Article

Exploring the determinants of health knowledge adoption in social media: An intention-behavior-gap perspective

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Abstract
Health knowledge plays an important role in health education and promotion, in providing critical services to the global population and helping them live healthier lives and make informed health decisions. This study explores what determines health knowledge adoption in the context of Chinese social media, and attempts to explain why there is a gap between health knowledge adoption *intention* and *behavior*. Based on the ELM (elaboration likelihood method) and EPPM (extended parallel process model), this paper proposes four processes of health knowledge adoption to construct an explanatory framework, and examines it from the intention-behavior gap perspective, highlighting the mediating effect of trust. Data collected from 355 Chinese respondents was tested using a partial least squares (PLS) approach. The results indicate that perceived threat has a positive effect on health knowledge adoption via the mediator, fear; perceived efficacy has a positive direct effect on health knowledge adoption; and perceived knowledge quality and perceived source credibility both have a positive effect on health knowledge adoption via the mediator, trust. Trust and fear have different impacts on health knowledge adoption intention and behavior, which explains why there is sometimes a gap between them. Theoretical and practical contributions are discussed.

Fear has a more positive effect on the intention to adopt health knowledge than on actual health knowledge adoption.

Introduction

Social media have become important in the dissemination of health information, as well as in healthcare marketing. Facebook, YouTube, and Twitter serve these functions outside China. In China, QQ and WeChat are the most active social media, with QQ

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reporting 853 million, and WeChat 697 million, active users per month, according the 2015 Tencent user report (2015). Meantime, 'public number' has been the most popular medium embedding in the WeChat. Public number is a new and flexible service platform nesting in users' social networking to push information and conduct service. It includes service public number, enterprise public number and subscription public number. Service public number provides services for enterprises and users, such as huaweicorp, a public number affiliated to HUAWEI company where you can purchase products; Enterprise public number provides mobile application entrance for businesses and organizations to help enterprise establish connections among employers, employees and suppliers; Subscription public number provides a new way of information dissemination to the individuals, such as health366 and baojiandaifu, two very popular public numbers pushing healthcare and disease precaution knowledge.

Social media offer technology-based interventions that facilitate health knowledge diffusion and application. But unlike health knowledge posted by authoritative organizations, such as hospitals, doctors, and healthcare centers, there is a great deal of misleading user-generated health information, some of which is no more than rumors or gossip, inhibiting the diffusion and translation of real health knowledge. For example, rumors about the H1N1 virus in Japan and the H7N9 virus in China both led to widespread trust crises with authorities (Shigemura et al., 2015). The 2013 rumor about the hepatitis B vaccine resulted in a serious public health crisis. Misleading information and rumors, such as "Milk causes cancer," "Calcium supplements can cause kidney stones," "GM foods kill your grandchildren," "Red wine can prevent heart disease," have permeated social media and confused users who seek health truths (Liu, 2014). Particularly, in the Weizexi event, the student Weizexi, who suffered synovial sarcoma, retrieved the Second Hospital of Beijing Armed Police Corps on the Baidu search engine and died due to medical fraud, which has attracted the attention of the people throughout the country to the Internet health information. In fact, according to a report from Life Time, the first health weekly in China (affiliated to the Global Times), 42.2% of social media users have been affected by such deceptions, which will certainly influence users' intention to adopt the health knowledge in the future.

Furthermore, the gap between health knowledge adoption intention and behavior also restrains the actual practices of health knowledge. Although prior researches have examined that intention was the proximal antecedent of behavior enactment, and regard it as the best predictor of behavior, sometimes intention does not predict behavior well, and only accounts for less than one-third of the variance in behavior (Webb and Sheeran, 2006). As shown in a meta-analysis using the action control framework, the overall intention-to-physical activity gap is 46% (Rhodes and Bruijn, 2013). The gap between health-related intentions and health behaviors is exacerbated by several complex factors. For instance, in healthy diet, physical activity, hand washing and hygienic food handling (Ferrer et al., 2016; Fulham and Mullan, 2011), such gaps are evident. The intention/behavior gap in terms of health behaviors moreover depends on language barriers, a priori knowledge, user openness and interest, and user confidence (Chirawattanakij and Vathanophas, 2016).

