such as involvement and expertise. Initially, Sussman and Siegal (2003) examined the moderating role of involvement and expertise in their proposed IAM. Further, more contextual factors were considered in subsequent studies. For instance, prior research has examined many moderators, including search vs. experience information in social Q&A communities (Sun et al., 2019), real vs. virtual relationship in online communities (Zhu et al., 2016), travel risk perceptions (Tseng & Wang, 2016), time pressure (Chou et al., 2015), and membership sense (Luo et al., 2015). Almost all these factors were examined regarding their moderating roles between perceived information usefulness and information quality and source credibility. Third, independent variables paratactic to argument quality and source credibility were added to extend the IAM. For example, variables such as website quality (Salehi-Esfahani et al., 2016), tie strength (Zhu et al., 2016), and information need and attitude (Erkan & Evans, 2016) were incorporated into the IAM to examine the integrate effect along with argument quality and source credibility.

Even if studies have expanded the IAM from diverse angles, they apply the model limiting to conscious cognitive process (Sun et al., 2019). In recent decades, some studies have begun to consider other factors beyond information usefulness in determining information adoption,

such as herding factors (Shen et al., 2016). Prior research notes that facilitating individuals' information processing and decision-making must address not only cognitive impacts (e.g., perceived information usefulness), but also affective and social influence (Straub, 2009). For example, the affective–cognitive model presents that both affective processing and cognitive processing simultaneously determine human decisions (Shiv & Fedorikhin, 1999). Zhang et al. (2021) proposed that emotional arousal (affective routine) as well as information uniqueness (cognitive routine) collectively influence information processing and information behaviors of individuals. Regarding to social influence, how social influence affects decision making (Dong et al., 2021; Lee et al., 2011; Venkatesh et al., 2003) and information processing (Fu et al., 2020; Yan & Wang, 2018) have been richly investigated. Information adoption as a decision making after information processing, is also prone to be influenced by affective and social impacts. However, few research has incorporated cognitive, affective, and social influence in an integrated model to systematically investigate the information adoption. Thus, this thesis attempts to extend IAM by considering cognitive, affective, and social impacts collectively.

2.4 Theoretical Framework of the Thesis

Based on above analysis of related theories, this thesis constructs a theoretical logical framework from two levels. First, the public learns first aid knowledge through social media in a sequential process of "formation of learning willingness -> first aid knowledge acquisition -> first aid knowledge adoption ", forming a sequence chain. Second, this thesis explores the antecedents that influence first aid knowledge learning in social media from perspectives of individuals, technology and information, and further analyzes the internal influencing mechanism by combining relevant theories. Figure 2-3 shows the theoretical logical framework

of this thesis.

This thesis conceptualizes first aid learning as a health behavior as well as an information behavior. First, concerning on the motivations, this thesis explores protection motivations and examines their impacts on the willingness to learn. Combined with the protection motivation theory, this thesis explores how self-related motivation, collectivity-related motivation, and emotional motivation can enhance the learning willingness. Secondly, after the generation of learning willingness, individuals begin to seek and acquire knowledge through social media. Therefore, this thesis explores impacts of social media interactivity on knowledge acquisition behavior through considering technical characteristics using the S-O-R framework. Finally, after the public uses social media acquiring first aid knowledge, they are exposed to specific first aid knowledge. Therefore, this thesis explores the influence of first aid knowledge characteristics, including cognitive, affective, and social characteristics, on first aid knowledge adoption behavior. Combined with the information adoption model, the influence mechanism between different information characteristics and first aid knowledge adoption is revealed.

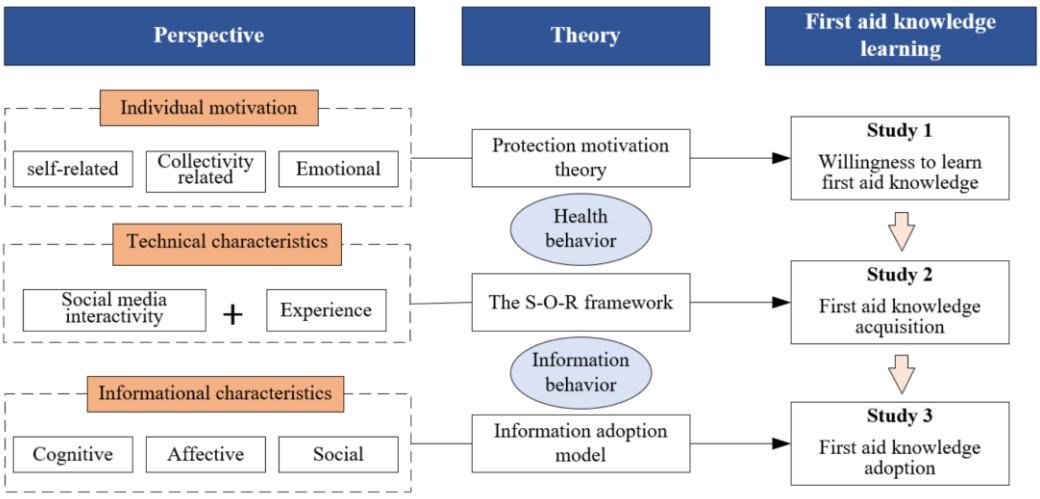

Figure 2-3 Theoretical logic framework

2.5 Summary

This chapter elaborates the relevant research, basic concepts and theories involved in this thesis. First of all, through a deep literature review on public first aid knowledge learning, social media in first aid, and knowledge acquisition and knowledge adoption on social media, research gaps are clarified. Secondly, the relevant concepts of first aid knowledge learning are expounded, and the definition of first aid knowledge learning behavior in this thesis is verified. In addition, the theories used in this thesis, including the protection motivation theory, S-O-R framework, and information adoption model are introduced, providing theoretical basis. Finally, the theoretical logic framework of this thesis is constructed.

Chapter 3 Exploring Motivations and Willingness to Learn First Aid Knowledge on Social Media

3.1 Introduction of Study 1

In recent years, countries desiring to improve population health have focused on facilitating health behaviors such as public health knowledge learning. For instance, the "Healthy China Action" guidelines released in 2019 affirm that it is vital to promote health knowledge popularization and individuals' health knowledge learning[1], and the guidelines specifically stress that it is necessary for the public to learn basic out-of-hospital first aid skills. First aid is immediate medical care usually provided by a layperson to an injured or sick individual, and common first aid scenarios include acute poisoning, electric shock, drowning, bleeding, and sudden cardiovascular disease (Mobarak et al., 2015). Broadly, first aid knowledge refers to life-saving treatment information, including specific knowledge and guidance for each type of injury or sudden illness and knowledge used to assess a situation and make appropriate decisions (Başer et al., 2007). British Red Cross statistics show that over 50% of sudden deaths caused by out-of-hospital medical emergencies can be eliminated if effective first aid is provided[2], which can also greatly reduce the medical burden on a country's healthcare system. As first aid can be applied at any time and in any place to someone in need, public first aid learning is invaluable.

The progress and extensive use of social media provides an effective channel for the public to gain first aid knowledge (Yates & Paquette, 2011). One reason for this is that professionals

[1] http://www.gov.cn/zhengce/content/2019-07/15/content_5409492.htm
[2] https://www.redcross.org.uk/dontstopat999

(e.g., emergency physicians) can diffuse first aid knowledge to the public easily and cost-effectively through social media (X. Zhang et al., 2020). Another reason is that individuals are increasingly depending on social media to acquire various types of information, including health-related knowledge. For instance, during the Covid-19 pandemic, the primary source of pandemic-related information and defensive knowledge for the public is social media (Soroya et al., 2021). However, although first aid knowledge learning on social media has been recognized as an important issue, its popularization among the public faces some challenges. First, in contrast with medical treatment or diagnosis, which aims to solve current health problems, learning first aid knowledge is a preventive health behavior adopted to cope with future health threats (Glanz et al., 2008). Second, learning first aid is collective-oriented, as first aid knowledge is applied to help others instead of protecting oneself. All of these factors may weaken individuals' learning willingness and motivations.

Given the above, in this study we aim to explore users' motivations and willingness for first aid knowledge learning on social media, considering its preventive and collective attributes. Particularly, we conceptualize first aid knowledge learning as a collective preventive health behavior since it aims to prevent illness or health threats to other people rather than to oneself. Protection motivation theory (PMT), a theory explaining preventive health behavior motivations (Milne et al., 2000), is employed as a theoretical foundation. Through the literature review of preventive health behavior and PMT, we identify prior studies of PMT and preventive health behaviors are generally limited to self-protective behaviors (Wang et al., 2019), and little research has focused on collective preventive health behaviors (e.g., first aid knowledge learning). Thus, it is necessary to confirm whether PMT is applicable and how PMT plays a

role in collective preventive health behavior context.

Therefore, this study focuses on first aid knowledge learning, a healthy behavior with social collective attributes, to explore the motivations and willingness to learn. We accordingly raise the specific research questions:

(1) What are the motivations for the public to learn first aid knowledge?

(2) Is the PMT applicable in this research context? If applicable, how does the theory explain individuals' motivations and willingness to learn?

To achieve the research objective and fill these research gaps, this study draws on a mixed approach involving both qualitative and quantitative study. According to Venkatesh et al. (2016), such a design is appropriate since the research topic is missing from existing work. Given the general paucity of studies on first aid knowledge learning and our objective of uncovering and confirming the effect of PMT context-specific factors, such a design is well suited to our work. Specifically, we confirm the applicability of PMT in this new research context and identify self- and collective cognition as well as the specific emotion (i.e., anticipated regret) related to first aid knowledge learning willingness through a qualitative study. Based on the qualitative results and drawing on the cognitive-affective-conative framework, we then build a model to examine impacts and influencing mechanisms of these contextualized factors in a quantitative study. The results indicate that self-cognition and collective cognition show different effects and that anticipated regret plays a full mediation role between cognitive appraisals and willingness to learn. This study not only advances the literature of preventive health behavior by conceptualizing and examining first aid knowledge learning, but it also expands and reveals the mechanism of PMT in a new context.

3.2 Qualitative Study

Since the motivation to learn first aid knowledge has not been verified in the current literature, this study employes semi-structural interview to explore individuals' motivations to learn first aid knowledge. The semi-structured interview is a useful method for conducting exploratory research, and current research has demonstrated the usefulness of this method in motivation exploration (Qin, 2021).

3.2.1 Qualitative Data Collection

Table 3- 1 Interviewee statistics.

Number	Age	Gender	Occupation	Duration
E1	35	Female	Financial industry	35min
E2	43	Male	IT	48min
E3	32	Female	Management	32min
E4	25	Male	Technician	50min
E5	39	Female	Education	30min
E6	42	Male	Photography	39min
E7	35	Female	Public institution	41min
E8	42	Male	Lecturer	45min
E9	38	Female	Full-time mother	40min
E10	39	Male	Engineer	37min

Through semi-structural interviews, we collected interview data from users of one of the first aid knowledge communities on Weibo, the most favored blogging social media in China. we choose one of the largest first aid knowledge sharing communities as the target community, which involves two million users. The sample of participants in the qualitative study drawn from the community is representative, and all selected interviewees have experience with first aid knowledge learning in the community. We recruited ten interviewees to conduct semi-structured interviews over phone, including five male and five female. The Table 3-1 shows

the demographic statistics of participants.

To ensure the interviews were manipulated in order, we made an appointment with each interviewee in advance. The time interval for each two interviewees is 2 hours, so as to ensure that we have enough time for interview and arrangement. Before the interview, we prepared a semi-structured interview outline, including self-introduction, introduction of the purpose of the interview, introduction of the interviewees' personal information and interview questions. The interview mainly focuses on the following aspects: (1) interviewees describe their views on learning first aid knowledge on social media; (2) reasons for learning first aid knowledge through social media; (3) The process and results of learning first aid knowledge. The interviews were manipulated in early August 2021, and each interview was 30-50 minutes long. In order to encourage the respondents to actively participate, a WeChat red envelope worth 50 yuan was provided to each interviewee after the interview. Among them, two interviewees said that learning first aid knowledge is a very meaningful thing, and they are very happy to contribute to related research, but they refused to accept our cash incentive. With the approval of interviewees, we recorded the entire interview. All interview content was recorded and transcribed into text for analysis.

3.2.2 Qualitative Data Analysis

Although PMT was employed to provide guidance for our analysis, we did not constrain ourselves to existing theoretical ideas but also allowed new insights to emerge as the exploratory feature of qualitative study (Sarker et al., 2018). The open, axial, and selective coding were adopted to analyze interview documents (Strauss & Corbin, 1998).

First, in the open coding process, we break up the original interview data, label and encode

all the original words and sentences, and mark related concepts. This process helps the researchers to define and extract all relevant concepts about the motivation of learning first aid knowledge. The invalid and repeated original codes were eliminated, and only the initial concepts with a repetition frequency of more than 3 times were retained. In the end, a total of 18 main concepts were excavated at the stage of open coding. See Appendix A for the detailed process and coding table.

Second, we use axis coding to recombine the initial concept by integrating the original material into a higher-level concept. The initial concepts obtained by open coding are generally independent of each other and belong to different levels of concepts and categories. Therefore, it is necessary to perform axis coding on the basis of open coding and develop into higher-level theoretically related constructs by discovering the potential logical relationship between different concepts. A total of 7 effective constructs were obtained through the axis coding, namely: perceived severity, perceived vulnerability, response efficacy, self-efficacy, anticipated regret, social media usefulness, and social media ease of use. All constructs are listed in Table 3-2.

Table 3-2 Selected constructs and quotations.

Constructs	**Selected supporting quotes**
Perceived severity	*If such an emergency happens, it is very dangerous. In fact, this is also one of my motivations for learning first aid knowledge. (E2)* *When an emergency occurs, it will be very serious if the surrounding people*
Perceived vulnerability	*In daily life, it is easy to suffer an emergency. Especially for little children, they are more likely to choke when eating. (E1)* *The elderly people in the family are getting older, and it is very likely that an accident will happen suddenly and they will need to be rescued quickly, so it is very important to master first aid knowledge. (E4)* *Actually, when I see some news about a sudden death, I think that I am also likely to experience a sudden death since I often work overtime and stay up late. (E9)*

Response efficacy	*Through learning first aid knowledge on social media, I have gained some basic knowledge. It is helpful in judging and coping with medical problems at home rather than going to hospitals. (E3)* *It is greatly helpful. If someone faints, I won't be overwhelmed and can judge whether he/she needs CPR based on the knowledge I have learned on social media. (E6)*
Self-efficacy	*I think I can learn effectively and have had some achievements. (E8)* *No, there is no trouble. I like to learn first aid knowledge on social media, where first aid knowledge is presented in text or video, which is easy for me to understand. (E5)* *At first, I always felt confused. After a long time, I am now familiar with this knowledge on social media and can understand easily. I can identify that my cognition on first aid knowledge has improved. (E10)*
Anticipated regret	*I want to learn first aid knowledge because I do not want to experience regret if there are any dangerous situations. (E1)* *Although we cannot control those accidents happen, we can learn how to cope to avoid more regret. (E4)* *When someone falls into a faint, if the people around all had no first aid knowledge to help him/her immediately, it would be likely that he/she could not be saved. It would be too bad. (E6)*
Perceived social media usefulness	*I think social media is indeed useful and helpful. Actually, I have no chance to access and learn professional first aid knowledge if there is no online channel. (E2)* *I think social media is a really good way. I am busy with work and have no time to participate in offline training courses. Through social media, I can learn whenever I am free. (E5)*
Perceived social media ease of use	*It is easy for the public to learn first aid knowledge on social media since everyone uses social media every day. (E7)* *Social media is a very convenient channel to for the public learn first aid knowledge, on which professionals publish expertise in an accessible way. It is easy for us to understand and learn. (E8)*

Third, we combine theory to analyze relationships between constructs obtained from the axis coding and construct the narrative concepts of these constructs at the theoretical level for further quantitative analysis. Guided by the protection motivation theory, this study finally determined the main link and key content that drives the public to learn first aid knowledge on social media through selective coding, including cognitive drives (perceived severity, perceived vulnerability, response efficacy, self-efficacy), affective drive (anticipated regret), and social media characteristics (social media usefulness and social media ease of use).

To ensure the coding validity, two researchers independently identified relevant concepts through systematic reading and analysis. After the independent coding was completed, the two researchers discussed the cases where the coding did not match until the coding results were finally agreed. The coding content and process are detailed in Appendix A.

3.2.3 Findings of the Qualitative Study

Through the interview content analysis, the research has drawn several important findings.

First, the applicability of the PMT in this research context is confirmed. Most of the constructs identified from the interview content are consistent with the main constructs in the PMT, including perceived severity, perceived vulnerability, response efficacy and self-efficacy. They are found to be main motivations for individuals to learn first aid knowledge. When asked about their reasons for learning first aid, most respondents addressed the severity and vulnerability. Severity refers to individuals' perceived serious extent of a threat, while vulnerability refers to individuals' subjective belief on the probability of threats occurring (Rogers, 1975). When evaluating first aid learning on social media, most respondents said that learning through social media can effectively improve their first aid skills and relevant cognition, help them cope with emergencies in daily life, and affirm the response efficiency of learning first aid knowledge. In addition, more respondents also put forward their views on the self-efficacy of learning first aid knowledge. They admit that self-efficacy plays a critical role in learning first aid knowledge, and learners may need to have certain cognitive ability, understanding and judgment ability. Examples of perceived severity, perceived vulnerability, response efficacy and self-efficacy from interviews are as follows:

E3: If there is no one around to give first aid, it will be very dangerous if there is a sudden

cardiac arrest, and it will be very difficult to be rescued.

E4: Maybe it happens when you are exercising, or when you are working, or when you are living at home. It can happen at any time.

E5: If someone passes out, I'm not overwhelmed and can tell if he/she needs CPR based on what I've learned on social media.

E8: For young people, there should be no problem in learning. For the elderly, their memory is relatively degraded, and they may need to study repeatedly.

Second, the cognitive constructs in PMT have collective attributes, and it is necessary to distinguish between self-cognition and collective cognition. When talking about the motivation of learning first aid knowledge, interviewees not only mentioned the factors related to themselves, but also mainly focused on the factors related to the collective. For example, when it comes to vulnerability to emergency threats, most people think that those around them are vulnerable to emergency threats, and only a minority talk about their own vulnerability. Similarly, people generally believe that learning first aid helps those around them respond effectively to threats, but less so to themselves. These results indicate that difference exists between self-cognition and collective cognition, and that the collective attribute should not be ignored in studies related to protective motivation, especially in the context of this study. Here are some examples of the differences between the self and the collective:

E2: Although first aid knowledge can almost only help others, I still think I should learn to help those in need.

E7: I learn first aid knowledge, because I think the elderly and children at home are prone to emergencies. I'm okay, I'm a healthy young man with less where I may need it.

E9: The main thing is to help others. If you learn this, it will not help you very much.

Collective cognition is more important than self-cognition in stimulating first aid learning behavior. Interviewees expressed their views on the relative influence of two different categorical constructs, collective cognition and self-cognition, in the interview. Some respondents said that while they acknowledged they had been threatened, they were less motivated to learn about first aid. Instead, they tend to act when they believe possible threats will occur to others around them. That is to say, self-cognition and collective cognition play different roles in driving first-aid knowledge learning, and collective cognition may play a relatively important role. This may be because the background features of this study have collective attributes, that is, the purpose of first-aid knowledge learning is to protect the health of others and the collective. Here are some examples of the relative effects of self-cognition and collective cognition:

E3: I'm actually an IT programmer with a high risk of sudden death, but that didn't motivate me to learn first aid. In fact, I study because of my family.

E10: I like helping others, and I believe that learning first aid knowledge is good for those around me. I don't think it does much, though to some extent it's good for me too.

Fourth, apart from cognitive factors in PMT, an affective/emotional factor, anticipated regret, was identified. Consistent with previous research, this finding shows that the affective factor and emotion (e.g., regret) are crucial motivations driving preventive health behavior (Chapman & Coups, 2006; Coifman et al., 2021). Compared to other negative emotions, anticipated regret is regarded as a strong determinant of health behavior (Brewer et al., 2016). Moreover, consistent with our interview results, prior studies also found that anticipated regret

was mentioned frequently in daily conversation (Kim et al., 2020; Saffrey et al., 2008). Thus, the role of anticipated regret in predicting health behavior cannot be ignored. In this research context, interviewees indicated that they would feel great regret if they had no first aid knowledge in a future emergency situation. The following are some examples of interview content related to anticipated regret:

E1: I want to learn first aid knowledge because I don't want to feel regret when I encounter danger.

E4: Although we cannot control the occurrence of accidents, we can learn how to deal with them and avoid more regrets.

E6: This thing must be met, just don't leave any regrets, just in case there is any problem.

Finally, variables related to social media characteristics, such as usefulness and ease of use, are also crucial factors that affect individuals' willingness and behavior to learn on social media. Most respondents said social media was a useful and convenient way to learn about first aid. Compared with traditional offline learning, social media not only can offer more choices to individuals, but also enables them to study without time and geographical constraints. Here are some examples of citations about social media usefulness and social media ease of use:

E2: I think social media is really useful. In fact, if there is no online channel, I would not have the opportunity to contact and learn professional first aid knowledge.

E6: I think social media is a great way to do that. I'm very busy with work and don't have time to attend offline training courses. With social media, I can learn anytime.

E8: In the form of social media, there are many animations of this kind of simulation, and then I gave a very good demonstration.

To summarize, the qualitative study finds that most of the main motivators are consistent with PMT concepts. Further, the results highlight the multidimensionality (i.e., self and collectivity) of the PMT concepts in this context and their relative importance in first aid knowledge learning. In addition to PMT-related concepts, we also capture a particular emotion: anticipated regret. Moreover, factors related to social media adoption also deserve consideration in our research.

3.3 Quantitative Study

3.3.1 Research Model

In light of the findings from our qualitative study, we propose an expansion of the traditional Protection Motivation Theory (PMT) to include a collective perspective in the context of first aid. This expansion necessitates the consideration of certain components that need to evolve. It is important to acknowledge that there is a significant conceptual difference involved in this extension, specifically the shift from individual protection to collective protection. This difference results in changes to how the constructs are characterized and how they relate to each other within a research model. Based on the findings of the qualitative study, we have identified two dimensions, namely the self-dimension and the collective dimension, that are relevant in a collective or social context. However, the traditional PMT only measures the self-dimension. To provide a more comprehensive view, we have expanded this narrow theoretical model to include both self-cognitions and collective cognitions, and we have compared their relative impacts. In our model, we not only measure individuals' threat appraisal and coping appraisal for themselves, but also for others, which is important in a collective context. Additionally, while the PMT primarily focuses on cognitions, it neglects the role of

emotions. We attempt to capture the specific emotion in first aid context and explore the relationships between emotions and cognitive constructs involved in the model.

we develop our research model based on the cognitive-affective-conative (CAC) framework (Fishbein & Ajzen, 1977). The CAC framework starts with the development of cognitive characteristics, which involve individuals' cognition, beliefs and perceptions (Han et al., 2011; Xiao et al., 2020). The affective element of the framework captures the development of individuals' feelings, emotions and attitudes (Hsiao, 2020; Lim & Kim, 2020). Finally, the conative aspect, which relates to an individual's behavior intentions and tendency to act, was induced (Kim et al., 2013; Lin, 2014). Based on the CAC framework and constructs identified in qualitative study, we built the research model shown in Figure 3-1. Specifically, the PMT concepts were divided into self- and collective cognition categories and the impacts of social media characteristics were also considered by adding covariates.

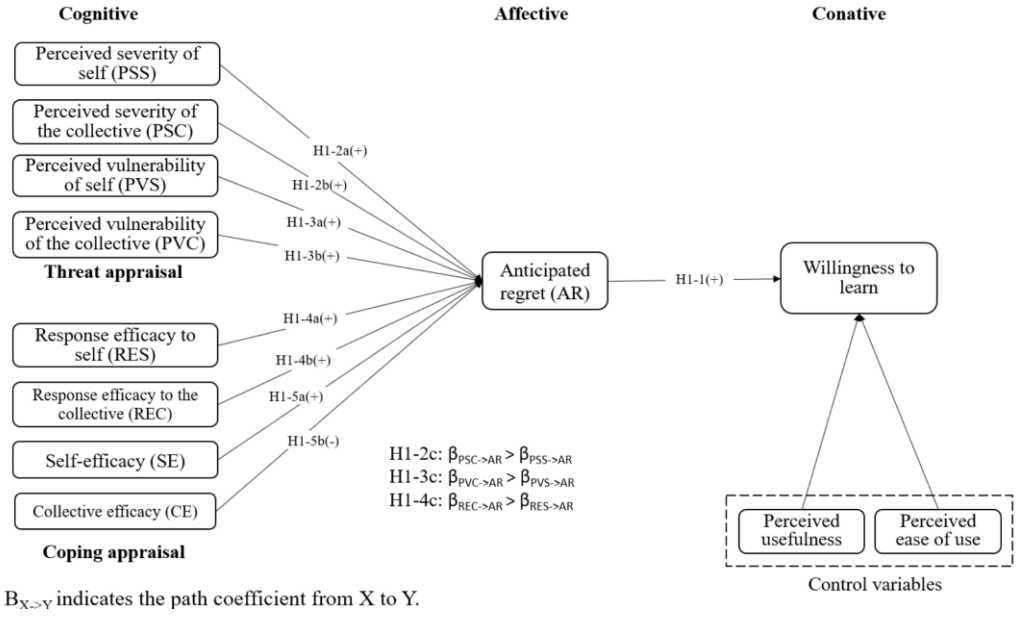

Figure 3-1 Research model of study 1

3.3.2 Hypotheses Development

3.3.2.1 The relationship between anticipated regret and willingness to learn

Anticipated regret refers to the pessimistic affective/emotional reaction to disadvantageous results in future (Lazuras et al., 2017). Research about anticipated regret posits that people will image a inverse outcome and will experience such negative emotion when they believe the inverse outcome is better than current results, and this emotion will force them to behave to avoid expected outcomes (Verkijika, 2018; Zeelenberg, 1999). Previous studies in fields of medicine and health behaviors have identified that anticipated regret play important roles in encouraging individuals to undertake health behaviors in order to avoid the regret of inaction. For example, anticipated regret has been proven to increase individuals' intent to get a vaccination in order to avoid contracting a given disease (Kim et al., 2020; Wolff, 2021). In fact, the impact of anticipated regret on promoting preventive health behavior has been confirmed in various contexts, including exercise, health information seeking, and fruit and vegetable consumption (Abraham & Sheeran, 2004; Ahn & Kahlor, 2020; van Koningsbruggen et al., 2016). Specific to the context of first aid knowledge learning, whereby individuals equipped with first aid knowledge are able to cope with medical emergencies, it is not surprising that when an emergency occurs, people will feel regret about not learning first aid. Thus, it is reasonable to postulate that individuals will be more motivated to learn first aid knowledge when they anticipate that they will experience regret if they take no action in an emergency. Therefore, we propose that:

H1-1: Anticipated regret is positively related to willingness to learn first aid knowledge.

3.3.2.2 The relationship between PMT concepts and anticipated regret

Perceived severity is identified as one primary component of a threat appeal and a factor contributing to an individual's protection motivation and behavior (Rogers, 1975). It refers to

the cognitive beliefs that individuals hold regarding the significance of threats (i.e., individuals' perception of threat severity and how serious damage it can cause) (Johnston & Warkentin, 2010). In this study, interviewees pointed out that regardless of whether the subject is themselves or someone else, a sudden medical emergency is a serious threat because it will cause great damage to one's physical health and possibly even death if no first aid action is taken. Earlier research found that individuals with high level of perceived severity were prone to experience emotional disorder (Liang & Xue, 2009). When they consider the severity of such threats inflicted by inevitable events, individuals are prone to suffer negative emotions. Anticipated regret, in which individuals imagine that one behavior may lead to worse outcomes than another behavior, is a predictive negative emotional response (Lazuras et al., 2017; Zeelenberg, 1999). Prior medical studies have illustrated that disease threats are positively related to and regret about not acting (Brewer et al., 2016). Individuals who face subsequent threats are especially likely to experience anticipated inaction regret.

Particularly, as the interview results indicated, individuals pay more attention to collective-related cognition when talking about the motivation to learn first aid knowledge. This is consistent with self-category theory, which posits that people are able to act as both individual persons and a social collective, while collective cognition is more likely to be shaped by and to play a role in a collective context (Turner et al., 1994; Turner & Reynolds, 2011). In our study, first aid knowledge learning is a preventive health behavior for collective health, where collective cognition may play a more important role than self-related cognition. Specific to perceived severity, the perceived severity of the collective may have a stronger impact on anticipated regret than perceived regret of self. Thus, we propose:

H1-2a: Perceived severity of self is positively related to anticipated regret.

H1-2b: Perceived severity of the collective is positively related to anticipated regret.

H1-2c: Perceived severity of the collective shows stronger impact on anticipated regret than perceived severity of self.

Perceived vulnerability is another important element in PMT, referring to individuals' subjective assessment on how likely a threat was to materialize (Liang & Xue, 2010; Rogers, 1975). In conventional PMT, perceived vulnerability refers to an individual's evaluation on the probability of being threated, which is an assessment on themselves (Duncan et al., 2009). However, in our research, we discover that individuals will assess the probability of an emergency threat occurring both to themselves and to others. Based on the appraisal theory, individuals' evaluation or appraisal of events causes emotions, or affective responses (Scherer, 1999). When people appraise an unfavorable event as likely to happen, they tend to anticipate adverse outcomes and have negative emotions. For example, since suffering a medical emergency can be considered life-threatening, a person may foresee this threat as being a likely occurrence and may anticipate the regret over death (their own or others') when a medical emergency occurs. When the probability of a threat is high, individuals tend to develop a negative expectation on future results, and they are likely to experience anticipate regret for not acting protection behavior (Verkijika, 2018). Furthermore, our interviewees stressed the vulnerability of the collective rather than their own vulnerability. They expressed the belief that learning first aid is an effective prevention measure that is more about protecting the health of surrounding people than about protecting their own health. In this regard, collective cognition (i.e., vulnerability of the collective) is likely to show a stronger impact on anticipated regret

than self-cognition (i.e., vulnerability of self), which also fits the collective context where collective cognition plays vital roles (Turner et al., 1994). Thus, we propose:

H1-3a: Perceived vulnerability of self is positively related to anticipated regret.

H1-3b: Perceived vulnerability of the collective is positively related to anticipated regret.

H1-3c: Perceived vulnerability of the collective shows stronger impact on anticipated regret than perceived vulnerability of self.

Response efficacy indicates how individuals believe the suggested response behavior can adequately respond to coming threats (Johnston & Warkentin, 2010; Rogers, 1975). In this research context, the recommended response is learning first aid knowledge on social media, while response efficacy means the effectiveness of learning first aid knowledge on social media to cope with medical emergencies. In the preceding qualitative study, interviewees disclosed that response efficacy to self is distinguishing from that to the collective. Specifically, although some interviewees admit that learning first aid knowledge is helpful in supporting themselves in their own emergencies, most interviewees indicate that knowing first aid helps themselves a little but helps others a lot.

Assessment on response efficacy is a process in which individuals evaluate the effectiveness of recommended response behaviors (i.e., first aid knowledge learning) to cope with threats (Rogers, 1975). Both response efficacy to self and response efficacy to collectivity are expected to be positively related to anticipated regret, which can be understood from the perspective of risk aversion. Regret is central to how individuals learn from experience and to the psychology of risk aversion (Zeelenberg et al., 1996). When individuals believe the response that they failed to provide would have performed effectively to avert a threat,

uncertainty and risk perception of future outcomes increase, thus leading to anticipated regret (Zeelenberg, 1999). Prior studies also provided empirical evidence showing that the more effective a response measure is, the more anticipated regret people will experience due to not adopting the measure (Leder et al., 2015). Notably, given individuals' aim of responding to possible threats to other people in this research context, individuals' perception of response efficacy to the collective is likely to play a more significant role than response efficacy to self. That is to say, people tend to experience anticipate regret about not learning first aid knowledge when learning would enable them to respond more effectively to threats to the collective. On this basis, we propose:

H1-4a: Response efficacy to self is positively related to anticipated regret.

H1-4b: Response efficacy to the collective is positively related to anticipated regret.

H1-4c: Response efficacy to the collective shows stronger impact on anticipated regret than response efficacy to self.

Self-efficacy refers to how a person believes that he or she is able to perform the recommended response behaviors well (Johnston & Warkentin, 2010). Here, self-efficacy refers to individuals' beliefs in their capacity to learn first aid knowledge on social media. Studies have demonstrated that individuals with high-level of self-efficacy in performing the recommended action are in fact more likely to perform it (Balapour et al., 2019; Menard et al., 2017). Yet despite existing studies examined impacts of self-efficacy on human behaviors, few research has inspected its impact on emotions. We argue that the self-efficacy related to performing the recommended behavior (i.e., learning first aid knowledge on social media) will increase the negative emotion (i.e., anticipated regret) associated with inaction. Self-efficacy

is a person's cognitive belief in their abilities to achieve a given aim. When individuals are convinced they are able to achieve something yet also imagine that they will fail, they are prone to feel regret (Hung et al., 2007). To be specific, individuals anticipate that they will suffer regret when they lack the first aid knowledge to cope with medical emergencies. This regret may particularly increase when they realize that they are capable of learning first aid knowledge and becoming equipped for emergencies. Based on above arguments, we propose:

H1-5a: Self-efficacy is positively related to anticipated regret.

In addition to self-efficacy, we conceptualize the corresponding construct, collective efficacy, indicating individual's perception of others' capability for learning first aid knowledge through social media. When individuals believe that other people have high ability to learn first aid knowledge, they may feel less regret about their inaction[3]. This can be understood from the perspective of diffusion of responsibility, which indicates that when the responsibility for helping is diffused among individuals, the blame and shame for not taking action is also diffused (Darley & Latané, 1968). Thus, individuals are less likely to take action and to feel bad for their inaction. In this study, the aim of learning first aid knowledge is to cope with the medical emergencies of the general population. Since the individual perceives that their neighbors can learn first aid knowledge, the individual also believes that their neighbors share the responsibility of dealing with emergencies. Therefore, the less responsibility that individuals take on themselves, and less anticipated regret of inaction they experience. Based on this, we propose:

H1-5b: Collective efficacy is negatively related to anticipated regret.

[3] We would like to clarify that we do not compare the effects of self-efficacy and collective efficacy because we believe that they play their roles under different mechanisms, so there is no value in comparing.

3.3.3 Data Collection

An online questionnaire instrument was employed to collect data for examining our research model. Before officially distribution, we first did a pilot test of twenty randomly-selected participants who had experience of learning first aid knowledge on social media. Their feedback and comments on the wording helped us to revise the questionnaire and to enhance its readability. Final online questionnaires were distributed within a first aid knowledge learning and sharing community in Weibo, as previously indicated. We encourage community users with first aid learning experience to participate in our survey. Moreover, a screening question was included to recognize respondents with no experience. In total, 704 responses were received. After removing invalid responses (e.g., no learning experience or overly short answer time), 560 valid survey responses were obtained. Among the valid samples, 43.6% of the respondents are male and 37.7% are aged 31-40 years. Table 3-3 shows demographic statistics of the respondents.

Table 3-3 Demographic statistics

Variables	Category	Frequency	Percentage (%)
Gender	Male	244	43.6
	Female	316	56.4
Age	18 or younger	3	0.5
	18-25	66	11.8
	26-30	154	27.5
	31-40	211	37.7
	41-50	95	17
	51-60	27	4.8
	61 or older	4	0.7
Education	Less than college degree	130	23.2
	College	34	9.6
	Undergraduate	339	60.5
	Postgraduate or higher	91	16.3
Learning time	Less than 1 month	53	9.5
	1-3 months	53	9.5

	3-6 months	94	16.8
	0.5-1 year	97	17.3
	1-2 years	109	19.5
	2-3 years	50	8.9
	More than 3 years	104	18.6

3.3.4 Measurement Development

Measurements were adapted from prior studies with words modified based on this research context. We employed Seven-point Likert scales ranging from "strongly disagree" to "strongly agree" to measure construct items. Specifically, items measuring willingness to learn (WL) were adapted from Darban and Polites (2016) based on the unique context of this study. Constructs of PMT were measured using the items altered from Johnston and Warkentin (2010), including perceived severity of self (PSS), perceived severity of the collective (PSC), perceived vulnerability of self (PVS), perceived vulnerability of the collective (PVC), response efficacy to self (RES), response efficacy to the collective (REC), self-efficacy (SE), and collective efficacy (CE). The items measuring anticipated regret (RA) were adapted from Verkijika (2018). Finally, perceived social media usefulness (PU) and perceived social media ease of use (PEOU) were measured with items adapted from Venkatesh and Bala (2008). Before distributing questionnaires, we translated all items into Chinese with back-translation. The constructs and measuring items are described more fully in Appendix B.

3.3.5 Model Results

The partial least squares structural equation model (PLS-SEM) was employed to test our research model and hypotheses, and Smart PLS (version 3.2) was used to analyze the data. PLS can simultaneously and systematically estimate the measurement model and structural model. Moreover, compared to other analysis techniques, PLS is more reliable when dealing with

complex models with medium sample sizes and plenty of constructs and indicators, especially for the mediation model (Chin et al., 2003; Nitzl et al., 2016). Next, we discuss the tests of measurement model and structural model.

3.3.5.1 Measurement Model

The quality of the measurement model was assessed by examining the reliability, convergent validity, and discriminant validity of constructs. As shown in Table 3-4, the composite reliabilities, Cronbach's Alpha values, and average variance extracted (AVE) of all constructs exceeded the widely recommended minimum values of 0.7, 0.7, and 0.5, respectively (Fornell & Larcker, 1981), indicating a good reliability. The convergent validity was examined by checking whether or not construct loading values were significant and high enough. As shown in Table 3-5, item loadings were greater than 0.7, suggesting strong convergent validity (Fornell & Larcker, 1981).

Table 3-4 Statistics of measurement model in study 1

Constructs	Cronbach's Alpha	composite reliabilities	average variance extracted (AVE)
AR	0.856	0.912	0.776
WL	0.927	0.954	0.873
CE	0.908	0.94	0.839
PVC	0.871	0.921	0.795
PEOU	0.886	0.921	0.745
PU	0.902	0.931	0.772
REC	0.89	0.932	0.819
RES	0.897	0.936	0.829
PSC	0.919	0.949	0.86
SE	0.903	0.939	0.837
PSS	0.935	0.959	0.886
PVS	0.9	0.937	0.833

Table 3-5 Construct loadings in study 1

Constructs	Items	Loadings	Constructs	Items	Loadings
PSS	PSS1	0.935	PSC	PSC1	0.914
	PSS2	0.944		PSC2	0.936
	PSS3	0.944		PSC3	0.933
PVS	PVS1	0.89	PVC	PVC1	0.861
	PVS2	0.934		PVC2	0.911
	PVS3	0.913		PVC3	0.902
RES	RES1	0.911	REC	REC1	0.893
	RES2	0.906		REC2	0.92
	RES3	0.914		REC3	0.902
SE	SE1	0.912	CE	CE1	0.918
	SE2	0.912		CE2	0.921
	SE3	0.921		CE3	0.91
AR	AR1	0.88	WL	WL1	0.922
	AR2	0.89		WL2	0.942
	AR3	0.872		WL3	0.938
PU	PU1	0.868	PEOU	PEOU1	0.86
	PU2	0.871		PEOU2	0.867
	PU3	0.887		PEOU3	0.842
	PU4	0.889		PEOU4	0.883

Table 3-6 Heterotrait-monotrait ratio in study 1

	AR	WL	CE	PVC	PEOU	PU	REC	RES	PSC	SE	PSS
WL	0.76										
CE	0.294	0.372									
PVC	0.648	0.515	0.333								
PEOU	0.538	0.514	0.746	0.396							
PU	0.797	0.634	0.512	0.569	0.771						
REC	0.741	0.583	0.352	0.601	0.596	0.756					
RES	0.636	0.543	0.501	0.51	0.715	0.758	0.838				
PSC	0.65	0.508	0.226	0.793	0.368	0.555	0.607	0.527			
SE	0.541	0.452	0.721	0.369	0.834	0.754	0.562	0.68	0.366		
PSS	0.559	0.507	0.266	0.745	0.37	0.502	0.555	0.488	0.77	0.322	
PVS	0.604	0.542	0.373	0.756	0.442	0.547	0.565	0.504	0.713	0.415	0.809

Finally, this study evaluates the discriminant validity using two methods. First, the heterotrait-monotrait ratio (HTMT) across constructs was examined. As shown in Table 3-6,

all HTMT values are less than 0.85, demonstrating that each construct has a good discriminant validity. Moreover, this study compared the square root of each construct's AVE (diagonal values) with the correlation coefficients for that construct and other constructs. As shown in Table 3-7, the square root of AVE of all constructs is higher than the correlation coefficient with other constructs, further indicating a good discriminant validity.

Further, we examined the variance inflation factor (VIF) values to test multicollinearity. The results showed that all VIF values were between 1.022 and 3.834, lower than the threshold value of 10, showing that multicollinearity was not a critical concern in our research (Petter et al., 2007). We also performed analysis to test common method bias. Following the guidelines of Podsakoff (2003) and Liang et al. (2007), we included a common method factor in the model and compared variance substantively explained by the principal constructs and by the method factor. The Table 3-8 shows that the results demonstrated that the average of variance substantively explained is 83.6% while the average of variance explained by method factor is only 0.2%, indicating that common method bias was not a threat in our study.

Table 3-7 Construct correlations in study 1

	AR	WL	CE	PVC	PEOU	PU	REC	RES	PSC	SE	PSS	PVS
AR	**0.881**											
WL	0.649	**0.934**										
CE	0.274	0.474	**0.916**									
PVC	0.563	0.453	0.301	**0.892**								
PEOU	0.469	0.676	0.673	0.347	**0.863**							
PU	0.7	0.72	0.48	0.506	0.689	**0.879**						
REC	0.647	0.605	0.332	0.532	0.528	0.766	**0.905**					
RES	0.56	0.658	0.462	0.452	0.637	0.773	0.748	**0.91**				
PSC	0.578	0.438	0.218	0.713	0.331	0.505	0.55	0.48	**0.928**			
SE	0.482	0.586	0.663	0.33	0.745	0.685	0.508	0.614	0.337	**0.915**		
PSS	0.5	0.431	0.254	0.675	0.336	0.461	0.507	0.447	0.708	0.298	**0.941**	
PVS	0.54	0.455	0.335	0.76	0.392	0.496	0.51	0.455	0.651	0.376	0.745	**0.912**

Note: The value in bold is the square root extracted from the mean variance of the corresponding variable.

Table 3-8 Examination on common method bias in study 1

Construct	Indictor	Substantive factor loading (R1)	$R1^2$	Method factor loading (R2)	$R2^2$
WL	WL1	0.923	0.852	-0.014	0.000
	WL2	0.941	0.886	0.032	0.000
	WL3	0.938	0.881	-0.018	0.000
AR	AR1	0.880	0.774	0.027	0.000
	AR2	0.885	0.784	0.050	0.001
	AR3	0.878	0.771	-0.080	0.002
PSS	PSS1	0.937	0.877	0.011	0.000
	PSS2	0.941	0.885	0.031	0.000
	PSS3	0.946	0.895	-0.041	0.001
PSC	PSC1	0.919	0.845	-0.025	0.001
	PSC2	0.930	0.866	0.042	0.000
	PSC3	0.933	0.871	-0.018	0.000
PVS	PVS1	0.906	0.821	-0.074	0.002
	PVS2	0.938	0.880	-0.021	0.000
	PVS3	0.895	0.801	0.095	0.004
PVC	PVC1	0.872	0.760	-0.063	0.001
	PVC2	0.913	0.833	-0.008	0.000
	PVC3	0.891	0.793	0.069	0.002
RES	RES1	0.904	0.817	0.047	0.001
	RES2	0.909	0.826	0.013	0.000
	RES3	0.918	0.844	-0.060	0.001
REC	REC1	0.890	0.791	0.030	0.001
	REC2	0.919	0.845	-0.001	0.000
	REC3	0.907	0.822	-0.029	0.000
SE	SE1	0.921	0.848	-0.042	0.001
	SE2	0.897	0.805	0.086	0.004
	SE3	0.928	0.861	-0.043	0.001
CE	CE1	0.936	0.875	-0.038	0.001
	CE2	0.887	0.786	0.119	0.011
	CE3	0.934	0.872	-0.077	0.024
Average			**0.836**		**0.002**

3.3.5.2 Structural Model

The analysis of the structural model in this study is done in two steps. In the first step, the

path coefficients between constructs are analyzed by PLS, and the hypothesis of direct influence relationship in the research hypothesis is tested. In the second step, the path coefficient comparison method suggested by Li et al. (2013) was used to compare path coefficients and test the hypothesis of relative influence.

(1) PLS Results

PLS results of the structural model are illustrated in Figure 3-2. The results indicated that anticipated regret positively influences willingness to learn (β=0.300, t=5.511, $p<0.001$), supporting H1-1. In terms of the impact of cognitive factors on affective factors, the interesting results are as follows. Perceived severity of self was proven to have no significant effect on anticipated regret (β=-0.076, t=0.869, p=0.835) while perceived severity of the collective significantly increased anticipated regret (β=0.209, t=2.733, $p<0.01$); thus, H1-2a was not supported but H1-2b was. Both perceived vulnerability of self (β=0.121, t=2.016, $p<0.05$) and perceived vulnerability of the collective (β=0.140, t=2.377, $p<0.05$) showed positive impacts on anticipated regret, confirming H1-3a and H1-3b. For the impact of response efficacy, response efficacy to self showed no significant influence on anticipated regret (β=0.05, t=0.683, p=0.495), but response efficacy to the collective showed a positive effect (β=0.321, t=5.523 $p<0.001$); this result did not support H1-4a but supported H1-4b. Finally, self-efficacy and collective efficacy exerted significant impacts on anticipated regret in opposite directions. Self-efficacy was found to positively influence anticipated regret (β=0.223, t=3.867, $p<0.001$) while collective efficacy was negatively related to anticipated regret (β=-0.113, t=2.735, $p<0.01$), lending support to both H1-5a and H1-5b. Regarding to the control variables, perceived usefulness (β=0.249, t=3.853, $p<0.001$) and perceived ease of use (β=0.351, t=6.996, $p<0.001$)

were found to have significant effects on willingness to learn. Overall, the model explained 54% and 63.5% of the variance in anticipated regret and learning intention, respectively.