Arousing more people to pay attention to health knowledge, and to adopt healthier living practices, have been critical problems in health education and communication. We explore what determines the adoption of health knowledge in the Chinese social media context from an intention-behavior-gap perspective, with a view to reducing the gap.

Theoretical hackground

Fear appeals and EPPM

Fear appeals have long been used in persuasive messages to motivate people to perform adaptive behaviors (Boss et al., 2015). As proposed in fear appeal theory, persuasive messages that warn of personal threats arouse fear by highlighting the potential danger if message recipients do not adopt the messages' recommendations (Dillard et al., 1996). According to protection motivation theory (PMT), individuals will take measures to protect themselves as long as they perceive potential harm. Based on this major tenet, the linear model of fear appeal, the curvilinear model, the health belief model, the stage model, the parallel process model (PPM) and the extended parallel process model (EPPM), are six prominent theories have been applied to predict the impact of fear appeals.

The extended parallel process model is an extension of PPM proposed by Witte. It enlarges upon prior research to explain why fear appeals fail, reincorporates the central variable of fear and specifies the relationship between threat and efficacy (Witte, 1992; Shi and Smith 2015). It argues that two
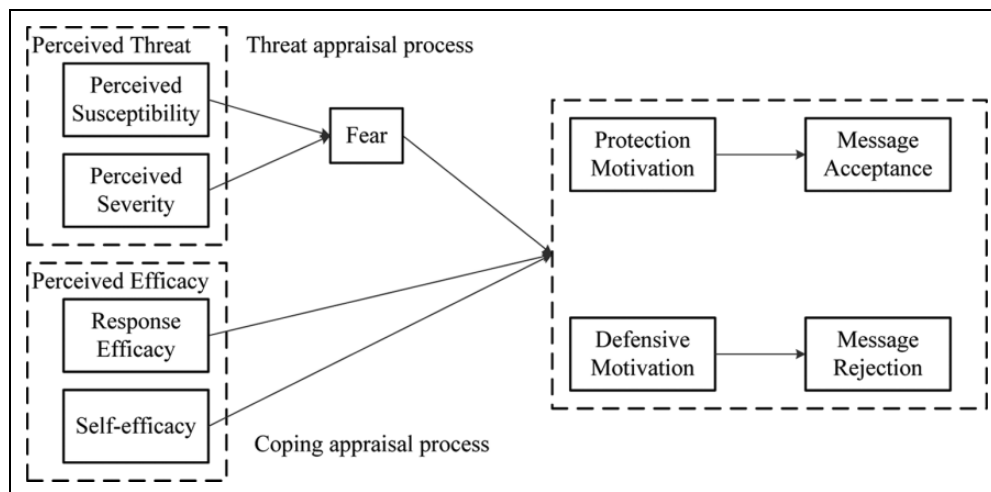
Figure 1. Extended Parallel Process Model (EPPM, according to Witte, 2001).

cognitive appraisals of the message will occur, namely threat appraisal and coping appraisal process, when an individual is exposed to a fear appeal (Witte et al., 2001). As elaborated in Figure 1, in the process of threat appraisal, perceived susceptibility and perceived severity are two critical factors that affect a message recipient and motivate him or her to take protective measures, such as accepting a message and its suggestions, or taking defensive measures, such as rejecting the message if overwhelmed by fear (Witte, 1994; So et al., 2016). In the process of coping appraisal, response efficacy and self-efficacy are two critical factors that can weaken the fear in the threat appraisal, because individuals are prone to adopt recommendations if their response efficacy and self-efficacy are effective, even if they perceive a high level of fear. On the other hand, message recipients will choose to ignore the message and escape from the fear if their response efficacy and self-efficacy are low (i.e., the message will backfire).