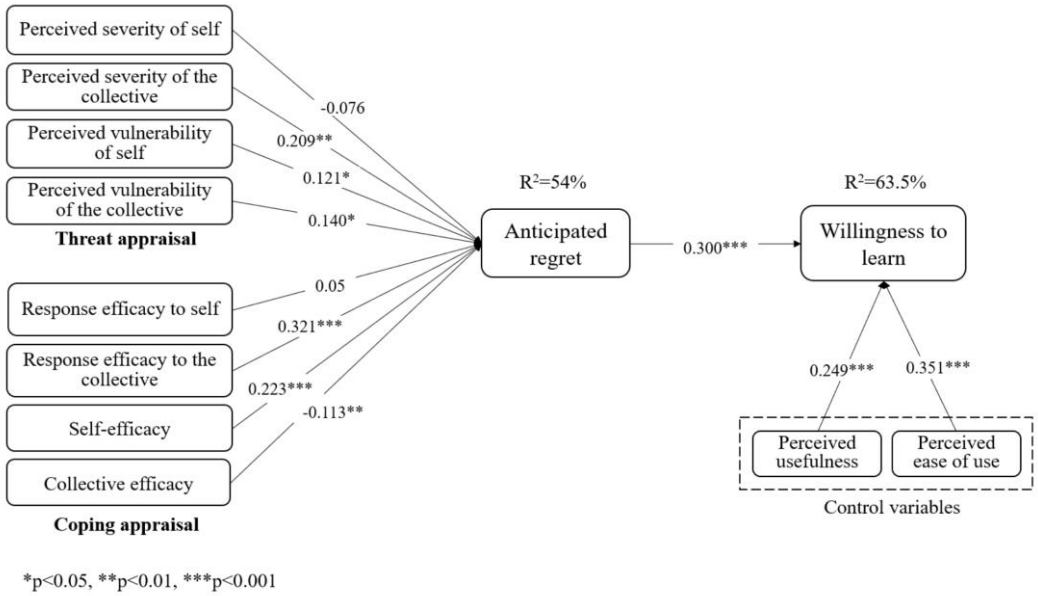

Figure 3-2 Structural model results of Study 1

(2) Path Comparison Analysis Results

To test hypotheses H1-2c, H1-3c, and H1-4c, this study adopts the method suggested by Li et al. (2013) to test whether significant difference exists. This method conducts T-test on the path coefficient obtained from PLS analysis, and the calculation formula is shown in formula (3-1):

$$t = \frac{\beta_i - \beta_j}{\sqrt{\frac{1-R_Y^2}{N-K-1} \times \left(\frac{sd_y^2}{sd_i^2} \times r^{ii} + \frac{sd_y^2}{sd_j^2} \times r^{jj} - 2\frac{sd_y^2}{sd_i \times sd_j} \times \frac{r_{ij}}{\sqrt{r_{ii} \times r_{jj}}} \right)}} \quad (3\text{-}1)$$

β_i is the path coefficient from the independent variable i to the dependent variable, sd_i is the standard deviation of the independent variable i; r_{ij} is the element corresponding to the variable ij in the inverse matrix of the correlation coefficient matrix; R^2_Y is the explained

variance of the dependent variable Y; n is the sample Quantity; k is the number of all independent variables.

We compared the impacts of self-related factors and collective-related factors on anticipated regret to test H1-2c, H1-3c, and H1-4c, as shown in Table 3-9. Following the method suggested by Li et al. (2013), we found that perceived severity of the collective has a stronger impact on anticipated regret than perceived severity of self ($t=70.405$, $p<0.001$), supporting H1-2c. Similarly, perceived vulnerability of the collective also has a stronger impact than perceived vulnerability of self ($t=4.654$, $p<0.001$), which supports H1-3c. Additionally, response efficacy to the collective was found to have stronger impact on anticipated regret than response efficacy to self ($t=65.586$, $p<0.001$); thus, H1-4c was supported.

Table 3-9 Results of hypothesis testing for H1-2c, H1-3c, and H1-4c

Hypothesis	Path coefficient	T value	Conclusion
H1-2c	$\beta_{PSC->AR}$ VS. $\beta_{PSS->AR}$ = 0.209** VS. -0.076	70.405***	$\beta_{PSC->AR} > \beta_{PSS->AR}$
H1-3c	$\beta_{PVC->AR}$ VS. $\beta_{PVS->AR}$ = 0.140* VS. 0.121*	4.654***	$\beta_{PVC->AR} > \beta_{PVS->AR}$
H1-4c	$\beta_{REC->AR}$ VS. $\beta_{RES->AR}$ = 0.321*** VS. 0.05	65.586***	$\beta_{REC->AR} > \beta_{RES->AR}$

Note. $B_{X->Y}$ indicates the path coefficient from X to Y. ***p<0.001

3.3.5.3 Post-hoc Analysis

Table 3-10 Test of mediation effect

Path	Direct effect	Confidence interval (95 %)		Indirect effect	Confidence interval (95 %)		Mediation effect
		Lower	Upper		Lower	Upper	
PSC->WL	-0.006	-0.124	0.097	0.058*	0.016	0.104	Full
PVC->WL	0.032	-0.055	0.126	0.039*	0.005	0.079	Full
REC->WL	0.049	-0.042	0.147	0.09**	0.042	0.150	Full
SE->WL	-0.024	-0.123	0.076	0.062**	0.024	0.108	Full
CE->WL	0.054	-0.031	0.144	-0.031*	-0.058	-0.008	Full

Notes: *p<0.05, **p<0.01, ***p<0.001

Anticipated regret is an affective construct that connects cognitive and conative constructs,

implying that a mediation effect may exist. We tested the mediation effect through a bootstrapping procedure. If independent variable shows insignificant direct effect on dependent variable but significantly influences dependent variable through a mediator, there is a full mediation effect (Baron & Kenny, 1986). As shown in Table 3-10, the mediation test results illustrated that anticipated regret fully mediates the effects of all factors on willingness to learn.

3.4 Discussions

3.4.1 Key Findings

This study aims to open up our comprehension of collective preventive health behavior (e.g., first aid knowledge learning behavior on social media) and explore motivations for this behavior based on PMT. Through both qualitative and quantitative studies, we obtain several salient findings. First, the qualitative study results confirm the applicability of PMT in this new context and additionally highlight the collective aspects of PMT cognition factors. Although PMT has been widely adopted in prior studies on preventive health behavior (Floyd et al., 2000), this is the first time its applicability has been confirmed in a collective preventive health behavior context. Our initial qualitative study suggests that from a PMT perspective, interviewees emphasize collective cognition and differentiate between self- and collective cognition. The quantitative study further proves this point by identifying discriminant validity between these two types of factors, expanding conventional PMT (Rogers & Prentice-Dunn, 1997). These findings imply that self-cognition and collective cognition in PMT are conceptually different constructs. We recommend that researchers and practitioners consider this multidimensional conceptualization of PMT in various contexts.

Second, we identify anticipated regret as a vital motivator for first aid knowledge learning

willingness in both qualitative and quantitative study. The empirical results indicate that anticipated regret significantly enhances learning willingness, resonating with prior research which has demonstrated that higher levels of anticipated regret can promote health behaviors (Ogbanufe & Pavur, 2022; van Koningsbruggen et al., 2016). Moreover, our post-hoc analysis suggests anticipated regret plays a mediating role between PMT cognitive appraisals and first aid knowledge learning, complementing previous findings which only capturing the straightforward effect of anticipated regret on motivating heath behavior (Brewer et al., 2016).

Third, through analyzing questionnaire data, we define the effects of collective cognition and self-cognition separately. We find that for perceived severity and response efficacy, self-related factors have no significant effect, yet in these cases the corresponding collective factors all show significant impacts. This is contradictory to findings of previous studies (Ling et al., 2019; Rad et al., 2021). We also find that both perceived vulnerability of self and perceived vulnerability of the collective show significant effects. This may be because individuals are more likely to form an willingness to take protective actions when they feel exposed to health risks (De Hoog et al., 2007). Interestingly, the impacts of self-efficacy and impacts of collective efficacy go in opposite directions: self-efficacy increases anticipated regret and collective efficacy decreases anticipated regret. This result demonstrates that self-efficacy and collective efficacy have different mechanisms, and it also implies the necessity of differentiating self- and collective cognition, echoing the statement of Turner et al. (1994).

Finally, in contrast with prior studies, which fail to compare the relative importance of self- and collective cognition in PMT (Floyd et al., 2000; Sun et al., 2020), we identify differences between two kind of cognitions through both qualitative interviews and empirical, statistical

evidence. The comparative results demonstrate in terms of perceived severity, perceived vulnerability, and response efficacy, collective related factors have stronger impacts on anticipated regret than their corresponding self-related factors. The results suggest that in a collective preventive health behavior context, collective cognition plays a more decisive role in motivating health behavior than self-related cognition.

3.4.2 Theoretical Implications

First, we advance the literature on motivation health behavior motivations by considering a collective preventive health behavior in this study. Existing studies of preventive health behaviors have mainly focused on behaviors protecting one's own health, such as vaccination (Kim et al., 2020), but the literature has generally neglected collective behaviors that are performed to help others. Here, we aim to provide a contextualized explanation on individuals' motivation for collective preventive health behavior by investigating learning first aid knowledge through social media. The findings of this study confirm significant roles of collective attributes in collective preventive health behaviors and reveal the mechanism for the motivations. This study is among the first identifying and investigating collective preventive health behavior, and it enables us to make important conceptual contributions and provide a new direction for future research.

Second, we develop a collective protection motivation model by considering collectivity-related threat appraisal and coping appraisal. PMT has mostly been conceptualized in self-protective contexts, where threat and coping appraisals are all designed as self-related, and existing studies have not considered the collective (Rogers, 1975; Rogers & Prentice-Dunn, 1997). This study extends PMT by identifying collective cognition. By validating the PMT

constructs across two dimensions (i.e., self and collective), we extend the generalizability of PMT beyond the self-protective contexts explored in previous studies (Wang et al., 2019). The results in this study demonstrate it is necessary to expand and improve PMT in diverse contexts.

Third, this study distinguishes the relative effects of self- and collective cognition as motivators in a collective preventive health behavior context. This study thus resonates with suggestions in prior research that self-cognition and collective cognition may work differently (Trafimow et al., 1991; Turner et al., 1994). Although it is true that self-cognitive motivations lead to health behaviors (Floyd et al., 2000), our study identifies these collective cognitive motivations playing more critical roles in collective health contexts. This study advances research by revealing how collective cognition differs from self-cognition in leading to health behaviors with collective attributes.

Finally, this study highlights the important roles of emotions (i.e., regret) in protective behavior and validates the mediating role of emotion between cognitive appraisals and protective behaviors. Previous studies revealed the significant effect of anticipated regret on health behavior (Brewer et al., 2016), but there has been no such exploration of the mediating effect between PMT cognitive appraisals and health behaviors. Compared with studies that have only addressed anticipated regret separately as a determinant (Chapman & Coups, 2006), this study integrates PMT and anticipated regret into a cognitive-affective-conation framework by carrying out in-depth interviews and questionnaires. Our observation of the mediating effect of anticipated regret is a significant contribution to both PMT and health behavior literatures.

3.4.3 Practical Implications

First, it adds value to the existing knowledge on how to motivate the public to learn first

aid knowledge through social media. Since social media is an inclusive platform to disseminate knowledge and information, individuals' learning behaviors will obviously help them enhance first aid skills, which are not very prevalent among the public. The government and practitioners should recognize the importance of increasing the prevalence of first aid knowledge and make efforts to encourage public engagement. Based a PMT perspective, results in this study advise that individuals' protection motivations determine their willingness to learn first aid knowledge. It indicates that practitioners need to take specific action to stimulate public's motivations especially improve their threat and coping appraisal to first aid.

Second, when specific PMT appraisal measures are taken, our findings suggest that practitioners are encouraged to keep an eye on collective appraisal cognition to increase the public's first aid knowledge learning willingness. In particular, we suggest that practitioners stress the severity of emergency and response efficacy of first aid in terms of the collective rather than the self. Specifically, they can advocate that emergency seriously threats to the safety and health of the collective and learning first aid knowledge can effectively help them. Notably, we find that collective-related efficacy will decrease individuals' learning willingness. Thus, practitioners may benefit from persuading individuals that the collective efficacy related to learning first aid knowledge is low while their self-efficacy is high, which would motivate their engagement.

Third, practitioners should consider individuals' emotional cognition (e.g., anticipated regret) when motivating them to learn first aid knowledge. Anticipated regret is verified as a strong motivation of individuals' learning willingness, and this finding also illuminates possibilities for first aid knowledge popularization. In planning publicity, we would advise

practitioners to tap into individuals' negative emotions to arouse their anticipated regret about not learning. This affective motivation can work in tandem with cognitive motivation to increase the first aid knowledge learning willingness among the public.

3.5 Summary of Study 1

Combining qualitative and quantitative methods, this study conceptualized a collective preventive health behavior (i.e., first aid knowledge learning on social media) and explored motivations for the behavior. Through qualitative interviews, we confirmed the applicability of PMT, distinguished its collective attributes, and identified anticipated regret in the research context. Drawing on the CAC framework, we built our research model which was empirically examined using field survey data. We found that most collective-related appraisals show stronger effects than self-related appraisals. In addition, we observed that self-efficacy and collective efficacy play contrary roles where self-efficacy increased anticipated regret and collective efficacy decreased it. We also identified the mediating effect of anticipated regret. These findings theoretically contribute to academic studies and guide practitioners to develop strategies that will encourage individuals to actively learn first aid knowledge through social media.

Chapter 4 Exploring First Aid Knowledge Acquisition on Social Media

4.1 Introduction of Study 2

As the present day, people are increasingly relying on social media to acquire information and knowledge (Liang et al., 2011). In particular, traditional health knowledge learning in classes gradually shifts to learning on social media (Xu et al., 2016; Zhou et al., 2018). Without temporal and physical constraints, social media provides great convenience for both knowledge communicators and knowledge learners. On the one hand, knowledge educators such as doctors and health organizations can post health knowledge available to all social media users. On the other hand, individuals are allowed to access health knowledge at any fragmentation time. Beyond that, social media has increasingly attracted more users. The report indicated that over 70% of people in China choose social media to obtain and learn information instead of traditional media. In this sense, social media represents great opportunities for individuals to acquire health knowledge (e.g., first aid knowledge).

Although the prevalence of health information and knowledge on social media has increasingly drawn academic interest, most of research paid attention to investigating how health knowledge is diffused on social media (Ahmed et al., 2019; Ghalavand et al., 2021). Few studies have examined an individual's acquisition behavior. Moreover, when investigating health knowledge processing and behavior on social media, studies paid more attention to individual beliefs (e.g., trust and health belief) (Jin et al., 2021) and knowledge content characteristics (e.g., content quality and source credibility) (Shang et al., 2020). Nonetheless, few previous studies examined the role of technological cues, such as interactivity of social

media, in knowledge acquisition. Motivated by these research gaps, this study attempts to explore impacts of interactivity on individuals' knowledge acquisition behavior on social media.

Interactivity is the most prominent feature distinguishing social media from traditional communication mediums (Li et al., 2021). It was extensively examined in studies on social media and was empirically confirmed to play vital roles in stimulating individual behaviors (Lin & Chang, 2018; Sreejesh et al., 2020). Prior research has divided interactivity as several different subdimensions — human-information interaction, human-system interaction, and human-human interaction (Liu & Shrum, 2002). Since three subdimensions emphasize distinct aspects of interactivity, a multi-dimensional perspective is beneficial in revealing the influence mechanism of interactivity. However, the specific role of each subdimensions of interactivity has not been explored in a social media knowledge acquisition context. Moreover, prior research indicated that interactivity influenced individual behavior through stimulating individual experiences such as involvement and telepresence (Shen et al., 2019; Zhao et al., 2020). Nonetheless, the role of involvement and telepresence in this research context and the impact of each subdimension of interactivity on these individual experiences are still unknown.

According to the above discussion, we propose research questions as follows:

(1) Does social media interactivity (including interactions of different dimensions) affect first aid knowledge acquisition?

(2) How does individual experience (i.e., involvement and telepresence) on social media affect individual first aid knowledge acquisition?

(3) How does the interaction of different dimensions stimulate the individual's involvement and telepresence?

Drawing upon the stimulus-organism-response (S-O-R) framework, we delineate the relationship roadmap of multiple interactions, involvement, telepresence, and knowledge acquisition, bearing several implications for both theory and practice. First, this study advances literatures on information systems and literatures on interactivity through examining social media knowledge acquisition behavior from the point of multidimensional interactivity. It significantly contributes to literature since previous research omitted individual active first aid knowledge acquisition on social media and failed in distinguishing the effects of different subdimensions (Li et al., 2021; Lin & Chang, 2018). Second, we verified the valuable roles of involvement and telepresence in driving knowledge acquisition. Through integrating and comparing the impacts of both involvement and telepresence, this study demonstrates that involvement and telepresence motivate individuals to acquire health knowledge in different manners. Third, by examining and comparing the effects of three interactivity subdimensions, this study revealed how three subdimensions of interactivity stimulate individual experience and further increase knowledge acquisition behavior. From that place, the current work complements prior research by expounding the underlying influence mechanism of interactivity. Meanwhile, this study offers practical suggestions for educators and social media administrators on motivating individuals to learn first aid knowledge through social media.

4.2 Research Model

This study mainly focuses on how social media interactivity affects individual experience when individuals use social media to learn first aid knowledge, and further focuses on how individual experience affects their first aid knowledge acquisition behavior. This chapter will further elaborate on individual experience (i.e., involvement and telepresence), and analyze the

theoretical relationship between different dimensions of interactivity and individual experience, as well as between individual experience and first aid knowledge acquisition.

4.2.1 Social Media Interactivity

Interactivity is a fundamental affordance distinguishing digital communication medium (e.g., social media) from traditional media. Although interactivity has drawn great attention from scholars, there is still no consensus about its definition (McMillan, 2005). For example, Steuer (1992) identified that interactivity refers to individuals' modification to information on media environment in terms of forms and content. Liu and Shrum (2002) indicated that interactivity is the interacting among two or more communication parties. In previous literature, interactivity has been variously identified as a technology feature, an information change process, or user's perception (Lowry et al., 2009; McMillan & Hwang, 2002). Different definitions can be categorized by whether researchers focused on features, process, or perception. Scholars who focus on features usually identify technology characteristics (e.g., hyperlinks, two-way communication) as interactivity (Jiang et al., 2010; McMillan & Hwang, 2002). Concerning on the process, scholars focused on characteristics of information change activities such as responsiveness and synchronicity (Liu et al., 2021). Previous research indicated that scholars should pay more attention on how users perceive or experience interactivity instead of counting features or analyzing processes (McMillan & Hwang, 2002). Thus, in this study, we focus on user perception perspective whereby interactivity focuses on users' perceptions and sense (Thorson & Rodgers, 2006).

Researchers have classified interactivity into three dimensions: human-information (message/content) interaction, human-system (technology/machine) interaction, and human-

human interaction (Li et al., 2021; Liu & Shrum, 2002; McMillan, 2005). Human-information interaction emphasizes users' beliefs that they are able to effectively search, acquire, and select control and modify information while human-system interaction describes how users believe they can smoothly interact with the digital platform. On the other hand, human-human interaction refers that users can easily communicate and change opinions with other users via the digital platform. Specific to our study, social media serves as a media platform enabling individuals to search, browse, and select knowledge and communicate with others when using social media. Since three dimensions of interactivity are key social media characteristics stimulating user's behavior, we investigate effects of these three interactions to better understand first aid knowledge acquisition on social media.

The effect of interactivity has been identified in various contexts, including web advertising, technology adoption, and education. Distinguishing from traditional media, social media is equipped with more interactive functions and offers a vital research opportunity for scholars to examine the impact of interactivity on user behavior. Table 4-1 summarizes some recent studies on social media interactivity and user behavior.

The Table 4-1 shows that studies on social media interactivity involve various user behaviors but absent in social media knowledge acquisition behavior. Examining the role of interactivity in knowledge acquisition on social media not only bridges the research gap but also enriches our understanding on the influence mechanism of interactivity in various contexts. Moreover, existing social media interactivity research has not fully took interactivity with a dimensionality view. The construction of interactivity is still mixed, whereby most studies treat interactivity as unidimensional or measure interactivity primarily from the process perspective

(e.g., responsiveness, control, and synchronicity). Although Lin and Chang (2018) and Li et al. (2021) categorized interactivity into human-information interaction and human-human interaction and examined their effects respectively, a complete comprehensive picture involving three dimensions is missing. Examining the specific effect and difference of each dimension of interactivity enables us a deep understanding of the underlying mechanism. Thus, this study investigates effects of three dimensions of interactivity and detects the difference among the effects to profoundly reveal how three interactions play roles in first aid knowledge acquisition behavior through social media.

Table 4-1 Studies on social media interactivity and user behavior

Study	Dimensions/components of interactivity	Effect difference detecting	Outcomes
(Wang et al., 2020)	perceived control, perceived responsiveness, and perceived communication	No	Brand community relationships
(Sreejesh et al., 2020)	Interactivity	—	consumer response to the advertisement
(Kang et al., 2021)	Responsiveness, personalization	No	Customer engagement
(Lin & Chang, 2018)	Human-to-information interaction, human-to-human interaction	No	Information exchange
(Liu et al., 2021)	Synchronicity, dialogism, richness, mobility	No	Job performance
(Kim & Lee, 2019)	Perceived interactivity	—	Purchase intention
(Huang et al., 2018)	Social influence, responsiveness, media richness	No	Brand loyalty
(Li et al., 2021)	Human-to-text interaction, human-to-human interaction	No	Satisfaction
(Zhong et al., 2021)	Perceived interactivity	—	Brand loyalty
(Huang et al., 2021)	human-computer interaction, computer-mediated communication, perceived interactivity	No	Attitude
(Bozkurt et al., 2020)	Perceived social media interactivity	—	Consumer behavior

4.2.2 Involvement

The definition of involvement is “a subjective psychological state reflecting the

importance and personal relevance of an object or event" (Barki & Hartwick, 1994). It refers to individuals' beliefs or perceptions on the extent to which they think that an object or even is both important and relevant based on their internal demand , attitudes, and benefits (Zaichkowsky, 1985). Thus, involvement is related to cognitive states.

The concept of involvement has been examined in numerous contexts and has been identified to play important roles in determining behavioral intention (Algharabat et al., 2018; Hess et al., 2005). For instance, McClure and Seock (2020) conceptualized brand involvement of consumers and found that high brand involvement led to positive attitude towards the brand, and further influenced individual's intention to purchase in the future. Shen et al. (2019) identified community involvement and examined its significant impact on user's engagement in social commerce community. Lim et al. (2013) verified that user's social media involvement significantly improved social media satisfaction and usage intention. In this study context, we define involvement as user's beliefs about the importance and relevance of learning first aid knowledge and examine what a role involvement plays in determining knowledge acquisition.

Research has identified three kinds of antecedents of involvement, including person factors, situation factors, and stimulus factors (Zaichkowsky, 1985). Interactivity, works as a stimulus factor, has attracted increasing attention from scholars. However, some controversial findings of the relationship between interactivity and involvement were reported in previous studies. Some scholars suggested that interactivity shows direct positive impact on involvement (Kang et al., 2015) while some others pointed out that no direct relationship exists between interactivity and involvement (Fortin & Dholakia, 2005). This may be due to the fact that there are multiple aspects of interactivity, and each aspect shows distinct effects on involvement

(Jiang et al., 2010). Inspired by these observations, this study specifically investigates impacts of three dimensions of interactivity on involvement. Considering that few previous studies have investigated effects of three-dimensional interactivity on involvement, our study fills the gaps and take a novel perspective to detect the relationship between interactivity and involvement.

4.2.3 Telepresence

Telepresence is defined as "the experience or feelings of being present in a communication medium environment rather than in one's own physical environment" (Steuer, 1992). It is a subjective feeling of "being there", whereby individuals perceived mediated experiences as real. In particular, telepresence describes a psychological state or sense and reflects individual's feeling of presence in medium environments (Mollen & Wilson, 2010). Specific to this study context, telepresence is regarded as the psychological sense of being in the first aid environment described as social media.

Previous studies have identified various antecedents of telepresence. Particularly, interactivity was widely proved to play vital roles in inducing telepresence (Animesh et al., 2011; Lim & Ayyagari, 2018; Zhao et al., 2020). However, these studies treat interactivity as unidimensional and fail to distinct the impact of different dimensions of interactivity on telepresence. Considering that interactivity involves three dimensions which stress disparate interaction feature and process (Liu & Shrum, 2002), different interaction may show different impact on telepresence. Investigating the relationship between interactivity and telepresence from a multidimensional angle will help to reveal how the relationship established and developed. Thus, to complement current studies and provide a new theoretical perspective to understand interactivity and telepresence, this study reexamines the influence of interactivity

on telepresence through a three-dimensional interaction framework, in which the impacts of three dimensions of interactivity on telepresence are explored respectively.

Previous studies illustrated that telepresence is associated with various behaviors and outcomes in computer-mediated environment such as virtual products purchase (Animesh et al., 2011), online shopping experience (Lim & Ayyagari, 2018), brand engagement (Algharabat et al., 2018), and advertising effectiveness (Wang & Yao, 2020). Particularly, the role of telepresence in online learning context also has been examined. For instance, Baabdullah et al. (2022) advocated that telepresence can substantially increase student learning experience with augmented reality learning applications. Also, Rodríguez-Ardura and Meseguer-Artola (2016) empirically examined effects of telepresence on students' attitude and intentions to continue using E-learning. Investigating factors influencing MOOC usage, Zhao et al. (2020) stated that telepresence significantly facilitated students' continuance intention. Although these studies aim to declare how telepresence plays roles in online learning environment, they mainly paid attention to the classroom learning behavior and examine the impact of telepresence on learning tool (which brings telepresence) usage behavior. Here, we concern on the unformal learning behavior, social media first aid knowledge learning, and examine impacts of telepresence on knowledge acquisition.

On account of above theoretical basis, we propose a theoretical model as shown in Figure 4-1. Several hypotheses are proposed and tested to understand relationships between constructs.

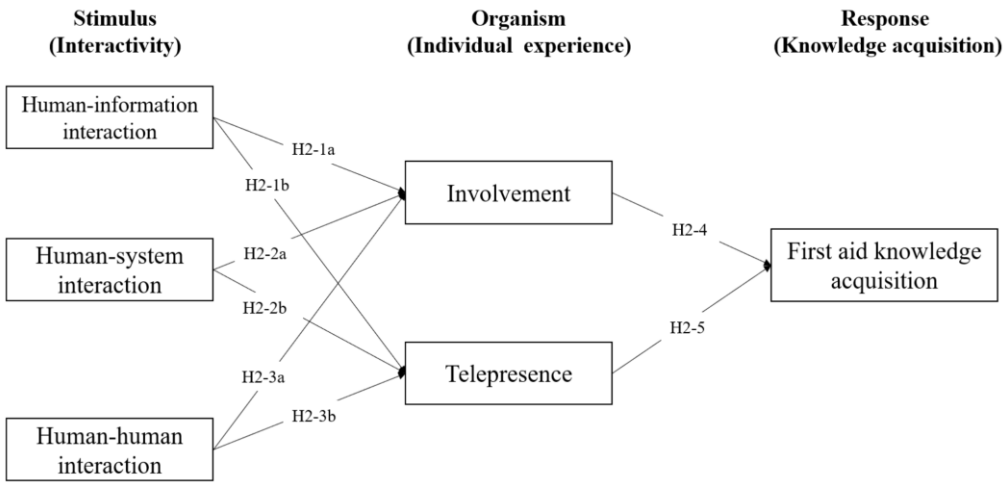

Figure 4-1 Research model of Study 2

4.3 Hypotheses Development

4.3.1 Human-information Interaction and Individual Experience

Human-information interaction indicates the interaction between individuals and information. Individuals process and interact with information, including information search, selection, and edition (Wei et al., 2015). High human-information interaction increases information processing efficacy, whereby individuals perform better in searching and selecting appropriate information. On social media, human-information interaction indicates that individuals can use social media to interact with information (Lin & Chang, 2018).

Since information presented on social media is not always appropriate and relevant for the need of every single individual, human-information interaction provides individuals more opportunities to access the information or knowledge meeting their own intrinsic needs (Ko et al., 2005). Besides, for single individual, the information or knowledge need may be dynamic across time (Ariely, 2000). They can change their search strategies through human-information interaction to meet the changing needs. Thus, human-information interaction facilitates the information available on social media to fit individual's heterogeneous and dynamic

information needs. Since human-information interaction enables individuals have more ability to find and acquire customized information and knowledge, individuals tend to be absorbed in information processing (Jiang et al., 2010). This further facilitates individuals to believe the first aid knowledge they find on social media is important and personal relevant to them. Thus, high human-information interaction may lead to individual's high involvement. Thus, we propose:

H2-1a: Human-information interaction is positively related to involvement.

In addition, human-information interaction is supposed to enhance individual's feeling of telepresence. As described in prior research, human-information interaction determines the efficacy of information/knowledge search and acquirement (Song et al., 2021), which may influence individual's learning experience on social media. When individuals have a good learning experience, they are prone to experience the flow, where individuals enjoy and become lost in the activity (Csikszentmihalyi, 2014; Zhao et al., 2020). Subsequently, individuals tend to feel like that they exist in the activity environment and the sense of telepresence is triggered. Specific to this study, human-information interaction enables individuals to effectively find and browse first aid knowledge relevant to them and that they need, they are prone to immersed in the first aid environment. In other words, higher human-information interaction promotes individual's first aid knowledge learning experience, leading to higher sense of presence in the first aid. Based on this, we propose that:

H2-1b: Human-information interaction is positively related to telepresence.

4.3.2 Human-system Interaction and Individual Experience

Also named as human-to-machine or human-to-computer interaction, human-system

interaction is the focus of early definition of interactivity and refers to the interaction between individuals and systems (Liu & Shrum, 2002). Human-system interaction emphasizes that an interactive system must be responsive to user's action, providing speedy and synchronous responses (McMillan & Hwang, 2002). Studies investigating interactivity as unidimensional mainly focus on the human-system interaction.

Human-system interaction allows individuals to enjoy a fluid browsing experience with no waiting when using social media because of the real-time responsiveness feature. A good experience enables individuals likely to be involved in the activity. In this case, human-system interaction is likely to promote individual's involvement. Specific to this study, human-system interaction is beneficial in facilitating individuals to be involved in first aid knowledge learning for two reasons. On the one hand, human-system interaction increases individual's perception that social media is an useful and efficient platform for learning first aid knowledge, which further accelerates individuals to involve in learning (Shao & Chen, 2020). On the other hand, because of the speedy and synchronous responsiveness of human-system interaction, individuals are less likely to be disturbed by external factors such as lag and long waiting time. This helps individuals involving in first aid knowledge learning quickly. Thus, we put forward that:

H2-2a: Human-system interaction is positively related to involvement.

The interaction between human and system may enable people to feel presence in the virtual world that the social media describes. Studies about interactivity has indicated that the real-time and efficient system feedback can cause individuals to incorporate technology as an expansion of themselves (IJsselsteijn, 2005). The more interaction with the technology, the

more rooted individuals will be in the virtual environment. Thus, the human-system interaction will distort individual's sense of reality and create feelings of telepresence (Animesh et al., 2011). Prior studies have proved interaction with system/technology significantly influences telepresence in diverse contexts including e-commerce and online education (Beuckels & Hudders, 2016; Zhao et al., 2020). In the social media context, where people seek and learn first aid knowledge, the speedy response facilitates brains to adapt the social media environment and feel themselves as part of the first aid atmosphere. Thus, we believe that a high-level human-system interaction will facilitate individuals perceive high-level telepresence. Based on this, we put forward that:

H2-2b: Human-system interaction is positively related to telepresence.

4.3.3 Human-human Interaction and Individual Experience

Human-human interaction is defined as "the two-way and reciprocal communication from information senders to receivers and vice versa" (Ko et al., 2005). Compared to traditional mass media, which only allows one-way information flow from sender to receiver, human-human interaction is a prominent character of social media. The interaction allows individuals through social media to communicate with others, send message, and receive feedback (Wei et al., 2015). Here, human-human interaction represents a two-way, reciprocal communication among individuals in first aid knowledge learning activity in social media environment.

Human-human interaction serves as the structural affordance of social media, providing individuals with communication opportunities. Previous studies have empirically verified that two-way and reciprocal communication between individuals significantly increases individual's involvement (Jiang et al., 2010; Shao & Chen, 2020). According to the

communication theory, individuals are interested in interacting with others to seek and exchange information about related events (West et al., 2010). Research indicated that the information conveyance through interaction allows individuals perform better in decision making (Dennis et al., 2008). Specifically, when individuals communicate first aid knowledge with others on social media, they pay cognitive effort to formulate their questions related to first aid knowledge and understand the information from others. In this case, the interaction with others accelerates individuals to elaborate first aid knowledge and further better evaluate whether the knowledge is important and relevant to themselves. Thus, it is likely that human-human interaction will stimulate individual's involvement. Based on this, we propose that:

H2-3a: Human-human interaction is positively related to involvement.

Previous research demonstrated that social media reciprocal communication facilitates individuals to exchange information and further enables them to experience connection and receptivity with others (Jiang et al., 2010). In other words, human-human interaction is likely to empower individuals a sense of being part of community through allowing them to connect with and change opinions with others in the community (Lu et al., 2010). For individuals who learn first aid knowledge on social media, all the participants form a virtual first aid knowledge learning community. Since individuals can discuss with other participants and receive feedback in real time, they may form a sense of belonging to and a strong feeling of presence in the virtual community. In this case, individuals are likely to sense that they are being in the concrete first aid environment suggested by the community and not in their physical surroundings (Rodríguez-Ardura & Meseguer-Artola, 2016). Thus, we propose that human-human interaction will accelerate individual's feeling of telepresence in first aid environment. Hence,

we put forward that:

H2-3b: Human-human interaction is positively related to telepresence.

4.3.4 Individual Experience and First Aid Knowledge Acquisition

As discussed above, involvement indicates individuals' perception on the importance and relevance of an event or something according to their intrinsic demands (Barki & Hartwick, 1994). The positive impacts of involvement on behavior intention have been empirically identified in various contexts. For example, Jiang et al. (2010) claimed that consumers who are involved in online stores have high-level intention to purchase. Shen et al. (2019) also demonstrated that individuals with high involvement present more tendency to engage in online communities. In this study, involvement as a psychological state represents individual's belief that it is important and relevant to themselves to study first aid knowledge through social media. With the observation from previous studies, we propose that individual's involvement will enable them to acquire first aid knowledge from social media. This can be understood from the perspective of need satisfaction, whereby involvement helps identifying individual's needs while acquiring first aid knowledge is compatible with their needs, which will motivate individuals to take corresponding behaviors to satisfy the needs (Salancik & Pfeffer, 1977). As such, high-level involvement may lead to corresponding responses such as first aid knowledge acquisition. Based on this, we put forward that:

H2-4: Involvement is positively related to first aid knowledge acquisition.

The relationship between telepresence and individual behavior response has been well established. For instance, Animesh et al. (2011) proved that when consumers experience telepresence, they stand a chance to purchase products in virtual world. Similarly, Pelet et al.

(2017) indicated that telepresence in social media is associated to frequency of social media use. Instead of feeling separated from the virtual environment, individuals who experience telepresence are more likely to get immersed, which accelerates them to engage in online actions (Animesh et al., 2011). Specifically in the first aid knowledge acquisition context, telepresence may play a more essential role in motivating individual's acquisition behavior. That is because individuals with low willingness to learn first aid knowledge usually believe that first aid is in low probability and is distinct from their daily lives. A sense of telepresence allows individuals feel they are present in a first aid environment and close to emergency events. Consequently, individuals are more likely to acquire first aid knowledge through social media. Therefore, we advise that:

H2-5: Telepresence is positively related to first aid knowledge acquisition.

4.4 Methodology

4.4.1 Research Setting

Sina Weibo (called simply "Weibo"), was chosen as the research context of this study. Launched by Sina Corporation in August 2009, Weibo is one of the biggest and most popular social media platforms in China. Weibo was chosen as the research environment based on the following considerations. (1) Weibo has a huge user group, which provides a good data guarantee for this research. As of the fourth quarter of 2022, there are more than 500 million users behave actively each month and 252 million users behave actively each day, making Weibo a veritable popular social media. (2) The Weibo platform and its dissemination attributes are in line with the background of this study. Weibo is a social media platform built on the basis of users sharing, disseminating and receiving information. Unlike WeChat and Facebook which

focus on user relationship networks and social communication, Weibo focuses on the dissemination and disclosure of content. Its content is open to all users and is widely covered. (3) Weibo has become the main channel for spreading and obtaining information. In particular, many doctors and official health institutions in China register Weibo accounts, including the World Health Organization, the Chinese Ministry of Health, etc., to publish and disseminate health-related information on Weibo, allowing all users to learn, discuss, and share.

The above discussion identifies the potential of Weibo in popularizing first aid knowledge and other health knowledge and confirms it a suitable platform for this study.

4.4.2 Data Collection

Users who have experience in acquiring first aid knowledge on Weibo are considered as potential objects of this study, including searching and discovering, browsing first aid knowledge, and discussing first aid knowledge with other participants. We established an online survey and sent an electronic questionnaire link and invitation information to those who have registered on Weibo and followed at least one first aid knowledge popularization account. Users can directly participate by clicking the link. In addition, to further ensure that participants are the target sample, a screening question "Do you have experience in acquiring first aid knowledge through social media?" was set at the beginning of the questionnaire. If the respondent answers "No", the participation will automatically end. To encourage user participation, each participant who completes the questionnaire has a chance to randomly draw a small cash reward.

Table 4-2 Demographic information in study 2

Variables	Category	Frequency	Percentage (%)
Gender	Male	161	42.9
	Female	214	57.1
Age	<18	2	0.5
	18-25	68	18.1
	26-30	135	36.0
	31-40	135	36.0
	41-50	23	6.1
	51-60	11	2.9
	>61	1	0.3
Education	Less than college degree	15	4.0
	College	64	17.1
	Undergraduate	239	63.7
	Postgraduate or higher	57	15.2
Experience	Less than 1 month	24	6.4
	1-3 months	30	8.0
	3-6 months	45	12.0
	0.5-1 year	74	19.7
	1-2 years	97	25.9
	2-3 years	70	18.7
	More than 3 years	35	9.3

Before answering the questionnaire questions, the respondents need to recall their experience of acquiring first aid knowledge on Weibo, and then answer the questions according to their actual experience. The survey time is from September to October 2021, and we collected 464 complete questionnaires totally. To ensure the validity of the questionnaire, we adopted strict criteria to screen the questionnaire. First of all, in order to prevent the respondents from filling in at will, all the questionnaires with more than 75% agreeing options were excluded. Second, questionnaires with less than 2 minutes response time were excluded. After the above screening, 375 valid questionnaires were finally obtained for data analysis. To test non-response bias, the top 100 and last 100 respondents were compared to see whether there

were significant differences in statistical indicators such as gender, age, education level, etc. The results indicated that no significant difference exists between these two groups in terms of demographic information indicators, indicating that the study would not be affected by non-response bias. The 375 respondents included 161 men and 214 women. Among them, more than half of them are between 26 and 40 years old, and most of them have college degrees. Demographic statistics of the respondents are described in Table 4-2.

4.4.3 Measurement

We adapted and modified measurements from previous studies to fit this research context. Specifically, both human-information interaction (HII) and human-human interaction (HHI) were surveyed using items adapted from Lin and Chang (2018). Human-system interaction (HIS) was surveyed with items adapted from Rodríguez-Ardura and Meseguer-Artola (2016). Moreover, involvement (INV) was measured using items adapted from Tseng and Wang (2016) and telepresence (TEP) was measured with items adapted from Zhao et al. (2020). Finally, the knowledge acquisition (KAC) was measured with the single item adapted from Basic and Erdelez (2015). Because all respondents are Chinese, we translated all these items from English to Chinese with a back-translation approach. Based on results of pilot test, we revised some wordings to improve the overall clarity. All items were measured with Seven-point Likert scales ranging from “1” to “7” (1=strongly disagree, 7=strongly agree). The constructs and measures were listed in Appendix C.

4.5 Data Analysis and Results

4.5.1 Common Method Bias

We adopted two widely accepted methods to test the common method bias. First, we

conducted the Harman's single-factor test (Podsakoff, 2003). The results showed that no single component accounting for most of the variance, reducing the concerns about common method bias. Second, according to the approach introduced by Liang et al. (2007), we added a common method factor in the research model. Results in Table 4-3 suggested that the average substantively explained variance of the indicator is 0.737 while the average common method-based variance is 0.006. The ratio of substantive variance to method variance is about 123:1, indicating common method bias is unlikely to be a threat in this study.

Table 4-3 Examination on common method bias in study 2

Construct	Indictor	Substantive factor loading (R1)	$R1^2$	Method factor loading (R2)	$R2^2$
HII	HII1	0.875	0.766	0.098	0.003
	HII2	0.865	0.748	0.042	0.000
	HII3	0.919	0.844	-0.135**	0.014
HSI	HSI1	0.830	0.689	-0.102	0.003
	HSI2	0.844	0.712	-0.116	0.004
	HSI3	0.789	0.623	0.228**	0.016
HHI	HHI1	0.931	0.866	0.102	0.003
	HHI2	0.936	0.877	-0.09	0.002
	HHI3	0.926	0.858	-0.012	0.000
INV	INV1	0.818	0.669	-0.002	0.000
	INV2	0.805	0.649	0.062	0.002
	INV3	0.846	0.716	-0.09	0.004
	INV4	0.800	0.640	0.034	0.001
TEP	TEP1	0.876	0.768	-0.179**	0.023
	TEP2	0.800	0.641	0.203**	0.030
	TEP3	0.872	0.761	0.130*	0.000
KAC	KAC	0.875	0.766	-0.088	0.005
Average			**0.737**		**0.006**

Note：*p<0.05, **p<0.005, ***p<0.001

4.5.2 Measurement Model

The structural equation modeling (SEM) technique was employed to validate the research

model. Particularly, partial least squares (PLS) approach was used to analyze data since it is very suitable in predictive and exploration research. Moreover, PLS has no restriction on data distribution and sample size (Hair et al., 2011). Following two-step procedures, we examined measurement model and structural model respectively.

The measurement model was evaluated by examining the reliability, convergent validity, and discriminant validity of all constructs. The reliability can be assessed by calculating the composite reliability and Cronbach's α. Table 4-4 showed that the composite reliability and Cronbach's α for each construct were greater than the suggested threshold values of 0.7 (Fornell & Bookstein, 1982), suggesting all constructs were with appropriate reliabilities. We calculated the values of average variance extracted (AVE) and item loading to assess the convergent validity. The Table 4-4 shows the AVE values ranged from 0.669 to 0.867, greatly exceeding the recommended threshold value of 0.5. The Table 4-5 shows item loadings, ranging from 0.799 to 0.935, are above the threshold value of 0.7. This strongly suggested that all constructs had adequate convergent validities (Fornell & Bookstein, 1982).

Table 4-4 Measurement model statistics and correlation coefficient matrix in study 2

	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)	HHI	HII	HSI	INV	TEP
HHI	0.923	0.951	0.867	**0.931**				
HII	0.863	0.917	0.786	0.676	**0.886**			
HSI	0.758	0.861	0.674	0.669	0.653	**0.821**		
INV	0.835	0.89	0.669	0.433	0.57	0.508	**0.818**	
TEP	0.807	0.882	0.713	0.515	0.374	0.435	0.154	**0.845**

Note: The value in bold on the diagonal is the square root extracted from the mean variance of the corresponding variable.

Table 4-5 Loadings and cross-loadings in study 2

	HHI	HII	HSI	INV	TEP
HHI1	**0.935**	0.612	0.668	0.441	0.497
HHI3	**0.933**	0.624	0.602	0.377	0.452
HHI4	**0.926**	0.652	0.595	0.388	0.486
HII2	0.637	**0.883**	0.554	0.486	0.427
HII3	0.589	**0.862**	0.617	0.5	0.307
HII4	0.566	**0.913**	0.567	0.53	0.25
HSI1	0.561	0.499	**0.813**	0.368	0.338
HSI2	0.469	0.518	**0.847**	0.435	0.383
HSI4	0.622	0.589	**0.802**	0.442	0.349
INV1	0.365	0.416	0.423	**0.818**	0.117
INV2	0.371	0.472	0.426	**0.811**	0.188
INV3	0.297	0.454	0.402	**0.842**	0.068
INV4	0.384	0.522	0.409	**0.799**	0.127
TEP1	0.309	0.16	0.235	0.034	**0.827**
TEP2	0.541	0.422	0.458	0.192	**0.861**
TEP3	0.391	0.294	0.351	0.12	**0.845**

Note: The values in bold are item loadings of the corresponding variable.

Discriminant validity was assessed with two methods. First, we compared a given construct's square root of AVE with its correlation with other constructs. As shown in Table 4-4, the square roots of AVE were greater than the correlation coefficients. Second, we checked whether the item loadings on their intended constructs were greater than the loadings on other constructs (i.e., cross-loadings). As shown in Table 4-5, all item loadings were greater than their cross-loadings. Both these two aspects suggested good discriminant validities of all constructs (Bock et al., 2005). Further, to test the multicollinearity, we calculated the variance inflation factor (VIF) values of all constructs. The results indicated that all VIF values ranged between 1.024 and 2.208, lower than the suggested criteria threshold of 3.3 (Petter et al., 2007). Thus, multicollinearity was not a serious concern in this study.

To rule out the influence of multicollinearity on the study results, the study calculated

variance inflation factor (VIF) values for all constructs. Collinearity test by Smart PLS 3.0, the results show that all internal VIF values are between 1.024 and 2.208, below the standard threshold of 3.3; external VIF values are between 1.000 and 3.737, all below 10, all within the acceptable threshold within the range (Petter et al., 2007). Therefore, there was no problem of multicollinearity in this study.