ELM and trust

The elaboration likelihood model (ELM) is a theory arguing that individuals change their attitudes through a dual-route persuasion process that includes central route persuasion and peripheral route persuasion (Petty et al., 1983). In the central route, the recipient experiences high levels of elaboration and devotes much cognitive energy to the message, to generate their own thoughts in response to the information to which they are exposed (Angst and Agarwal, 2009). In peripheral route persuasion, the recipient experiences low levels of elaboration and may ignore the information content, due in part to his prior

knowledge, or his motivation and ability to expend the effort to absorb the information (Petty and Cacioppo, 2012). Both routes suggest attitudes are formed and modified as the user processes information and are usually involved as a mixture in the influence processes—although the central and peripheral routes are viewed as the extremes of a single elaboration dimension (Sussman and Siegal, 2003). Figure 2 presents the classic elaboration likelihood model.

ELM has been widely applied in the field of socio-psychology to describe how people process information, and how they form their attitudes to behavior. Sussman and Siegal (2003) integrated the technology acceptance model with ELM to investigate how knowledge workers are influenced to adopt the advice that they received in mediated contexts; they highlighted the assessment of information usefulness as a mediator of the information adoption process. Later, many researches began to focus on perceived usefulness and ELM to investigate questions in a variety of fields. For instance, Chung et al. (2015) adopted this model to investigate travel information adoption in social media with the moderating effect of social presence. Tseng and Wang (2016) investigated the individual information adoption process on travel websites under the influence of perceived risk via the integrated model of ELM and perceived usefulness. Angst and Agarwal (2009) integrated an individual's concern for information privacy with the ELM to examine individuals' attitudes toward electronic health records systems. Li (2013) attempted a theoretical extension of the elaboration likelihood model with the social influence theory. Although some researchers have attempted to extend the ELM, there is little research pertaining to the effect
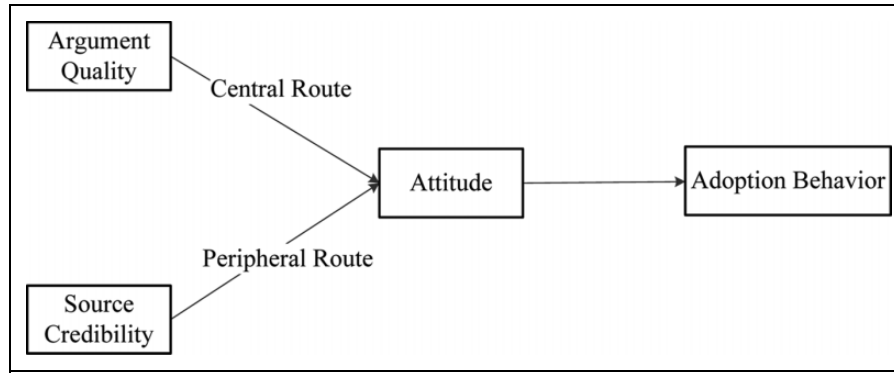
Figure 2. Elaboration likelihood model framework.

of trust on user behavior. That is the point that this paper explores—the mediator of trust on adoption of health knowledge promulgated by many public numbers on WeChat.

Research model and hypotheses

Health knowledge adoption intention and behavior

Health knowledge adoption includes health knowledge adoption intention and adoption behavior. Adoption intention signifies an individual's preference, plan and possibility about the adoption, while behavior signifies actual practices of adoption (Limayem et al., 2007). As argued in the theory of reasoned action, theory of planned behavior, theory of attitude behavior and theory of protection motivation, intention is the proximal antecedent of behavior enactment, and is believed to be the best predictor of behavior; people generally do what they intend and don't do what they do not intend. In the context of health knowledge, the intentions to adopt the health knowledge signify recipients' attitudes and cognition toward the health knowledge in the process of health knowledge learning, absorption and reservation. The absorbed and preserved knowledge is easily deduced from the mind and translated into subsequent knowledge application. Therefore, health knowledge adoption intention might contribute to the actual health knowledge adoption. Thus, we propose the following:

> **H1:** Health knowledge adoption intention positively affects health knowledge adoption behavior.