4.5.3 Structural Model

Results of structural model were illustrated in Figure 4-2. The results indicated that human-information interaction significantly increases involvement (β=0.420, t=4.799, $p<0.001$) but shows no significant effect on telepresence (β=-0.015, t=0.203, p=0.839), suggesting that H2-1a was supported but H2-1b was not. Human-system interaction was proved to positively influence both involvement (β=0.241, t=2.996, $p<0.005$) and telepresence (β=0.171, t=2.248, $p<0.05$), supporting H2-2a and H2-2b. In addition, human-human interaction was found to show no significant impact on involvement (β=-0.012, t=0.173, p=0.862) but positively affect telepresence (β=0.411, t=5.227, $p<0.001$), leading no support to H2-3a but support to H2-3b. Finally, both involvement (β=0.572, t=12.307, $p<0.001$) and telepresence (β=0.251, t=6.034, $p<0.001$) exerted significant positive impact on first aid knowledge acquisition. Thus, H2-4 and H2-5 were supported. All control variables were insignificant. Overall, the model explained 44.0% of the variance in knowledge acquisition, whereby the variances explained in involvement and telepresence were 35.7% and 28%, respectively.

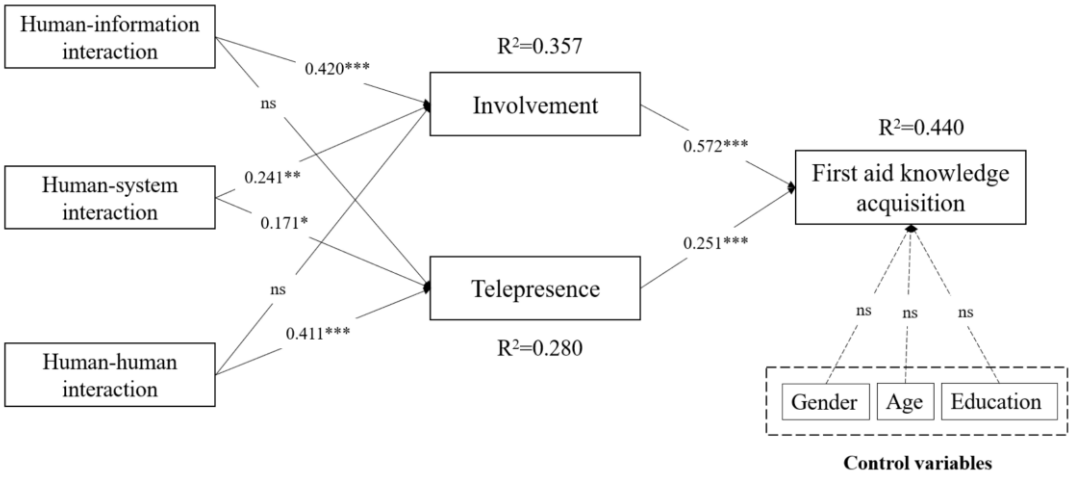

Figure 4-2 Structural model results of Study 2

4.5.4 Post-hoc Analysis

Since human-information interaction, human-system interaction, and human-human interaction emphasize distinct aspects of interactivity, a follow-up question is whether the three interactions exert disparate influences on individual experience (i.e., involvement and telepresence). More specifically, the distinction between three-dimensional interaction mechanisms may stimulate individuals experience organism in different manners. Furthermore, since involvement emphasizes the cognitive importance and relevance while telepresence emphasizes the sensory feeling of presence, they may show different mechanisms in the formation of knowledge acquisition. Hence, the distinction between effects of involvement and telepresence is also worth exploring. To address this issue, we compare the path coefficients to test the difference of the influence in statistics, to reveal the mechanism of three interactions, involvement, and telepresence.

First, we compared the relative effects of three interactions on involvement and telepresence, respectively. We employed the path comparison method proposed by Cohen et al. (2014) and widely applied in current studies (e.g. (Li et al., 2013)).The calculation formula is shown in formula (3-1). The results summarized in Table 4-6 show that significant differences

exist in path comparisons. Specifically, human-information interaction (t=74.23, p<0.001) and human-system interaction (t=45.75, p<0.001) have stronger impacts on involvement than human-human interaction while human-information interaction (t=28.64, p<0.001) also shows significant stronger impact than human-system interaction. On the contrary, the comparison results of impacts of three interactions on telepresence are diametrically opposite. Specifically, human-human interaction shows stronger impact than both human-system interaction (t=-41.88, p<0.001) and human-information interaction (t=-74.35, p<0.001), while human-system interaction shows stronger impact than human-information interaction (t=-33.09, p<0.001). The results indicate that three interactions play different roles in stimulating involvement and telepresence.

Table 4-6 Comparison of path coefficients of different interactions on one dependent variable

DV	Path coefficient	$\triangle\beta$	T values	Conclusion
INV	$\beta_{HII->INV}$ vs. $\beta_{HSI->INV}$ = 0.420*** vs. 0.241**	0.179	28.64	$\beta_{HII->INV} > \beta_{HSI->INV}$
	$\beta_{HII->INV}$ vs. $\beta_{HHI->INV}$ = 0.420*** vs. -0.012	0.432	74.23	$\beta_{HII->INV} > \beta_{HHI->TEP}$
	$\beta_{HSI->INV}$ vs. $\beta_{HHI->INV}$ = 0.241** vs. -0.012	0.253	45.75	$\beta_{HSI->INV} > \beta_{HHI->INV}$
TEP	$\beta_{HII->TEP}$ vs. $\beta_{HSI->TEP}$ = -0.015 vs. 0.171*	-0.186	-33.09	$\beta_{HII->TEP} < \beta_{HSI->TEP}$
	$\beta_{HII->TEP}$ vs. $\beta_{HHI->TEP}$ = -0.015 vs. 0.411***	-0.426	-74.35	$\beta_{HII->TEP} < \beta_{HHI->TEP}$
	$\beta_{HSI->TEP}$ vs. $\beta_{HHI->TEP}$ = 0.171* vs. 0.411***	-0.240	-41.88	$\beta_{HSI->TEP} < \beta_{HHI->TEP}$
KAC	$\beta_{INV->KAC}$ vs. $\beta_{TEP->KAC}$ = 0.572*** vs. 0.251***	0.321	98.46	$\beta_{INV->KAC} > \beta_{TEP->KAC}$

Note: *p<0.05, **p<0.01, ***p<0.001

Table 4-7 Comparison of path coefficients of one interaction on different dependent variables

	Path coefficient	T values	Conclusion
Human-information interaction	$\beta_{HII->INV}$ vs. $\beta_{HII->TEP}$ = 0.420*** vs. -0.015	3.438	$\beta_{HII->INV} > \beta_{HII->TEP}$
Human-system interaction	$\beta_{HSI->INV}$ vs. $\beta_{HSI->TEP}$ = 0.241** vs. 0.171*	-0.494	No significant difference
Human-human interaction	$\beta_{HHI->INV}$ vs. $\beta_{HHI->TEP}$ = -0.012 vs. 0.411***	-5.185	$\beta_{HHI->INV} < \beta_{HHI->TEP}$

Note: *p<0.05, **p<0.01, ***p<0.001.

Second, we compared whether there were differences in the impact of the same interaction on different individuals' experiences. According to the method mentioned in the research of Li et al. (2013), the regression analysis and comparison are carried out. The specific method is as follows: (1) As two dependent variables for comparison, involvement and telepresence are subtracted to generate a new dependent variable ; (2) The independent variable and the newly generated dependent variable form a new regression equation to obtain the path coefficient; (3) Check the significance of the path coefficient, if it is significant, it indicates that the independent variable has a significant impact on the two dependent variables (i.e., the degree of involvement and telepresence) are significantly different. Through the comparison of the above methods, the results are shown in Table 4-7. There are significant differences in the impact of human-information interaction on involvement and telepresence, and its impact on involvement is stronger than on telepresence ($t=3.438$, $p< 0.001$). There are also differences in the impact of human-human interaction on involvement and telepresence, specifically showing that the impact of human-human interaction on telepresence is stronger than that on involvement ($t=-5.185$, $p<0.001$). However, no significant difference appears between the effects of human-system interaction on involvement and on telepresence.

Third, we compared the effects of involvement and telepresence on knowledge acquisition. As shown in Table 4-6, involvement shows stronger impact on knowledge acquisition than telepresence ($t=98.46$, $p<0.001$).

Further, to reveal the mechanism of involvement and telepresence in the research model, we tested the mediating effect of them on the relationship between three interactions and knowledge acquisition. Followed the procedure proposed by Hayes (2012), we used PROCESS

to estimate. As shown in Table 4-8, involvement significantly partially mediates the effects of human-information interaction and human-system interaction on knowledge acquisition; telepresence significantly partially mediates the effects of human-system interaction and human-human interaction on knowledge acquisition.

Table 4-8 Mediation effect test in Study 2

Mediator	Path	Indirect effect			Direct effect			Results
		Size	LLCI	ULCI	Size	LLCI	ULCI	
Involvement	HII->INV->LI	0.184	0.1174	0.2706	0.357	0.2763	0.4312	Patrial
	HIS->INV->LI	0.189	0.1213	0.2637	0.393	0.3135	0.4717	Partial
Telepresence	HII->TEP->LI	0.038	0.0130	0.0689	0.499	0.4271	0.5721	Partial
	HIS->TEP->LI	0.036	0.0016	0.0748	0.545	0.4630	0.6279	Partial

4.6 Discussions

4.6.1 Key Findings

First, the findings demonstrate that the organisms, involvement and telepresence, explain 44% of the variance of knowledge acquisition, thus identifying the vital role of involvement and telepresence in facilitating first aid knowledge acquisition. Distinguishing from prior research which only focus on the single effect of involvement or telepresence on behavior intentions (Kim et al., 2021; Shen et al., 2019), the results indicate that both involvement and telepresence play significant roles. Particularly, involvement shows stronger impact in increasing knowledge acquisition than telepresence. The findings are in line with the underlying mechanism of elaboration likelihood model, in which individual behavior is determined by both central route (which emphasizes thoughtful cognitive consideration such as involvement) and peripheral route (which emphasizes unthoughtful sensory feeling such as

telepresence) (Petty & Briñol, 2011). In the circumstances of first aid knowledge learning, the central route (e.g., involvement) shows greater prediction on behavior than peripheral route (e.g., telepresence).

Second, the findings clarify how each dimension of interactivity affects involvement and telepresence, complementing prior research which treats interactivity as unidimensional (Animesh et al., 2011; Zhao et al., 2020). The findings illustrate that human-information interaction presents a significant influence on involvement but shows no significant impact on telepresence. One possible explanation may be that first aid knowledge learning is an activity requiring a lot of cognition, in which human-information interaction facilitates information processing with elaboration which further induces cognitive evaluation rather than sensory feelings. Results also show that the effects of human-system interaction, in line with prior interactivity research (Fortin & Dholakia, 2005), are significant on both involvement and telepresence. However, human-human interaction is proved to have significant influence on telepresence but not on involvement. This maybe because interpersonal interaction among first aid knowledge leaners can builds a first aid environment but may not provide sufficient useful first aid knowledge for individuals to elaborate.

Third, through comparing the path coefficients, the results suggest that three interactions stimulate individual experience and behavior with distinct effects. The findings indicate that human-information interaction shows strongest impact on involvement while human-human interaction plays the most essential role among three interactions in telepresence. The findings are consistent with results of prior research, which demonstrates human-information interaction and human-human interaction play different roles in determining individual

experience (Lin & Chang, 2018). This finding implies that human-information interaction is the most vital subdimension of interactivity in predicting involvement while human-human interaction plays the most essential role in driving telepresence. Although human-system interaction is significant in facilitating both involvement and telepresence, it shows relative less impacts.

4.6.2 Theoretical Implications

This study shows theoretical contributions in the following ways. First, drawing upon the S-O-R framework and defining the concept of interactivity from markets and media-mediated communication, this study expounds how social media interactivity stimulates individuals to acquire first aid knowledge. Although previous literatures have demonstrated the significant effect of interactivity in contexts of online retailing and social network (Chang, 2018; Wu, 2019), this study firstly examines the specific effect of different subdimensions of interactivity in a social media knowledge learning context. Specifically, the empirical results indicate three subdimensions of interactivity stimulate individual experience simultaneously but with different weights. This study not only echoes prior research which emphasizes interactivity as multidimensional (Liu & Shrum, 2002; Yang & Shen, 2018) but also enriches studies on interactivity by distinguishing the effects of three subdimensions in an emerging new behavior context. We believe this research can guide future research to examine interactivity from multidimensional perspective in various contexts.

Second, this study advances literature by cleaning up the role of involvement and telepresence as organism in first aid knowledge acquisition through social media. Despite previous research has examined the impacts of involvement and telepresence on behavior

separately (Shen et al., 2019; Zhao et al., 2020), gaps still remain in examining integrating effect and relative importance. This study contributes to behavior research by incorporating two individual experiences and explaining how they play different roles in leading to knowledge acquisition behavior. This study reveals the underlying influence mechanism of involvement and telepresence, whereby the process is in line with logic of ELM that involvement acts through central route showing stronger prediction than telepresence which acts through peripheral route (Shahab et al., 2021). On the one hand, this study produces rich insights into the critical roles of involvement and telepresence in driving behavior. On the other hand, specific to involvement and telepresence, this study also enhances current understanding on the effect of organism in S-O-R framework from the ELM perspective.

Third, this study reveals the mechanism that how different subdimension of interactivity stimulates individual experience and further motivates behavior response. Prior research on subdimensions of interactivity only focused on their direct effects on targets (Li et al., 2021; Lin & Chang, 2018) but rarely compared their relationship to identify how each subdimension differs in leading to individual experience and behavior. Through comparing the path coefficients, this study describes a clear-cut relationship roadmap of interactivity-individual experience-behavior. Specifically, human-information interaction increases knowledge acquisition mainly through stimulating involvement while human-human interaction mainly facilitates telepresence to increase knowledge acquisition. Human-system interaction plays roles through involvement and telepresence, both of which are equally effective. This study unfolds a concrete picture of the distinct influence routes of each subdimensions of interactivity on individual experience and behavior, thus providing a reference for future research.

4.6.3 Practical Implications

Findings of this study provide some useful guidance for practitioners, especially first aid knowledge popularizers and social media designers to motivate public to learn first aid knowledge on social media. First, acquiring first aid knowledge through social media is significantly predicted by involvement and telepresence. Therefore, stressing the importance and relevance of learning first aid knowledge and building an environment with presence feelings are essential for the success of motivating the public to learn. There are several ways for educators and practitioners to achieve personal relevance and feeling of presence. Specifically, results in this study suggest that involvement is mainly determined by human-information interaction. Thus, to improve individual' involvement, practitioners should strengthen the interaction between human and information such as personalizing first aid knowledge to individuals when they use social media browsing. Moreover, since telepresence is primarily determined by human-human interaction, measures that facilitating personal interaction can be taken to improve public's feeling of presence in first aid circumstances.

Second, this study underlines the antecedent role of technology interactivity in stimulating individual's involvement and telepresence in first aid knowledge acquisition on social media. Accordingly, managers and designers should realize the interactivity is imperative. They are suggested to foster three types of interactions by designing some interactive modules on social media. For example, to increase the human-information interaction, administrators are encouraged to provide the personalization recommendation to facilitate individuals finding relevant information efficiently. Moreover, human-system interaction is noteworthy as well because of the significant effects on both involvement and telepresence. In this regard, social

media designers are suggested to optimize the user interface and improve system response, which will smooth the interaction between individuals and social media. Moreover, educators and social media designers can take measures to foster human-human interaction. On one hand, first aid knowledge popularizers can introduce social news about first aid and set related questioners to encourage individuals to discuss and share their views. On the other hand, designers are suggested to build discuss communities on different topics, allowing individuals participate personal interaction based on topics that they are interested in.

4.7 Summary of Study 2

Drawing on the S-O-R framework, we explore how social media interactivity affects knowledge acquisition by affecting individual experience. First, according to the existing literature, this study identified two important experiences (namely, involvement and telepresence) of the public when learning first aid knowledge on social media. Secondly, the impacts of three dimensions of interactivity on the two kinds of individual experiences are explored separately. Through the comparative analysis of path coefficients, this study found the influence mechanism of the three-dimensional interaction on the two kinds of individual experience and the individual experience on knowledge acquisition. This study not only advances studies on knowledge acquisition and interactivity, but also provides theoretical and practical guidance for first aid knowledge popularization workers to promote the public's access to first aid knowledge through social media.

Chapter 5 Exploring First Aid Knowledge Adoption on Social Media

5.1 Introduction of Study 3

In recent decades, social media has grown as a primary source for individuals to communicate and acquire information, including health-related knowledge and information. For example, most of people get Covid-19 information and defensive knowledge from social media during the pandemic (Soroya et al., 2021). A recent survey from Pew Research Center in America shows that almost half of Americans say that they have been getting information about Covid-19 vaccines from social media (Liedke, 2021). Similarly in China, the research indicated that over 70% of people choose social media to get and learn information instead of traditional media[4]. The popular tendency of information communication on social media has drawn increasing attention from industries and academics. Particularly, the Chinese government proposes using social media to promote education and popularization in health knowledge to improve the health literacies of the public is necessary[5]. Online communities are encouraged to be built to disseminate health knowledge, especially first aid knowledge.

In China, the first aid knowledge penetration rate is much lower than that of western developed countries (Xinhuanet, 2019). One of the possible reasons is lacking effective channels to get qualified and professional first aid knowledge. Although the development of knowledge communication technologies can address this issue, first aid knowledge education cannot be effective unless individuals actively adopt and learn the knowledge on social media

[4] https://www.pishu.com.cn/skwx_ps/bookdetail?SiteID=14&ID=11637615
[5] http://www.gov.cn/xinwen/2019-07/15/content_5409694.htm

(Jin et al., 2021). Knowledge adoption indicates the knowledge learning internalization where individuals process and internalize the knowledge gained from external sources, which further promotes their knowledge reserve or help them utilize the provided knowledge to improve their skills and performance (Shen et al., 2016; Sussman & Siegal, 2003). Thus, improving the first aid knowledge penetration among the public relies heavily on individuals' adoption behavior. In this case, understanding the influencing factors for individuals' adoption of first aid knowledge from social media is critical to first aid popularization. It can help the government and organizations to speed up first aid education in China and further promote the public's knowledge level and health literacy.

Despite the practical implications, scant research paid attention to first aid knowledge adoption from social media. Most of current studies on knowledge/information adoption focused on online reviews which help individuals to make purchase decisions (Cheung et al., 2008a; Erkan & Evans, 2016) and working advice in organizations (Sussman & Siegal, 2003). Findings of these research note that individuals' cognitive evaluation of the information (i.e., perceived information usefulness) shows a primary impact on the information adoption behavior. However, existing explanations on information/knowledge adoption might be insufficient in this study. On the one hand, first aid knowledge learning is a health protection behavior, which has been validated to be determined by both cognitive beliefs and emotions (Chapman & Coups, 2006). On the other side of the coin, research indicated that information adoption behavior of individuals in online social communities will be significantly affected by social influence (Shen et al., 2016). Thus, it is necessary to simultaneously examine affective factors and social factors to better understand first aid knowledge adoption behavior in social

media.

In this study, we propose that individuals' emotional arousal and social norms may play important roles in first aid knowledge adoption process. Arousal refers to individuals' emotional response to stimulus and further leads to corresponding reactions of individuals (Liu et al., 2013). In accordance with Zhang et al. (2021), individuals' information processing and information behavior are often affected by the emotional arousal evoked by the information. In terms of social factors, studies emphasized that social norms, especially descriptive norms, play vital roles in determining decisions and behaviors of individuals (Cialdini, 2007). Descriptive norms are a social norm referring that individuals believe what most others do is the right thing (Cialdini, 2007). In social communities, individuals may learn from others' behavior in adopting information given that this can help them easily identify the appropriate and effective adoption. Although arousal and descriptive norms are expected to play important roles in knowledge adoption, no research has involved these two factors in the adoption model and examined how arousal and descriptive norms work with information usefulness to determine individuals' adoption decisions. Moreover, according to the argument that information characteristics serve as stimulus inducing individuals' perception and belief (Sussman & Siegal, 2003), it remains unclear that how emotional arousal and social descriptive norms are influenced by information characteristics.

In summary, we propose research questions as follows:

(1) What do information characteristics of first aid knowledge, such as affective and social characteristics, affect individuals' arousal and descriptive norms?

(2) How do emotional arousal and descriptive norms affect individual first aid knowledge

adoption? In particular, how do these two factors interact with perceived information usefulness to influence knowledge adoption?

This study shows some theoretical contributions to existing literature. First, even though many studies have examined information adoption in the environment of online communities (Hussain et al., 2018; Salehi-Esfahani et al., 2016; Zhu et al., 2016), much remains unknown regarding health knowledge learning. This study extends existing studies by investigating the adoption of first aid knowledge from social media. Second, by considering and incorporating arousal and descriptive norms, this study sheds new lights on information adoption model. It might be insufficient whereby the original model merely considers cognitive factors (i.e., perceived information usefulness) in this research context. Through incorporating arousal and descriptive norms, the extended model represents how cognitive, affective, and social factors mutually determine knowledge adoption behavior. Third, key determinants of arousal and descriptive norms were identified from the perspective of information characteristics. This will help scholars and practitioners understand what information characteristics should be emphasized to promote individuals' arousal and perception of descriptive norms, and further lead to a higher tendency of adopting first aid knowledge.

5.2 Research Model

This study introduces arousal and descriptive norms as emotional and social factors to extend the original information adoption model and explores information characteristics inducing arousal and social norms. In the section of theoretical background, the information adoption model was introduced in detail. This section will further elaborate on arousal and descriptive norms, analyze the theoretical basis for adding these two factors to the information

adoption model. We also identify the corresponding cues leading to arousal and descriptive norms to construct a theoretical model for this study.

5.2.1 Arousal

Based on Broach Jr et al. (1995) definition, arousal is a state that people feel their psychological and physical activation. Studies have operated arousal with self-report measures and physiological measures, which corresponds to both psychological and physical aspects of arousal (Vettehen et al., 2008). Specifically, psychological/emotional arousal indicates the intensity of people' subjective feelings and emotional response (e.g., excited, stimulated and so on), while physiological arousal focuses on physical responses (Venkatraman et al., 2015). In recent years, most studies on social science and information systems research emphasize the psychological dimensions of arousal, in which the terms of "arousal" and "emotional arousal" are used interchangeably (Liu et al., 2013; Yin et al., 2017). We define arousal as a subjective psychological/emotional experience in this study.

Arousal has been addressed to play vital roles in people's decision-making under various circumstances, including advertising persuasiveness (Lindenmeier, 2008), corporate social responsibility (Chung & Lee, 2019), impulsive purchasing (Mittal et al., 2015) and travelling (Şahin & Güzel, 2020). This is because emotion is believed to influence individuals' judgement and choice, further driving individuals to make decisions (Bagozzi et al., 1999; Lerner et al., 2015). It has been proved that arousal will occur in online environment, which has appealed growing attention from scholars. For instance, in the context of information systems, research indicated that arousal induced by website design can significantly increases individuals' approach tendency to the website (Deng & Poole, 2010). An empirical study by Zhang et al.

(2021) examined arousal in information processing context. They found that individuals who feel arousal when viewing some messages on social media are likely to share the information. However, although arousal has been highlighted in information systems research, concerning the knowledge adoption on social media, what role arousal plays is still under explored.

Prior research notes that arousal denotes people's emotional response to stimulus, such as a picture, a game, or emotional expression (Codispoti & De Cesarei, 2007; Liu et al., 2013; Vettehen et al., 2008). Particularly, emotional expression has been identified as a critical antecedent of individuals' arousal and evaluation on information or news (Bolls et al., 2001). According to prior research, there are two aspects included in emotional expression, namely verbal cues and nonverbal cues (Hewstone et al., 2008). Specifically, verbal cues refer to the tone or words embedded in a message, while nonverbal cues represent auxiliary signals which can convey arousal. In research on online environment, vividness is considered as a crucial nonverbal signal that significantly arousing individuals' emotional response (Xiao & Benbasat, 2011). Thus, emotional tone and vividness as two dimensions of emotional expression are examined the impact on arousal in this study.

5.2.2 Social Norms and Descriptive Norms

Social norms have been identified as an essential type of social influence factors and proved to impact user behaviors profoundly (Cialdini et al., 2006; Cialdini et al., 1990).Social norms includes two aspects: injunctive norms and descriptive norms (Cialdini, 2007). The first one is defined as individual's belief on what they should do to satisfy other people' expectation or avoid social sanctions, while the second one refers to beliefs on what is done by most other people (Cialdini, 2007). Due to the distinctive motivational source of these two norms, previous

research indicated that the primary difference of injunctive and descriptive norms is that injunctive norms typically involve social sanctions or disapproval for noncompliance with the norm while descriptive norms do not (Lapinski & Rimal, 2005). Concerning to this research context, individuals' knowledge adoption behavior is pure voluntary with no social pressures and sanctions. Thus, we only examine impacts of descriptive norms in knowledge adoption on social media.

Descriptive norms refer to individuals' beliefs on what is the most typical and appropriate behavior according to what most of others behave (Jaeger et al., 2021). Cialdini (2007) argued that descriptive norms deliver signals that the thing most people are doing is wise and correct. Therefore, in uncertain situations, descriptive norms represent important social information indicating the potential behavior is appropriate (Cialdini, 2007). Prior studies have empirically demonstrated the powerful influence of descriptive norms on people's behaviors in different contexts, including risky sexual behavior among adolescents (Baumgartner et al., 2011), environment protection (Cialdini, 2003), sustainable consumption (Demarque et al., 2015; Pristl et al., 2020), healthy eating (Robinson et al., 2014), and policy compliance (Jaeger et al., 2021). Particularly, in social media context, the role of descriptive norms has drawn increasing consideration among scholars. Results of studies demonstrated that descriptive norms perform significant impact on individuals' information processing and behaviors on social media. For instance, Link (2021) examined the influence of descriptive norms on accessing COVID-19 pandemic related information. It indicates that descriptive norms decrease people' sense of information insufficiency, resulting avoidance to information. Moreover, when individuals perceive high descriptive norm on knowledge sharing in online social communities, they are

more likely to sharing knowledge (Alajmi, 2012). Descriptive norms also facilitate individuals' risky behavior on social media, such as sharing embarrassing photos and sharing current locations (Branley & Covey, 2018). Park et al. (2011) and Wang (2013) proved that descriptive norms significantly increase people's intention to upload content and intention to use social media while viewing mediated sports.

Descriptive norms are examined playing crucial roles in decision-making and behaviors in social media context (Gimpel et al., 2021). However, the antecedents identifying of descriptive norms is fairly limited. Although some studies found individual factors (e.g., individual awareness and collectivism) are related to descriptive norms (Jaeger et al., 2021; Paek et al., 2014), they fail to explain what social cues involved in the information facilitate the formation of descriptive norms. Considering that descriptive norms represent social information indicating typical and popular behaviors (Lapinski & Rimal, 2005), the endorsement of other people may play a fundamental role in inducing descriptive norms. In this study, we will expand antecedents of descriptive norms to social cues in social media information through investigating the impact of other people's endorsement.

Build upon the preceding review, we developed the research model (see the Figure 5-1). We propose that individuals' knowledge adoption behavior is simultaneously influenced by cognitive factors (i.e., perceived information usefulness), affective factors (i.e., arousal), and social factors (i.e., descriptive norms). We hypothesize that cues involved in the content (e.g., affective cues, cognitive cues, and social cues) will affect three corresponding factors. Next, we examine the impacts of these factors on knowledge adoption, involving direct effects and synergistic effects.

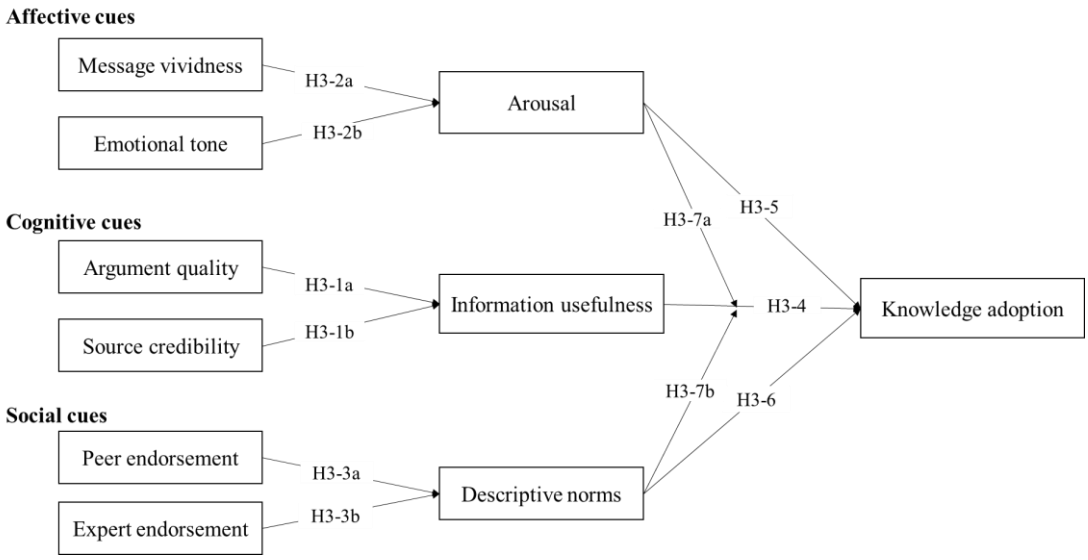

Figure 5-1 Research model of Study 3

5.3 Hypotheses Development

5.3.1 Argument Quality, Source Credibility, and Perceived Information Usefulness

Argument quality and source credibility are considered as two cognitive cues. According to the information adoption model, information adoption is determined by perceived information usefulness, which is driven by both argument quality and source credibility (Sussman & Siegal, 2003). In social media contexts where individuals learn first aid knowledge, people read the message to capture the knowledge it conveys. The more understandable, accurate, and comprehensive the knowledge is, the higher quality individuals will perceive (Cheung et al., 2008a; Sussman & Siegal, 2003). In turn, such high-quality argument helps individuals engaging in more effective cognitive information processing as well as understanding and evaluating the knowledge more easily. In this case, individuals may form the assessment that argument with high quality is more useful to acquire knowledge.

On the other hand, source credibility indicates that how individuals think the information source is believable (Petty & Cacioppo, 1986). Regarding to the message on social media,

when message posters are expert, knowledgeable, and trustworthy, the source of message is usually considered to be credible (Shen et al., 2016). Prior studies have proven that source credibility is necessary for evaluating the usefulness of message and inducing individuals' adoption behavior, especially when individuals have less expertise in the message topic (Sussman & Siegal, 2003). Specific to this context, message involving first aid knowledge is hard to evaluate for individuals in social media because of the lack of expertise. Thus, the source becomes a crucial cue of usefulness assessment, for which the knowledge posters are more credible, the knowledge is more likely to be regarded as helpful. Thus, we propose that:

H3-1a: Argument quality of first aid knowledge is positively related to perceived information usefulness.

H3-1b: Source credibility of first aid knowledge is positively related to perceived information usefulness.

5.3.2 Message Vividness, Emotional tone, and Arousal

Affective cues include nonverbal cues and verbal cues, corresponding to message vividness and emotional tone in this study. We employ message vividness to describe how the information presentation is emotionally attractive, imagery provoking, and inherently tempting (Sundar & Kalyanaraman, 2004). A vivid presentation represents rich formal features, involving more nonverbal language and multiple visual channels than pale presentations (Jiang & Benbasat, 2007). Paralleling to media richness, vividness could stimulate individuals' senses and further elicit emotions, and is generally regarded as emotionally attractive. Arousal is an emotional response to stimuli, and prior research has found that vividness shows significant impacts on an individual's arousal level (Fortin & Dholakia, 2005). We define vividness as

individuals' perceptions on sense richness conveyed by the message. Compared to a pallid message (e.g., only text), a vivid message (e.g., including pictures, animation, and videos) is more likely to stimuli multiple senses and induce emotional arousal. Especially for message on first aid knowledge, which relates to individuals' health and life safety, individuals' emotions are more prone to be aroused when they read message with high vividness. Thus, we propose that:

H3-2a: Message vividness of first aid knowledge is positively related to arousal.

Emotional tone is a verbal cue for emotional expression, stressing the emotional aspects of the conveyed information through specific words and linguistic markers embedded in the message (Fortin & Dholakia, 2005). While emotional tone captures both positive/negative directions and intensity of emotion, we only focus on the degree or intensity of expressed emotion (Harris & Paradice, 2007). Such an informational feature concerns expressing emotions and subjective feelings of writers or speakers instead of the rational fact, also considered as emotional appeals (Casais & Pereira, 2021; Li & Samp, 2019). Thus, the message with a higher level of emotional tone will elicit more emotional arousal. Specific to the first aid knowledge learning context, we propose that this relationship will strongly hold since emotion plays a critical role in health protection situations (Ferrer & Mendes, 2018). That is, the more emotional tones that the message involving first aid knowledge shows, the more likely individuals feel arousal. Thus, we put forward that:

H3-2b: Emotional tone of first aid knowledge is positively related to arousal.

5.3.3 Peer Endorsement, Expert Endorsement, and Descriptive Norms

Endorsement is chosen as a social cue of message on social media in this study.

Endorsement indicates the declaration of approval and support on an object or an issue, reflecting social influence of other people (T. Wang et al., 2021). In different contexts, endorsement comes from various sources such as celebrities in advertising, peers in social networks, and experts in professional fields (Knoll & Matthes, 2017; Kusumasondjaja & Tjiptono, 2019; T. Wang et al., 2021). Specific to this research, a context where first aid knowledge spreading on social media, peer endorsement and expert endorsement are considered influential in this study. Specifically, peer endorsement performs as like-clicking and retweet behaviors, while expert endorsement performs as expert's positive evaluation and assessment on the information.

Prior research demonstrated that endorsement is an efficient and valuable communication strategy, which shows significant influence on individuals' evaluation and attitude and further facilitate related subsequent behavior (Chen & Lin, 2018). Descriptive norms is a type of social norms, indicating typical and popular behaviors accepted by others (Cialdini, 2007). In the current research context, peer endorsement and expert endorsement as social cues may shape individuals' perception on descriptive norms of first aid knowledge adoption. The underlying rationale is that the specific peer endorsement behaviors such as like-clicking or retweet directly reflect their positive attitudes and learning intentions on the knowledge. Such cues provide signal to individuals that the information is widely accepted by other people. In terms of the expert endorsement, the approval of the expert enhances the believability of the information as well as the validity of knowledge learning behavior (Biswas et al., 2006). In this regard, individuals tend to believe that people will adopt information with expert endorsement rather than information without expert endorsement (Limbu et al., 2012). Hence, for

information involving first aid knowledge with more peer endorsement and expert endorsement, individuals are prone to feel higher level of descriptive norms on learning the targeted knowledge. Thus, we put forward that:

H3-3a: Peer endorsement of first aid knowledge is positively related to descriptive norms.

H3-3b: Expert endorsement of first aid knowledge is positively related to descriptive norms.

5.3.4 Direct Effect of Information Usefulness, Arousal, and Descriptive Norms on Knowledge Adoption

Perceived information usefulness is a cognitive evaluation on individuals' beliefs that the information is useful for completing a task or behavior (Sussman & Siegal, 2003). Sussman and Siegal (2003) has accounted that perceived information usefulness will significantly facilitate individuals to adopt the information/knowledge to solve problems. Studies in various contexts has confirmed information/knowledge adoption is significantly determined by individuals' perception on information usefulness (Sun et al., 2019; Tseng & Wang, 2016). Specific to this research context, when individuals find the information/knowledge involved in a message is useful for improving their first aid skills, they will learn first aid knowledge advocated in the message. Thus, we put forward that:

H3-4: Perceived information usefulness is positively related to first aid knowledge adoption.

Arousal is regarded as an emotional reaction to stimuli, which shows significant effects on the formation of individuals' attitude and behavior intention (Mano, 1997). Distinguishing from cognitive assessment through elaborating information, arousal emphasizes the affective

activation or emotion evocation induced by stimulus (Broach Jr et al., 1995). Previous scholars have confirmed that such feeling rather than thinking play prominent roles in forming attitudes and determining behaviors under the peripheral route (Kim et al., 2007). In other words, arousal acts as a heuristic cue to motivate behavior with less cognitive efforts. Research also indicated that arousal play a role in judgement especially for information about importance and urgency (Storbeck & Clore, 2008). Corresponding to the research context of this study, where first aid knowledge is characterized by importance and urgency and individuals have less expertise to make judgement, arousal is considered to work apparently in determining knowledge adoption behavior. On the basis of these discussions, a high level of arousal is likely to elicit importance and urgency judgement on first aid knowledge, and further motivates individuals to adopt the knowledge. Thus, we put forward that:

H3-5: Arousal is positively related to first aid knowledge adoption.

Descriptive norms function as social information influencing individuals' behavior since it provides information about what most of others do (Cialdini, 2007). The behavior of others can be used as a heuristic cue to help individuals make decisions without triggering elaborated assessment about the message or issue, especially in uncertain or ambiguous situations (Paek et al., 2014). More specifically, when individuals are uncertain in making judgements on a particular behavior and when the behavior is popularly acted by other people, individuals are likely to believe the behavior is effective, adaptive, and appropriate and follow this action (Jacobson et al., 2011). For example, previous research indicated that sustainable consumption behavior of others would accelerate individuals' choice on sustainable product (Pristl et al., 2021). We expect that when individuals believe the first aid knowledge is widely adopted by

people, they show strong intention to adopt the knowledge. According to these arguments, we assume knowledge adoption behavior of other people will enhance individuals' intention to adopt the knowledge. Thus, we put forward that:

H3-6: Descriptive norms is positively related to first aid knowledge adoption.

5.3.5 Synergistic Effects of Perceived Information Usefulness, Arousal, and Descriptive Norms

Prior studies respectively investigated impacts of perceived information usefulness, arousal, and descriptive norms, but neglected their interaction effects (Gimpel et al., 2021; Hussain et al., 2018; Zhang et al., 2021). Here, we propose that these three factors can complement each other to create addictive impact. This complementary effect is called synergistic effect, which can be represented as the positive interaction effect at the methodological level (Tanriverdi, 2006).

In terms of the impacts on knowledge adoption, perceived information usefulness is a cognitive belief on information after conscious processing while arousal and descriptive norms serve as heuristic factors reflecting affective and social influence. It is expected that arousal and descriptive norms complement the effect of perceived information usefulness, eliciting positive synergistic effects. According to elaboration likelihood model (ELM), cognitive factors and heuristic factors work in different information processing routes to determine individuals' behavior (Petty & Cacioppo, 1986). Specifically, people's careful and thoughtful consideration (i.e., perceived information usefulness) works in a central route where a great amount of cognition involved, while heuristic factors (i.e., arousal and descriptive norm) usually involve less logical quality and influence behaviors under an inessential track (Petty &

Cacioppo, 1986). The inessential track will be triggered as complement when the central route is insufficient. Especially in uncertain and ambiguous situations and when individuals have not adequate ability, individuals rely more on peripheral route, thus the positive synergistic effect emerges (Petty et al., 1987; Sun et al., 2019).

The context of this study is a context with high uncertainty and ambiguity, where individuals have less ability in making decisions. In this case, positive synergistic effects may occur among perceived information usefulness, arousal, and descriptive norms. Prior studies have proven the significant interaction effects of affective factor and usefulness as well as of social factors and usefulness on behavior intention (Sun et al., 2019; Wu et al., 2019). Correspondingly, we argue that arousal and descriptive norms positively interact with information usefulness to determine the adoption behavior. Based on this, we argue that:

H3-7a: The synergistic effect of arousal and perceived information usefulness on knowledge adoption is positive.

H3-7b: The synergistic effect of descriptive norms and perceived information usefulness on knowledge adoption is positive.

5.4 Research Methodology

5.4.1 Research Setting and Data Collection

Focusing on the impacts of information characteristics on individual first aid knowledge adoption, the research environment is chosen as the same as Study 2. Therefore, to ensure the consistency of the research, this study still uses Sina Weibo in Study 2 as the research environment. A large amount of information is generated on Weibo every day, and the information has the following important characteristics: (1) Since any registered user can post

news on Weibo, the information has the characteristics of wide sources and uneven quality; (2) Weibo allow users to publish information in diverse patterns including text, pictures, videos, etc., thus the vividness is guaranteed to a certain extent; (3) Weibo has functions such as likes, comments, and forwarding, which are public to all users, and individuals can see comments from anyone else. Therefore, the information on Weibo has the cognitive, emotional, and social characteristics that this research focuses on, thus it is an effective research environment in line with this research.

Research object in this study is the valid samples (375 samples) same as the Study 2. The variables involved in this study have been collected in Study 2, including the newly added constructs in this study and demographic information (i.e., age, gender, education level, etc.). See Table 4-2 in Study 2 for sample statistics.

5.4.2 Measurement

Consistent to Study 2, measurements were adapted from previous studies. Specifically, first aid knowledge adoption (KAD) was measured with three items adapted from Chou et al. (2015) and Tseng and Wang (2016). Perceived information usefulness (PIU), argument quality (AQ), and source credibility (SC) were measured using items adapted from Bhattacherjee and Sanford (2006). Items of arousal (AR) were adapted from Liu et al. (2013) and items of descriptive norms (DN) were adapted from Herath and Rao (2009). Three items adapted from Jiang and Benbasat (2007) were used to measure vividness (MV) and three items adapted from De Keyzer et al. (2017) were used to measure emotional tone (ET). Finally, peer endorsement (PEE) was measured with three items adapted from Cheng et al. (2019) and expert endorsement (EXE) was measured using three items adapted from Lim et al. (2006). The Appendix D lists

measurement questions. Particularly, since three items of peer endorsement capture different signals supporting endorsement and are not interchangeable, peer endorsement is conceptualized as a formative construct. All measurements were assessed using Seven-point Likert scale from 1 (strongly disagree) to 7 (strongly agree).

5.5 Data Analysis and Results

5.5.1 Common Method Bias

Because we used the self-report survey method, the potential common method bias should be checked. We utilized two approaches to test the common method bias. First, we performed Harman's single-factor test (Podsakoff et al., 2003). The results indicated that the most variance explained by one factor is 37.5%, less than the threshold of 50%. Second, following the procedure proposed by Liang et al. (2007), we added a common method factor into the research model. As shown in Table 5-1, the ratio of substantive variance (0.722) to method variance (0.004) is 180:1. Thus, it can be concluded that the common method bias has no threats to research results.

Table 5-1 Examination on common method bias in study 3

Construct	Indictor	Substantive factor loading (R1)	$R1^2$	Method factor loading (R2)	$R2^2$
Knowledge adoption	KAD1	0.875	0.765	-0.017	0.000
	KAD2	0.845	0.714	-0.053	0.001
	KAD3	0.840	0.706	0.071	0.003
Perceived	PIU1	0.862	0.743	0.032	0.000
information	PIU2	0.802	0.643	0.124	0.004
usefulness	PIU3	0.836	0.699	-0.156	0.007
Arousal	AR1	0.897	0.804	0.004	0.000
	AR2	0.908	0.824	-0.085	0.005
	AR3	0.776	0.603	0.096	0.006

Descriptive norms	DN1	0.874	0.765	0.067	0.001
	DN2	0.833	0.694	-0.131	0.005
	DN3	0.898	0.806	0.054	0.001
Argument quality	AQ1	0.835	0.696	-0.097	0.005
	AQ2	0.887	0.787	-0.014	0.000
	AQ3	0.840	0.706	0.111	0.005
Source credibility	SC1	0.836	0.698	0.065	0.002
	SC2	0.840	0.706	-0.085	0.003
	SC3	0.843	0.710	0.019	0.000
Message vividness	MV1	0.821	0.675	-0.018	0.000
	MV2	0.860	0.739	0.120	0.006
	MV3	0.895	0.802	-0.099	0.003
Emotional tone	ET1	0.827	0.684	0.174	0.031
	ET2	0.882	0.777	-0.113	0.013
	ET3	0.849	0.720	-0.061	0.004
Peer endorsement	PEE1	0.856	0.733	-0.033	0.000
	PEE2	0.868	0.754	0.038	0.001
	PEE3	0.864	0.747	-0.006	0.000
Expert endorsement	EXE1	0.758	0.575	0.075	0.003
	EXE2	0.820	0.672	-0.015	0.000
	EXE3	0.845	0.713	-0.054	0.002
Average			**0.722**		**0.004**

5.5.2 Measurement Model

The partial least squares structural equation modeling (PLS-SEM) technique was used to validate and analyze hypotheses and the research model. Using PLS-SEM is appropriate in this study for testing research model with formative constructs (Hair et al., 2011). In addition, PLS-SEM performed better in analyzing non-normal distributed data (Hair et al., 2011). Following two-step procedures, we firstly examined the measurement model and then tested the structural model.

We examined the reliability, convergent validity, and discriminant validity of constructs to evaluate the measurement model. As shown in Table 5-2, the composite reliabilities,

Cronbach's Alpha values, and average variance extracted (AVE) of constructs were respectively higher than 0.7, 0.7, and 0.5 (Fornell & Bookstein, 1982). Therefore, the results showed a good reliability. As shown in Table 5-3, item loadings were greater than 0.7, demonstrating a good convergent validity. Two methods were employed to evaluate discriminant validity. First, we compared the square roots of AVEs for a given construct and the correlation coefficients between this construct and other constructs. Second, we checked whether item loadings were higher than the cross-loadings (Fornell & Bookstein, 1982). The results are shown in Table 5-2 and Table 5-3. The square roots of AVEs were higher than correlation coefficients between constructs; item loadings were greater than cross-loadings. The results illustrate the discriminant validity of all reflective constructs is good.

Table 5-2 Reliabilities and correlations in Study 3

	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)	AR	DN	KA	AQ	PEE	EXE	SC	ET	PIU	MV
AR	0.825	0.896	0.744	**0.862**									
DN	0.837	0.902	0.755	0.432	**0.869**								
KAD	0.813	0.889	0.728	0.495	0.663	**0.853**							
AQ	0.814	0.89	0.73	0.271	0.532	0.406	**0.854**						
PEE	—	—	—	0.414	0.661	0.457	0.535	—					
EXE	0.734	0.849	0.652	0.151	0.472	0.34	0.517	0.591	**0.807**				
SC	0.791	0.877	0.704	0.238	0.505	0.467	0.665	0.555	0.678	**0.839**			
ET	0.812	0.885	0.72	0.55	0.109	0.22	-0.024	-0.001	-0.133	-0.087	**0.849**		
PIU	0.78	0.872	0.695	0.341	0.607	0.547	0.607	0.622	0.687	0.691	0.014	**0.833**	
MV	0.822	0.894	0.738	0.419	0.611	0.574	0.506	0.568	0.43	0.569	0.071	0.645	**0.859**

Note: The value in bold on the diagonal is the square root extracted from the mean variance of the corresponding variable.