Threat appraisal process, fear, and perceived threat

In the process of threat appraisal, fear plays a mediator role to connect the message stimulus with the response of intention and behavior. Fear is conceptualized as a negative emotional reaction to messages (Popova, 2012). As proposed in prior studies, fear can induce people to accept health recommendations to eliminate fear (Hajian et al., 2015; Boss et al., 2015). In the context of social media, if health knowledge put forward by public numbers or others is filled with serious symptoms and bad outcomes with pictures and videos, these may arouse fear, and may contribute to user health knowledge adoption intention and acceptance of behavior recommendations. Thus, we propose the following:

> **H2:** Fear positively affects health knowledge adoption intention.
>
> **H3:** Fear positively affects health knowledge adoption behavior.

In the process of threat appraisal, perceived threat acts as a stimulus to induce an emotional response to the information. Perceived threat, a subjective evaluation about the threat contained in the message, is composed of two critical dimensions: the perceived probability of the undesirable result, and the perceived cost if the result comes true (Berenbaum et al., 2007). As defined in earlier studies, perceived vulnerability is a subjective evaluation about the amount of risk that exists from not performing certain recommendations (Popova, 2012). Perceived severity is defined as a subjective evaluation about the cost associated with performing a specific behavior. For the health knowledge posted in the social media, different individuals may have different perceptions of vulnerability and severity toward the undesirable outcome and the unhealthy condition suggested in the health knowledge. So different perceptions about vulnerability and severity may result in different levels of
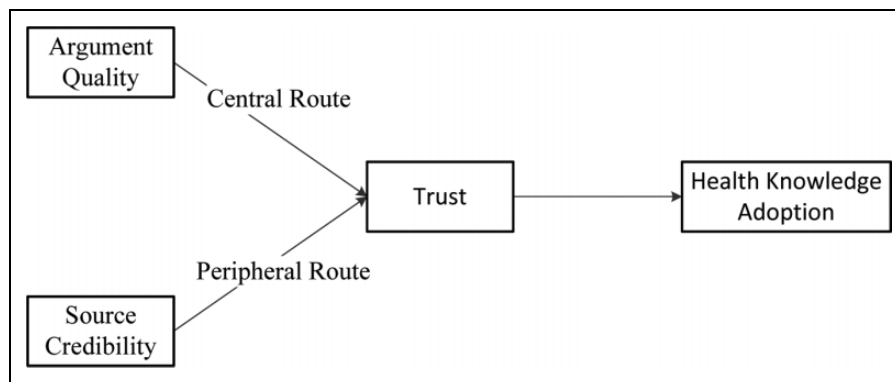
Figure 3. The mediator of trust in the ELM of health knowledge adoption.

fear in reaction to the health knowledge. Thus, we propose the following:

> **H4:** Perceived threat positively affects fear.

Coping appraisal process and perceived efficacy

In the process of coping appraisal, perceived efficacy has a determinant impact upon the subjective evaluation of efficacy, consisting of response efficacy, efficacy of recommendations and suggestions embedded in a persuasive message in response to undesirable outcomes and potential threats, and self-efficacy, an individual's confidence in their ability to respond to the potential problems and to follow established coping guidelines in the messages (Witte, 1994; Redmond et al., 2015). As examined in prior studies, individuals who score high on response efficacy or self-efficacy are more likely to perform the recommendations. For example, exercise during pregnancy (Redmond et al., 2015), quitting smoking (Barbeau et al., 2013), social acceptance of nuclear power plants (Song et al., 2013), early preventive dental visits (Natoshia et al., 2013), intention for vaginal delivery (Hajian et al., 2015), and motivation to eat more fruits and vegetables (Napper et al., 2013). For health knowledge in social media, people might be prone to adopt knowledge that is in conformity with their existing knowledge, and perform the recommendations embedded in the knowledge for coping with the undesirable outcomes and threats. Thus, we propose the following:

> **H5:** Perceived efficacy positively affects health knowledge adoption intention.
> **H6:** Perceived efficacy positively affects health knowledge adoption behavior.

Trust

Trust has long been regarded as a catalyst for transactional relationships in such diverse areas as economics, communication and sociology, and also as an essential for understanding interpersonal behaviors and economic exchanges (Pavlou, 2003). Some researchers argue that trust can lead to risk-taking in a relationship. They suggest that the more trust, the more risk one is willing to take (McEvily et al., 2003). For health care education, the more trust in health knowledge, the more willingness to risk adopting the knowledge—despite the fact that much information on social media is misleading, and even deceptive (Lim and Kim, 2012). So the trust may be essential in getting health knowledge to affect individual behavior. Thus we highlight the assessment of trust in knowledge as a mediator of health knowledge adoption. The model is presented in Figure 3.

We propose the following:

> **H7:** Trust positively affects health knowledge adoption intention.
> **H8:** Trust positively affects health knowledge adoption behavior.

Central route process and perceived knowledge quality

As argued in the ELM, argument quality makes a contribution to attitude or trust through the central route. In the knowledge context, knowledge quality plays the role of argument quality to construct trust in knowledge. Knowledge quality is an objective evaluation of the knowledge according to rigid guidelines and standards. The literature recognizes that the identification of high-quality knowledge is a challenge due to the wide range of knowledge quality (Poston

and Speier, 2005; Dong, 2014). On the other hand, perceived knowledge quality is a subjective evaluation of knowledge that depends on individuals' prior experience, professional knowledge, and the situation of perceptions. According to sense-making theory, perception of knowledge quality is a dynamic progress that integrates intrinsic values of the knowledge and the specific situation of translating knowledge into action (Dong, 2014). Some researchers have divided knowledge quality into intrinsic knowledge quality, contextual knowledge quality, and actionable knowledge quality (Dong, 2014), and verified the greater relevance of contextual knowledge quality to knowledge quality (Dong et al., 2011).

In social media, high perceived health knowledge quality may be increasingly critical in determining trust in health knowledge, due to excessive advertisements and overload of misleading health information, even rumors, much of which is difficult to distinguish from real knowledge. We therefore introduce perceived knowledge quality, consisting of intrinsic knowledge quality, contextual knowledge quality, and actionable knowledge quality, to predict the trust of individuals in health knowledge in the social media. Thus, we propose the following:

> **H9:** Perceived knowledge quality positively affects trust.

Peripheral route process and perceived source credibility

The effect of perceived source credibility on information adoption has been extensively investigated through questionnaire surveys and experiment design, such as the adoption of travel information in user-generated content (Chung et al., 2015), the evaluation of online health information (Kim et al., 2011), and the formation and transformation of attitudes in response to a topic advocated in communication campaigns (Tarcan et al., 2010). Perceived source credibility focuses on perceived expertise, which emphasizes the accumulation of competence, skill, or knowledge through experience, and perceived trustworthiness, which attributes the motives of a source to persuade users to adopt particular information. As examined in previous studies, source credibility allows people to take a shortcut in decision-making through a peripheral route instead of complex cognitive processing. Source credibility has been most important for non-experts to evaluate a message (Sussman and Siegal, 2003).

In social media, persuasive messages are usually browsed in a context where browsers are submerged in the streams of numerous persuasion attempts, one after another, rather than an isolated context (Tormala et al., 2007). Under such multiple-message situations, source credibility may make a more important contribution to recipients' response to persuasion than other factors. Furthermore, with the flood of unreliable health knowledge posted by many public numbers, source credibility may become an important factor to use as a filter before attempting to evaluate health knowledge in the social media. This led us to construct the variable *perceived source credibility*, consisting of the platform the health knowledge presents and the provider of this knowledge, from the perceived expertise and perceived trustworthiness perspectives, to predict user trust in health knowledge in social media. We propose the following:

> **H10:** Perceived source credibility positively affects trust.

Based on the theoretical background and hypotheses development mentioned above, we integrate EPPM and ELM, highlighting the mediator of trust, and construct a conceptual model respectively from the intention and behavior perspectives to predict the health knowledge adoption, and attempt to explore why there is the gap between intention and behavior in social media. The overall research framework is shown in Figure 4.