Table 5-3 Loadings and cross-loadings in Study 3

	AR	DN	KAD	AQ	EXE	SC	ET	PIU	MV
AR1	**0.902**	0.382	0.459	0.226	0.134	0.213	0.514	0.289	0.389
AR2	**0.909**	0.345	0.437	0.168	0.063	0.169	0.532	0.266	0.339
AR3	**0.769**	0.4	0.381	0.328	0.21	0.243	0.36	0.338	0.358
DN1	0.41	**0.876**	0.606	0.458	0.433	0.474	0.148	0.588	0.556

DN2	0.377	**0.829**	0.528	0.414	0.35	0.374	0.116	0.427	0.439
DN3	0.343	**0.9**	0.591	0.509	0.444	0.463	0.026	0.56	0.589
AQ1	0.204	0.38	0.314	**0.831**	0.414	0.52	-0.03	0.491	0.401
AQ2	0.22	0.466	0.339	**0.893**	0.475	0.597	-0.049	0.566	0.378
AQ3	0.274	0.517	0.391	**0.837**	0.433	0.585	0.023	0.494	0.527
KAD1	0.492	0.597	**0.878**	0.349	0.234	0.402	0.248	0.441	0.499
KAD2	0.418	0.556	**0.843**	0.309	0.278	0.355	0.224	0.439	0.447
KAD3	0.351	0.542	**0.838**	0.383	0.365	0.439	0.086	0.524	0.523
MV1	0.342	0.484	0.437	0.45	0.341	0.468	0.07	0.56	**0.822**
MV2	0.335	0.547	0.487	0.471	0.442	0.548	-0.008	0.615	**0.851**
MV3	0.398	0.545	0.548	0.393	0.336	0.46	0.112	0.502	**0.902**
EXE1	0.261	0.405	0.345	0.344	**0.787**	0.511	0.056	0.586	0.299
EXE2	0.059	0.389	0.237	0.453	**0.816**	0.56	-0.136	0.565	0.356
EXE3	0.03	0.344	0.233	0.462	**0.819**	0.573	-0.265	0.504	0.394
PIU1	0.305	0.564	0.531	0.51	0.57	0.585	0.068	**0.866**	0.531
PIU2	0.351	0.494	0.476	0.5	0.562	0.558	0.076	**0.808**	0.586
PIU3	0.188	0.453	0.349	0.508	0.587	0.586	-0.123	**0.825**	0.494
SC1	0.304	0.459	0.414	0.542	0.554	**0.846**	0.061	0.618	0.475
SC2	0.126	0.406	0.376	0.543	0.544	**0.838**	-0.152	0.571	0.446
SC3	0.159	0.403	0.383	0.593	0.612	**0.834**	-0.142	0.548	0.515
ET1	0.575	0.19	0.291	0.117	-0.069	0	**0.875**	0.145	0.222
ET2	0.338	-0.028	0.05	-0.094	-0.149	-0.163	**0.842**	-0.116	-0.037
ET3	0.426	0.057	0.157	-0.146	-0.144	-0.104	**0.829**	-0.067	-0.08

Note: The values in bold are item loadings of the corresponding variable.

For peer endorsement, we evaluate the reliability and validity of this formative construct following the procedure proposed by (Petter et al., 2007). As shown in Table 5-4, the weights of three items of peer endorsement were all significant with loadings higher than 0.7 statistically. Furthermore, the variance inflation factor (VIF) values for the three items were 1.837, 1.938, and 1.898, respectively, lowering the suggested criteria threshold of 3.3 (Petter et al., 2007). Thus, the three items of peer endorsement should be retained for further analysis (Cenfetelli & Bassellier, 2009).

Table 5-4 Reliability and validity of formative construct

	Items	Weights	T-values	Loadings	T-values	VIF-values
Peer endorsement	PEE1	0.388	4.561	0.876	19.780	1.837
	PEE2	0.356	3.627	0.829	19.802	1.938
	PEE3	0.406	4.433	0.900	28.012	1.898

We further calculated the variance inflation factor (VIF) values of all reflective constructs to address potential multicollinearity issues. The results showed that the internal VIF values of all constructs ranged from 1.005 to 1.792, which were lower than the standard threshold of 3.3; the external VIF values ranged from 1.323 to 2.680, which were all within the acceptable threshold (Petter et al., 2007). Therefore, the results indicated that multicollinearity would not significantly affect the results of this study.

5.5.3 Structural Model

In this study, Smart PLS 3.0 was employed to conduct a two-stage analysis of the structural equation model. First, the analysis of the basic model that does not include the interaction has verified the direct influence between the variables; then, the interaction between the variables is added to the model to test the influence of the interaction. The final full model analysis results are shown in Figure 5-2.

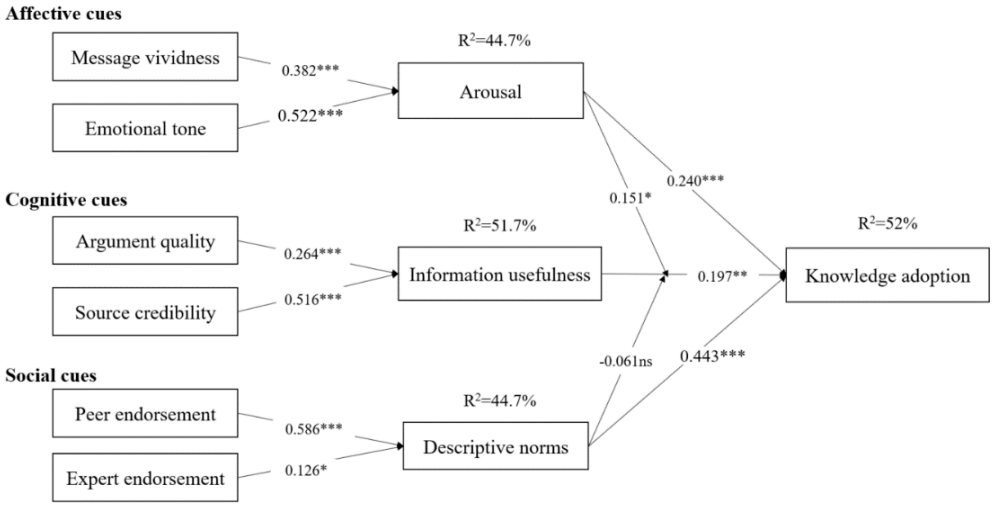

Figure 5-2 Structural model results in Study 3

5.5.3.1 Direct Effect Analysis

In line with previous findings, argument quality (β=0.264, t=4.792, p<0.001) and source credibility (β=0.516, t=9.941, p<0.001) positively influence perceived information usefulness, supporting H3-1a and H3-1b. In addition, the results confirm that arousal is positively determined by message vividness (β=0.382, t=10.303, p<0.001) and emotional tone (β=0.522, t=12.920, p<0.001), thus H3-2a and H3-2b are supported. Meanwhile, the results show that both of peer endorsement (β=0.586, t=10.522, p<0.001) and expert endorsement (β=0.126, t=2.114, p<0.05) exert positive effects on descriptive norm, which supports H3-3a and H3-3b. In addition, perceived usefulness, arousal, and descriptive norms are explained by the corresponding cognitive, emotional, and social characteristics with 51.7%, 44.7%, and 44.6% of the variance explained, indicating that information characteristics have a strong explanatory power and strong impact on individual perceptions.

In terms of the determinants of knowledge adoption, results showed that perceived information usefulness, arousal, and descriptive norms all show powerful impacts at the level of 0.01 (β=0.197, t=3.462), 0.001 (β=0.240, t=4.592) and 0.001 (β=0.443, t=6.576), respectively. Therefore, H3-4, H3-5, and H3-6 are supported. The three factors work together to explain 52% of the variance of knowledge adoption, indicating that perceived usefulness, arousal and descriptive norms can explain most of the variance of knowledge adoption, that is, they have powerful effects on knowledge adoption. None of the control variables were significant.

5.5.3.2 Synergistic Effect Analysis

The interaction between perceived information usefulness, arousal, and descriptive norms was involved in the model for analysis. The analysis results showed that arousal and perceived

information usefulness positively interact to show a significant synergistic effect on knowledge adoption (β=0.151, t=2.575, p<0.05), while no synergistic effect was found between descriptive norms and perceived information usefulness (β=-0.061, t=1.626, p>0. 1), suggesting that H3-7 was supported but H3-8 was not.

In addition, to further verify hypotheses H3-7 and H3-8, the method proposed by Aiken et al. (1991) was adopted in this study for interaction effect test. First, the H3-7 (the interaction effect of arousal and perceived information usefulness on first aid knowledge adoption) was verified. The Figure 5-3 shows that when individuals have high arousal (dashed line), the first aid knowledge adoption will rise faster with the increase of perceived usefulness; when the arousal of individuals was low (solid line), the first aid knowledge adoption changed slowly with the increase of perceived information usefulness. Therefore, it can be seen from the graph that arousal and perceived information usefulness have a positive interaction on first aid knowledge adoption. That is, when individuals are in a high state of arousal, perceived information usefulness promotes first aid knowledge adoption more quickly than in a low state of arousal. Hypothesis H3-7 is further supported.

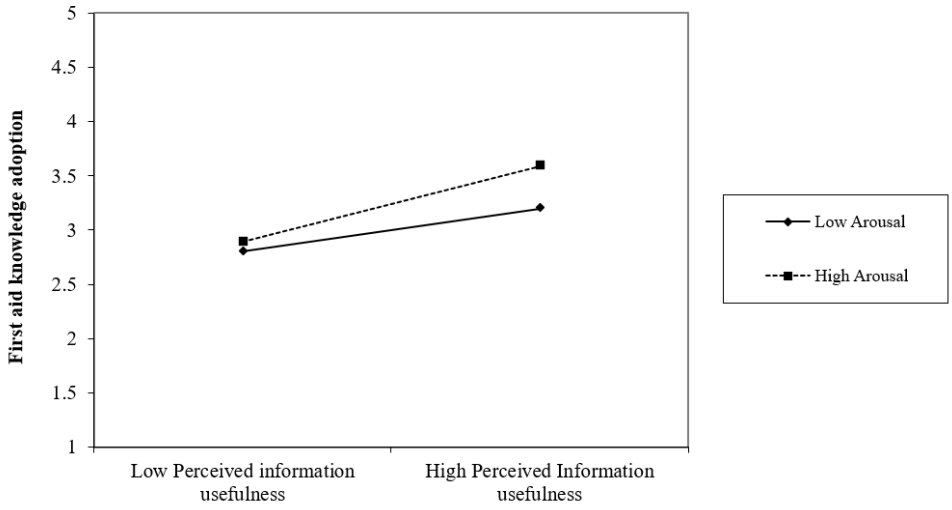

Figure 5-3 Interaction of perceived information usefulness and arousal

Next, hypothesis H3-8 (the interaction of descriptive norms and perceived information usefulness on first aid knowledge adoption) is verified and Figure 5-4 shows the interaction relationship. Under the two different conditions of high-level and low-level descriptive norms, first aid knowledge adoption shows the same changing trend with the increase of perceived information usefulness. That is to say, the relationship between perceived information usefulness and first aid knowledge adoption is not influenced by the level of descriptive norms. Therefore, the interaction between descriptive norms and perceived information usefulness on first aid knowledge adoption is not significant, not supporting hypothesis H3-8.

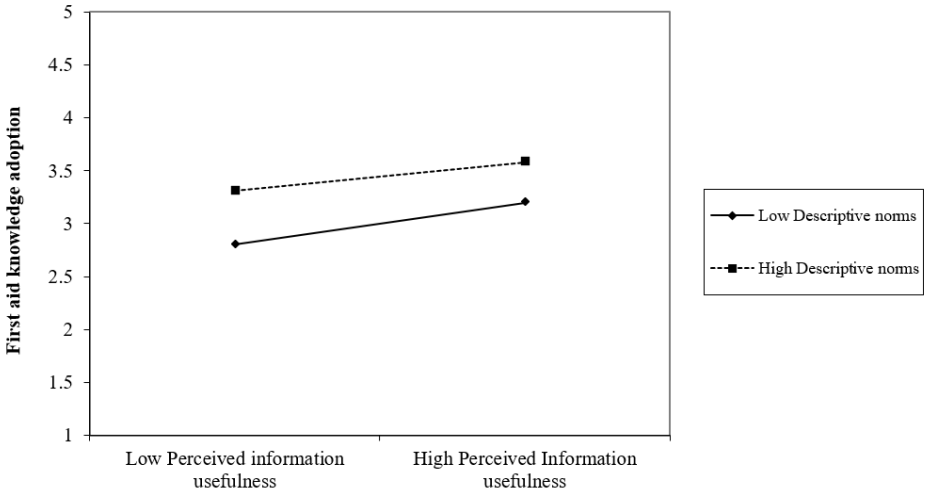

Figure 5-4 Interaction of perceived information usefulness and descriptive norms

5.5.4 Post-hoc Analysis

Perceived information usefulness, arousal, and descriptive norms are three determinants of knowledge adoption, which reflect cognitive, affective, and social influence. These three factors connect informational characteristics (e.g., cognitive, affective, and social cues in information) and individuals' adoption behavior, implying that mediating effect may exist. Mediation effect of these three factors were conducted through a bootstrapping procedure with

the value of variance accounted for (VAF) calculated (Carrión et al., 2017). Table 5-5 shows the results. Perceived information usefulness played a mediating role in source credibility and knowledge adoption but had no effect on argument quality. The effects of affective cues (i.e., message vividness and emotional tone) and social cues (i.e., peer endorsement and expert endorsement) on knowledge adoption were all mediated by arousal and descriptive norms respectively.

Table 5-5 Result of mediating effect analysis in Study 3

Path	Indirect effect	Total effect	VAF	Mediating effect
AQ->PIU->KA	0.025	-0.04	—	None
SC->PIU->KA	0.075*	0.229*	32.8%	Partial mediating
MV->AR->KA	0.071**	0.220*	32.3%	Partial mediating
ET->AR->KA	0.098**	0.168***	58.3%	Partial mediating
PEE->DN->KA	0.26***	0.191*	—	Full mediating
EXE->DN->KA	0.06*	-0.021	—	Full mediating

Note: VAF=indirect effect/total effect (VAF<20%, unmediated; 20%<VAF<80%, partially mediated; VAF>80%, fully mediated); *p<0.05, **p<0.01, ***p<0.001

Table 5-6 Path coefficients comparison in Study 3

Path	Path coefficient	T value	Conclusion
$\beta_{PIU->KA}$ VS. $\beta_{AR->KA}$	0.197*** vs. 0.240***	0.672 ns.	No significant difference
$\beta_{PIU->KA}$ VS. $\beta_{DN->KA}$	0.197*** vs. 0.443***	-2.918**	$\beta_{DN->KA} > \beta_{PIU->KA}$
$\beta_{AR->KA}$ VS. $\beta_{DN->KA}$	0.240*** vs. 0.443***	-3.615***	$\beta_{DN->KA} > \beta_{AR->KA}$

Note: ***p<0.001, **p<0.01, *p<0.05, ns. p>0.05

Further, we tested whether there is difference among the impacts of perceived information usefulness, arousal, and descriptive norms on knowledge adoption. We compared path coefficients following the method suggested by Li et al. (2013). The results in Table 5-6 showed that no difference exist between the impacts of perceived information usefulness and arousal. However, descriptive norms presented stronger effect on knowledge adoption than perceived

information usefulness and arousal in this study.

5.6 Discussions

5.6.1 Key Findings

First, perceived information usefulness, arousal, and descriptive norms all play positive direct effects on first aid knowledge adoption. Despite scant literature paid attention on affective and social influence on information adoption (Han et al., 2021; Hussain et al., 2018), results confirm the significant impacts of cognitive, affective, and social factors on determining individuals' knowledge adoption. It also resonates the argument of prior research that decision-making is determined not only by cognitive beliefs but also by affective and social influence (Straub, 2009). In addition, we find that descriptive norms produce the most significant effect on knowledge adoption. It suggests that individuals are prone to adopt first aid knowledge that are widely adopted by others. The result further validates findings of Shen et al. (2016) and Sun et al. (2019), which indicated individuals are prone to imitate others' behavior in adopting information.

Second, the results find the positive synergistic effect of arousal and information usefulness. Prior research investigated the impacts of usefulness, arousal, and descriptive norms independently (Gimpel et al., 2021; Luo et al., 2018; Zhang et al., 2021), and neglected their interaction effect. The findings indicate that arousal complements the effect of information usefulness on knowledge adoption. However, no synergistic effect exists between descriptive norms and information usefulness. This may because descriptive norms serve as a strongest direct determinant of knowledge adoption. When people believe the knowledge adopted by most others, they will also adopt considering less about the usefulness.

Third, in addition to confirming the determining role of argument quality and source credibility, our findings show that arousal is determined by message vividness and emotional tone while descriptive norms is determinant by peer endorsement and expert endorsement. Compared with prior research which examined influence of image on arousal and impacts of individual awareness on descriptive norms (Jaeger et al., 2021; Zhang et al., 2021), we investigate antecedents of arousal and descriptive norms in terms of affective cues (i.e., message vividness and emotional tone) and social cues (i.e., peer endorsement and expert endorsement) respectively. We find these antecedents explained many more variances of arousal (44.7%) and descriptive norms (44.7%) and predicting knowledge adoption indirectly, indicating the value and necessity of involving affective cues and social cues in the message.

5.6.2 Theoretical Implications

This study sheds light on several significant implications for theory and research. First, we add to the existing information systems literature by enriching the understanding of first aid knowledge adoption in social media. Existing studies have emphasized knowledge adoption in organizations (Sussman & Siegal, 2003), review adoption in e-commerce (Peng et al., 2016), and experience and search information adoption in Q&A communities (Sun et al., 2019). This study extends prior studies to the context of first aid knowledge adoption in social media. Particularly, due to the feature of specialty of first aid knowledge, it is uncertain and ambiguous for individuals to build cognitive discrimination in this context. In this case, affective and social factors, which have been proved to significantly influence individuals' behaviors (Straub, 2009), are considered to play crucial role in knowledge adoption. The findings advocate that the integration of cognitive, affective, and social influencing factors can enrich and deepen the

understanding of individuals' first aid knowledge adoption behavior on social media and provide new directions for future research.

Second, we expand the information adoption model through integrating affective factor (i.e., arousal) and social factor (i.e., descriptive norms) and revealing the influencing mechanism. Although the original model has been extended in several ways in past research, such as identifying moderators (Watts & Zhang, 2008), refining dimensions of independent variables (Cheung et al., 2008a), and examining bias effects (Sun et al., 2019), these studies still primarily pay attention to the role of information usefulness. Impacts of affective factors and social factors on information adoption remain to be investigated despite their roles in decision-making have been verified (Straub, 2009). We firstly simultaneously incorporate cognitive factors, affective factors, and social factors into information adoption model. Further, through investigating direct and synergistic effects of these factors as well as their informational antecedents, the results reveal how cognitive factors, affective factors, social factors, and their corresponding informational cues work together to determine information adoption. On these grounds, the information adoption model has been enriched and provides a complete picture in information adoption.

Finally, we yield an advanced viewpoint for explaining determinants of arousal and descriptive norms. Prior research which explored the antecedents of arousal and descriptive norms is limited in context stimulus and individuals' characteristics (Jaeger et al., 2021; Şahin & Güzel, 2020). However, in the information adoption research context, it will be important to explore informational characteristics that elicit arousal and descriptive norms. This is consistent with the principal of the model that informational characteristics play important roles

during information processing process (Sussman & Siegal, 2003). Drawing upon theories of emotional expression and endorsement from communication and sociology literature, we show that verbal cues (i.e., emotional tone) and nonverbal cues (i.e., message vividness) of information can give rise to arousal. Moreover, endorsement from peers and experts involved in the information leads to high descriptive norms. Therefrom, we reinterpret arousal and descriptive norms from a perspective of informational characteristics in the online information adoption area.

5.6.3 Practical Implications

The findings present some shrewd implications for practitioners. First, governments, organizations, and social media managers who pay efforts to promote individuals adopting first aid knowledge from social media are suggested to put their eyes on individuals' emotional arousal and perception on descriptive norms. Specifically, since descriptive norms show strong impact, practitioners should convey the norms that learning first aid knowledge is a popular and appropriate behavior accepted by majority of people. Moreover, because arousal can complement the effect of information usefulness on knowledge adoption, messages involving first aid knowledge, especially those difficult to understand and judge the usefulness, should be designed emotional arousing.

Second, the findings contribute to optimizing the content and format of first aid knowledge presented in social media. Firstly, designers and managers should always keep in mind to disseminate high-quality and credible knowledge. That is, they should pay attention to remove those inaccurate knowledge and motivate experts to produce high-quality and credible first aid knowledge. In addition, designers and educators are recommended to shed light on emotional

expression. In particular, the message should contain not only text but also animation and videos to appear vivid. Instead of pure rational description of the knowledge, an emotional tone such as great threat of medical emergencies and regret of life lost is encouraged to be involved in message. Moreover, endorsement of peers and experts on the knowledge is encouraged to be displayed clearly on social media. One possible approach to achieve this goal is that managers conduct award measures to encourage users and experts actively express their approval (e.g., like-clicking, retweet, and positive comments) on first aid knowledge on social media. Another possible approach is to design features to display endorsement signally, such as labels that indicate the rating of endorsed by peers and experts.

5.7 Summary of Study 3

This study addressed the issue of first aid knowledge adoption behavior in social media context. Drawing upon information adoption model and incorporating arousal and descriptive norms as affective and social factors, this study enriched the understanding of knowledge adoption from cognitive, affective, and social perspectives. According to the findings, information usefulness, arousal, and descriptive norms all show positive significant effects on knowledge adoption. Particularly, descriptive norms play a most significant role while arousal and information usefulness present synergistic effect. In addition, antecedents of these factors are identified from the viewpoint of informational characteristics. Suggestions are provided to practitioners on harnessing the power of arousal and descriptive norms and designing more effective knowledge representations. We hope this research can provoke further research theoretically and practically investigating knowledge adoption behavior on social media from various perspectives.

Chapter 6 Conclusions

In China, the penetration rate and level of first aid knowledge among the public are quite low. Fortunately, the speedy development of social media has brought new opportunities for first aid knowledge popularization. Broking the constraints of time and space, social media has changed traditional way of information production and dissemination, and has gradually turned into the primary channel for the public to access knowledge and information. Therefore, how to promote public to learn first aid knowledge through social media has become the key to addressing issues in first aid knowledge popularization. Based on the three stages of the knowledge learning process (i.e., knowledge learning willingness -> knowledge acquisition -> knowledge adoption), this thesis conducts three sequential studies. Specifically, study 1 explores the knowledge learning willingness from the perspective of individual motivation. Next, from the perspective of social media technical characteristics, study 2 investigates how social media interactivity influences individuals acquire first aid knowledge on social media. Aiming at the stage of knowledge adoption, study 3 examines the impact of information characteristics on knowledge adoption behavior of individuals. The three studies uncover different stages of first aid knowledge learning behavior, providing theoretical support and practical suggestions for how to improve public to learn first aid knowledge on social media.

6.1 Overall Implications

6.1.1 Theoretical Implications

First, grounded on the protection motivation theory, the motivation to learn first aid knowledge is identified, the influence mechanism of different motivations on individuals' willingness to learn is revealed, and the protection motivation theory is expanded. Specifically,

this thesis conceptualizes first aid knowledge learning as a socialized health behavior based on the social collective nature of first aid knowledge. Through qualitative analysis, the unique self-related cognitive motivations, collective-related cognitive motivations, and emotional motivations in the research context are identified. Further, the empirical analysis reveals how each motivation affects learning willingness and discovers the difference among these effects. The findings not only reveal the influence mechanism of motivations on the willingness to learn but also enrich and expand the protection motivation theory.

Second, employing the stimulus-organism-response model, this thesis describes influence paths of different dimensions of social media interactivity on first aid knowledge acquisition behavior. Through the analysis and comparison of different paths, the influence mechanism between social media interactivity and users' first aid knowledge acquisition behavior is revealed. This thesis regards social media interactivity as external environmental stimuli and defines two important individual experiences (i.e., involvement and telepresence) as organisms. Building a theoretical model, this thesis empirically verifies how social media interactivity affects first aid knowledge acquisition. In particular, this thesis analyzes and compares the effects of the three interaction dimensions finds that different interaction influences knowledge acquisition behavior by affecting different individual experiences. Therefore, this thesis outlines the impact path of different dimensions of interaction on first aid knowledge acquisition behavior, reveals the internal mechanism, enriches the literature on interactivity, and provides new theoretical insights for examining social media interactivity and individual behavior.

Third, through integrating emotional factors and social factors into the information

adoption model, this thesis confirms the joint influence of first aid knowledge's cognitive characteristics, emotional characteristics, and social characteristics on knowledge adoption behavior and expands the information adoption model. The majority of previous studies on knowledge adoption pay attention to impacts of information cognitive characteristics (e.g., the argument quality and source credibility) as well as the influence of cognitive feelings (e.g., perceived information usefulness) on adoption behavior. In this thesis, emotional factors (i.e., arousal) and social factors (i.e., descriptive norms) are included in the information adoption model for the first time, and the relative weight and interaction of the three category factors on first aid knowledge adoption are identified. Therefore, this thesis expands current information adoption model and systematically and comprehensively reveals the underlying structure of how information characteristics affect knowledge adoption behavior.

6.1.2 Practical Implications

The thesis yields several contributions for policymakers, first aid knowledge popularizers, and social media designers practically.

First, policymakers need to be aware of the significance of inducing individuals' motivations and willingness to learn first aid knowledge. Current low motivation and low willingness of the public have led to a low penetration rate of first aid knowledge in China. The findings of this thesis suggest that improving individuals' protection motivations, including collective-related cognitive motivations, self-related cognitive motivations, and emotional motivations, can effectively increase their willingness to actively learn first aid knowledge. Thus, it is beneficial for policymakers to encourage the public to develop corresponding motivations, especially collective cognitive motivations and emotional motivations. For

example, policymakers are suggested to emphasize threats to collectivity when promoting first aid knowledge and related policies. Further, policymakers could mobilize the public's emotions. For instance, by stressing the terrible outcomes of emergencies, they can heighten the regret emotion in promotional language.

Second, since social media interactivity can significantly influence first aid knowledge acquisition behavior of the public on social media, designers and managers should closely notice the interactivity feature. Results in this thesis show that multiple dimensions of social media interactivity influence first aid knowledge acquisition by affecting individuals' personal experiences. Due to the positive effect of involvement on first aid knowledge acquisition, designers are suggested to optimize the human-information interaction of social media to increase involvement. Moreover, social media managers should realize the potential of human-human interaction on telepresence and knowledge acquisition, thus developing more functions and features to facilitate interaction among social media users. The human-system interaction shows a significant impact on both involvement and telepresence, thus social media managers and designers are encouraged to simplify and smooth the interaction between social media and users.

Third, first aid knowledge popularizers and educators need to notice the effects of information characteristics on first aid knowledge adoption by the public. This thesis finds that cognitive characteristics, affective characteristics, as well as social characteristics of first aid knowledge significantly influence individuals' adoption behavior. Therefore, when producing and disseminating first aid content, practitioners should always bear in mind the need for highlighting the characteristics of first aid. For example, apart from ensuring high quality and

credible sources, educators are recommended to express emotions in the first aid content, such as using some sentiment words and emotional tone. Further, results in this thesis demonstrate that first aid knowledge social characteristics lead to descriptive norms, which show the strongest impact on first aid knowledge adoption. Hence, we suggest popularizers and educators weighting social characteristics, such as drawing and repeating the endorsement from experts and other social media users.

6.2 Limitations and Future Research

Despite some innovative achievements with theoretical and practical significance, there are still several limitations remaining to be overcome in the future.

First, research settings of this thesis are narrow. The research settings (i.e., Weibo) of this thesis are relatively simple, which makes the research results have certain limitations in terms of generalization. In addition, this thesis is based on the Chinese cultural background. The cultural divergence is likely to affect the interpretation and applicability of findings in this research. Therefore, future research can be conducted in multiple platforms and different cultural environments to test the scope and boundaries of current results and further provides more robust findings. Moreover, although this thesis focuses on first aid knowledge shared by professionals, averting the problems of inaccurate knowledge, future research may consider the challenges of misinformation on social media.

Second, the data collection sources are not rich enough. Although both semi-structured interviews and questionnaire surveys are adopted in this thesis to collect research data, the data obtained are individual subjective data, which are likely to lead to subjective bias and defects in studies of this thesis. Future studies should use mix-methods and multi-source data, such as

field experiments and design science, especially observation data, such as individuals' actual behavior data on social media, to enrich data sources and improve the effectiveness of research results.

Third, the measurement of first aid knowledge learning behavior cannot measure actual behavior. Although the questionnaire scale is an effective measurement that has been widely accepted, it cannot objectively reflect the actual behavior of individuals, causing some limitations on the accuracy of results. Therefore, in future studies, the actual behaviors of individuals should be considered. For example, scholars can use observational data to capture individuals' actual behavior. Furthermore, we recommend scholars to consider both subjective measurements and observational data to enhance the robustness of research results.

6.3 Concluding Remarks

This thesis concerns first aid knowledge popularization and highlights the crucial roles of digital technologies to diffuse the knowledge. The results provide timely references for practitioners to address issues on healthcare development in China to bring impact on the society.

First, this thesis provides insights for public health policy development in China. Current public health policy of our country focuses on the treatment and response to public diseases and dangerous accidents, while this thesis attaches importance to preventive behavior to diseases and accidents, and specifically emphasizes first aid knowledge learning behavior. This thesis advocates that the public should not only be the receivers of health care services but also the contributors to take responsibility for proactively protecting health. Thus, in addition to regulating local governments for actions in organizing and providing health care services,

policymakers are recommended to advocate active health and encourage the public to take proactive health measures to prevent disease and harm. The shift from reactive response to proactive prevention is crucial to upgrade the public health policy in China.

Second, this thesis provides a version for the application of digital technologies in first aid in this age of industry 4.0. Results in current thesis demonstrate that social media plays vital roles in first aid knowledge popularization by engaging the public to learn. With the progress of information technology, more advanced technologies such as Artificial Intelligence (AI) and cloud computing have been applied in industry and improving lives, and show great potential in facilitating first aid popularization due to powerful enabling functions. Thus, this thesis sheds light on the future trends of first aid knowledge adoption and diffusion by emphasizing the role of digital technologies.

Third, this thesis inspires society to place importance on first aid knowledge and skills, especially in Covid and Post-Covid China. During the Covid-19 pandemic, people encountered unprecedented threats to their lives; especially for patients with chronic disease, emergencies often occur. As control measures were relaxed in early 2023, 60,000 people in China died after becoming covid-infected within a month. Entering the Post-Covid era, threats are ever-present, and first aid knowledge and skills are necessary for dealing with immediate health care threats. Thus, it is paramount to learn first aid in the pandemic and post-pandemic era. The findings provide new insights on educating the public in responding to the Covid-19 pandemic by drawing on first aid knowledge.

Finally, this thesis shows potential in addressing health care issues for the aging population. The proportion of the population over 60 years old in China has reached 18.9 percent, with a

total number of 267 million. Aging, accompanied by disease outbreaks, poses huge public health challenges to society. First aid is essential for a society to deal with the sudden illness of the elderly, which can further effectively relieve the poverty of medical resources due to the aging issues. Moreover, the empirical results of this thesis illustrate that the Internet (e.g., social media) serves as a competent channel to learn health knowledge, which provides evidence for encouraging the elderly to seek health knowledge online. This can effectively solve the problem of lacking health knowledge and potentially promote health literacy and health knowledge level of the elderly.

Appendix A Interview Text Coding

Interviewee	Text example	Open coding	Axis coding	Selective coding
E2	Yeah, in case the baby gets hurt, it's a very dangerous emergency.	Dangerousness	Perceived severity	Cognitive motivations
E4	We ourselves always work overtime and stay up late, and sometimes we really think, oh, will this cause sudden death?			
E6	In fact, his situation was quite serious at the time, and I didn't know what to do.，			
E7	I think it is very dangerous, or that family and friends are very important.			
E5	It's still dangerous when no one will give first aid.			
E3	If there is no one around to give first aid, it will be very dangerous if there is a sudden cardiac arrest, and it will be difficult to save it.			
E9	Sudden death in the industry, or some children who were not rescued after something happened, just like that, people will gradually pay attention to this matter.			
E5	He suffocated in a very short time, and he couldn't be saved.	Urgency		
E2	Those emergencies are dangerous, and it's too late to find a doctor.			
E8	In fact, the original intention was mainly because there were colleagues around me who encountered such a tense and urgent situation.			
E4	If the family members have physical problems, knowing how to give first aid in case of emergency is necessary.			
E3	You don't realize that this is actually related to everyone until you have no problems with your body.	Relevance	Perceived vulnerability	
E6	In fact, it is some basic medical knowledge, which I think everyone needs to master.			
E8	I think it is a very necessary skill for everyone.			
E9	Everyone may face this problem in their life.			
E10	Whether it is yourself or the dearest person around you, or someone you don’t know, this situation may happen.	Susceptibility		
E7	This is likely to happen to family members, relatives, and friends.			

E9	For example, there are still accidents like this in the Beijing subway, such as another person falling down, etc.			
E5	Maybe it happens when you are exercising, or when you are working, or when you are living at home, it can happen at any time.			
E1	It is very likely that people around you will encounter this situation.			
E3	Because everyone is walking outside, maybe an accident will happen at any time.			
E6	Young people go out more and are more likely to encounter accidents, so they should add some first aid knowledge.			
E2	Children can easily face this kind of first aid situation.			
E9	They always say that the child's physique is not good, and he may be born weak.	Fragile body		
E4	Children are prone to choking on food, that is, children often stuff things into their mouths.			
E10	When the father was looking after the child at home, the child ate and accidentally choked the trachea.			
E6	Children will die suddenly, such as eating a jujube, eating jelly, eating peanut kernels, and finally block the trachea.			
E7	The elderly in the family is also getting older, um, there are also problems such as three highs.			
E3	Everyone is under a lot of work pressure, and their health is getting worse.			
E5	If you encounter some very critical situations, you can also reach out to help others	Offer help	Response efficacy	
E1	If I have learned this skill myself, then when I am faced with this situation, I can help.			
E6	I just felt the need to help them.			
E8	I just want to learn something and then help myself and others.			
E9	For those in need, if there is no professional medical treatment or personnel around, then you can help others.			
E2	Being able to help others at a critical moment is also to protect yourself.			
E1	I completely refreshed my previous understanding and learned a lot of useful knowledge.	Improve cognition		
E4	It is very helpful to know when to send the patient to the hospital and what kind of situation does not need to be judged.			
E2	If I really encounter it, I am not sure if I can operate it well. Learning this at least means that we			

	know this method.			
E8	It may be limited to learn from social media, but at least people have the awareness to pay attention and to learn.			
E9	Anyway, there is some improvement, but the improvement is definitely limited, after all, I am not a professional.			
E10	Perhaps more is to assist you to supplement and update knowledge.			
E4	For young people, there should be no problem in learning. For the elderly, their memory is also relatively degraded, and they may need to study repeatedly.	Comprehension ability	Self-efficacy	
E3	If there is a foundation, if I read it online again, I can understand the above things relatively quickly.			
E7	Some professional terms and expressions may be involved, and it may be difficult to understand.			
E2	On social media, first aid information is presented in the form of text or video, which is easier for me to understand.			
E1	I think it depends on the knowledge; you have to ensure that you can judge that it is correct.	Judgement ability		
E6	As an ordinary person who has no knowledge of this aspect, it is difficult for him to distinguish right or wrong. If he believes it easily, he will create a preconceived and wrong concept for himself.			
E2	Maybe you need to judge by yourself. For us enlightened people, it is very simple to judge, because maybe we have understood			
E9	For example, if some people see an old man falling down and pinch him, then it must be a wrong judgment and it is useless.			
E4	The knowledge level of the audience is a big issue right now.	Knowledge level		
E5	Some people have many folk remedies, and they come from various angles.			
E8	The corresponding knowledge level of modern people has improved in all aspects, so if it is online learning, there should be no problem.			
E10	First aid knowledge is not something only professionals can master. If everyone is willing to learn it, they can learn it.			
E1	First aid tests a person's professional skills, proficiency, and the correct use of it.	Operability skills		
E2	At the beginning, I did not understand many things; after a long time, gradually understanding some things.			

E4	The treatment of burns at home, this kind of trial still needs to be read more to understand.			
E6	Those with relatively small operability can be learned by everyone, and those with relatively strong operability may only have one concept.			
E5	I don't think it's useful when I don't encounter it, but once I encounter it, I'm blinded if I haven't learned it.	Concern on future	Anticipated regret	Emotional motivations
E3	This thing must be met, just don't leave any regrets, just in case there is any problem.			
E4	If you really encountered this kind of sudden cardiac arrest, if you have to wait for the ambulance, it can only be terminated.			
E7	I am afraid that the child will have some sudden incidents at home, such as choking on food, so I went to learn.			
E10	I worried that people around me may have problems, and meeting people who can't deal with them.			
E6	If there was first aid on the scene at the time, maybe it could be rescued, but in fact, no one at the scene would do this.	Pity		
E9	I think it's a pity, but if there is someone nearby who can rescue him immediately, he might be able to be rescued.			
E8	If you have this knowledge, you can help, so that such an accident will not happen, I feel it is a pity.			
E5	While we cannot control accidents as they happen, we can learn how to cope and avoid more regrets.			
E1	At the very least, I don’t want that in the future, because in the situation that my previous colleagues had, I feel very regretful that I didn’t learn this knowledge.	Regret		
E4	I hope that I have the ability to help others, and I don't want to regret because I don't know first aid.			
E5	I want to learn first aid because I don't want to regret it when I'm in danger.			
E7	Once someone faints, if the people around them do not have first aid knowledge and timely help, it is very likely that they cannot be rescued, and they will feel very heartbroken.			
E9	The influence of social media is gradually increasing.	Social media accessibility	Perceived usefulness	Social media characteristics
E7	I am basically on Weibo now; I basically use that Weibo as Baidu.			
E4	First aid is usually out of reach, and there are more people who pay attention to this on Weibo.			
E2	Social media is a good way to reach knowledge for the masses, and it can and can take into account different levels of education and career.			

E1	In fact, if there is no online channel, I would not have the opportunity to contact and learn professional first aid knowledge.			
E5	Through online learning, I think there should be no problem in mastering skills.	Social media effectiveness		
E9	On this platform, I think popularizing first aid knowledge is effective.			
E2	Use social media to learn about first aid at very low cost.			
E6	Video explanations, simulated animations, and text descriptions on social media will give people a general understanding of first aid.			
E4	Social media is very handy for people who want to learn about first aid.	Social media convenience	Perceived ease of use	
E1	To find time in the fragmented time, and you will be able to obtain some knowledge more easily on social media.			
E7	It is a very fast and very convenient channel.			
E8	I think social media is a great way to do that. I'm very busy with work and don't have time to attend offline training courses. With social media, I can learn anytime.			
E5	Professional first aid knowledge on social media is crushed, and then processed into very simple content that the public can understand and accept.	Easy understanding		
E8	The knowledge explained on social media is more detailed and specific.			
E3	There are many simulated animations on social media, giving a very good demonstration that can help the public understand first aid.			

Appendix B Measurement of Study 1

Construct	Questions	Related research
Perceived severity of self	If I am caught in an emergency that requires first aid, it will be severe. If I am caught in an emergency that requires first aid, it will be serious. If I am caught in an emergency that requires first aid, it will be significant.	(Johnston & Warkentin, 2010)
Perceived severity of the collective	If people around me (e.g., my family/friends/colleagues) are caught in an emergency that requires first aid, it will be severe. If people around me (e.g., my family/friends/colleagues) are caught in an emergency that requires first aid, it will be serious. If people around me (e.g., my family/friends/colleagues) are caught in an emergency that requires first aid, it will be significant.	(Johnston & Warkentin, 2010)
Perceived vulnerability of self	I am at risk for being caught in an emergency that requires first aid. It is likely that I will be caught in an emergency that requires first aid. It is possible that I will be caught in an emergency that requires first aid.	(Johnston & Warkentin, 2010)
Perceived vulnerability of collectivity	My family/friends/colleagues are at risk for being caught in an emergency that requires first aid. It is likely that my family/friends/colleagues will be caught in an emergency that requires first aid. It is possible that my family/friends/colleagues will be caught in an emergency that requires first aid.	(Johnston & Warkentin, 2010)
Response efficacy to self	Learning first aid knowledge on social media works to protect me. Learning first aid knowledge on social media is effective in protecting me. When I learn first aid knowledge on social media, my safety is more likely to be protected.	(Johnston & Warkentin, 2010)
Response efficacy to the collective	Learning first aid knowledge on social media works to protect my family/friends/colleagues. Learning first aid knowledge on social media is effective in protecting my family/friends/colleagues. When I learn first aid knowledge on social media, the safety of my family/friends/colleagues is more likely to be protected.	(Johnston & Warkentin, 2010)
Self-efficacy	Learning first aid knowledge on social media is easy for me. Learning first aid knowledge on social media is convenient for me. I am able to learn first aid knowledge on social media without much effort.	(Johnston & Warkentin, 2010)
Collective efficacy	Learning first aid knowledge on social media is easy for my family/friends/colleagues. Learning first aid knowledge on social media is convenient for my family/friends/colleagues. My family/friends/colleagues are able to learn first aid knowledge on social media without much effort.	(Johnston & Warkentin, 2010)

Anticipated regret	There is a high probability that I would regret it if I failed to learn first aid knowledge to cope with an emergency. I would feel very worried if I had no first aid knowledge to cope with an emergency. If I came across an emergency but had no first aid knowledge to cope with it, I would regret it.	(Verkijika, 2018)
Willingness to learn	I would plan on learning first aid knowledge on social media in the future. I would intend to continue learning first aid knowledge on social media in the future. I expect my learning of first aid knowledge on social media to continue in the future.	(Darban & Polites, 2016)
Perceived usefulness	Using social media improves my learning performance. Using social media in my learning increases my productivity. Using social media enhances my effectiveness in learning. I find social media to be useful in my learning.	(Venkatesh & Bala, 2008)
Perceived ease of use	My interactions with social media are clear and understandable. Interacting with social media does not require a lot of my mental effort. I find social media to be easy to use. I find it easy to get social media to do what I want it to do.	(Venkatesh & Bala, 2008)

Appendix C Measurement of Study 2

Construct	Questions	Related research
Human-information interaction	I can easily and effectively search for first aid knowledge by using social media. I can easily filter first aid knowledge by using social media. I can quickly and easily access first aid knowledge by using social media.	(Lin & Chang, 2018)
Human-system interaction	When I use social media, there is very little waiting time between my actions and the computer's response. Pages on social media usually load quickly. The range of what can be manipulated on social media is wide.	(Rodríguez-Ardura & Meseguer-Artola, 2016)
Human-human interaction	I can easily communicate with others by using social media. I can easily exchange and share opinions with others by using social media. I can easily connect with other people by using social media.	(Lin & Chang, 2018)
Involvement	The first aid knowledge on social media is important to me. The first aid knowledge on social media is relevant to me. The first aid knowledge on social media means a lot to me. The first aid knowledge on social media is fascinating to me.	(Tseng & Wang, 2016)
Telepresence	When I learn first aid knowledge on social media, I feel I am more in the “computer world” than in the “real world” around me. I forget about my immediate surroundings when I learn first aid knowledge on social media. I feel like I am in a “virtual reality” when I learn first aid knowledge on social media.	(Zhao et al., 2020)
Knowledge acquisition	Within the last 6 months, how often did you collect first aid knowledge on social media?	(Basic & Erdelez, 2015)

Appendix D Measurement of Study 3

Construct	Questions	Related research
Knowledge adoption	I intended to adopt knowledge on social media and learn first aid skills. I intended to use knowledge on social media to improve my first aid skills. I intend to follow knowledge on social media and think or do what was suggested.	(Chou et al., 2015; Tseng & Wang, 2016)
Perceived information usefulness	First aid knowledge on social media will make my first aid skill learning faster. First aid knowledge on social media will make my first aid skill learning better. First aid knowledge on social media is useful in my first aid knowledge learning.	(Bhattacherjee & Sanford, 2006)
Arousal	The first aid knowledge makes me feel active. The first aid knowledge makes me feel excited. The first aid knowledge makes me feel stimulated.	(Liu et al., 2013)
Descriptive norms	I believe other participants adopt first aid knowledge on social media. I am convinced other participants adopt first aid knowledge on social media. It is likely that the majority of other participants adopt first aid knowledge on social media.	(Herath & Rao, 2009)
Argument quality	The first aid knowledge provided on social media was informative. The first aid knowledge provided on social media was helpful. The first aid knowledge provided on social media was valuable.	(Bhattacherjee & Sanford, 2006)
Source credibility	The person providing first aid knowledge was knowledgeable on this topic. The person providing first aid knowledge was trustworthy. The person providing first aid knowledge was credible.	(Bhattacherjee & Sanford, 2006)
Message vividness	First aid knowledge demonstration on social media is animated. First aid knowledge demonstration on social media is lively. I can acquire first aid knowledge from different sensory channels.	(Jiang & Benbasat, 2007)
Emotional tone	The expression of the first aid knowledge on social media is rational—emotional. Objective—subjective Tangible—intangible	(De Keyzer et al., 2017)
Peer endorsement	Favorable comments from peers in social media make me feel that the first aid knowledge is valuable. The number of likes from peers in social media makes me feel that the first aid knowledge is valuable. The number of forwards from peers in social media makes me feel that the first aid knowledge is valuable.	(Cheng et al., 2019)
Expert endorsement	The testimonials on first aid knowledge from experts are attractive to me. The testimonials on first aid knowledge from experts are useful to me. The testimonials on first aid knowledge from experts are valuable to me.	(Lim et al., 2006)

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