Research methodology
Measurement development

Following the above analysis, twelve constructs were constructed in the conceptual research model. To ensure the validity of the scale, most items used to measure the constructs are adapted from previous studies on a seven-Likert scale, in order to fit the research context, from *strongly disagree* to *strongly agree*. Three items regarding health knowledge adoption behavior are adapted from Chou et al. (2015); three items on health knowledge adoption intention are adapted from Liao (2012), Chirawattanakij and Vathanophas (2016), and Chou et al. (2015); three items on fear are adapted from Boss et al. (2015). The perceived threat is constructed via perceived vulnerability and perceived severity, adopted respectively from Tyc et al. (2006) and Boss et al. (2015). Perceived efficacy is constructed based on response efficacy and self-
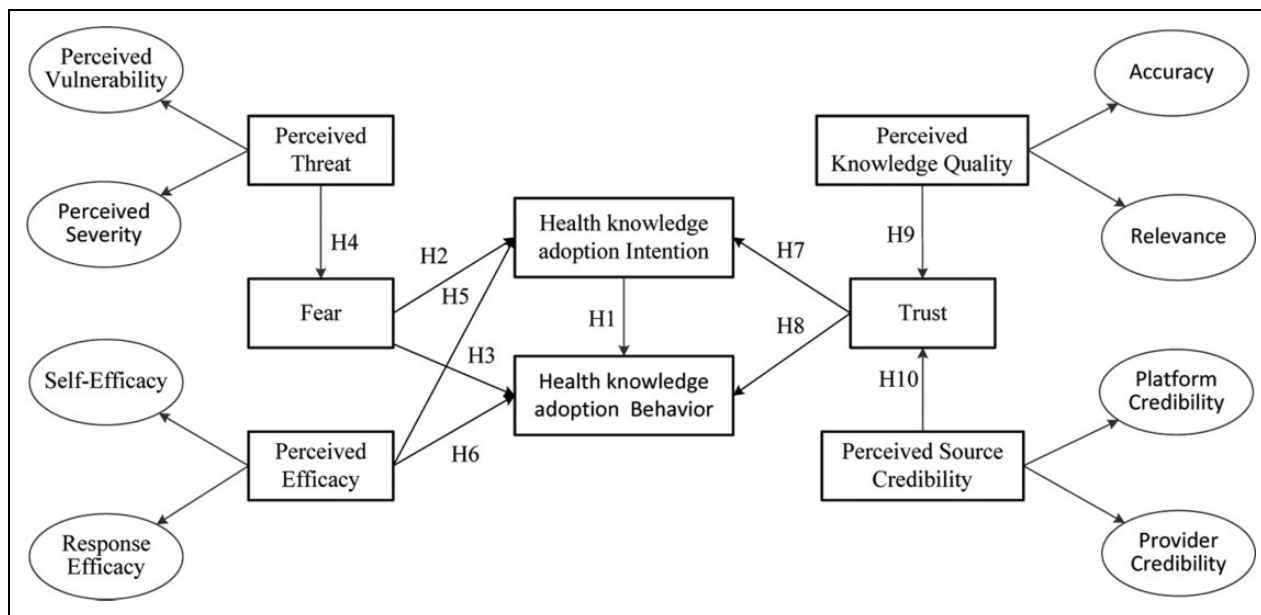
Figure 4. Health Knowledge Adoption Research Model.

efficacy referenced from Boss et al. (2015). Three items about trust were referenced from Cazier et al. (2007) and Awad and Ragowsky (2008). Perceived knowledge quality is constructed via accuracy and relevance, adapted respectively from Cheung et al. (2008) and Citrin (2001). Perceived source credibility is adapted from Chou et al. (2015), and consists of platform credibility and provider credibility. Questionnaire details are presented in Appendix A.

Data collection and descriptive analysis

To ensure the data quality of the experiment and questionnaire, we design a screening mechanism by asking the question, "Do you look up related health knowledge in the social media and do you pay attention to health WeChat public numbers?" We called participants sampled randomly in WeChat. Unless answers to both questions are yes, the participants participate in the research only with regard to WeChat. Naturally, the participants will get some bills as reward through WeChat red envelope until their questionnaires are checked by hand. After 25 days' collection, we ended up with 385 responses and 355 effective ones after strict filtering, excluding the few time-paid questionnaires that fell far below the mean time and incomplete questionnaires. The valid rate is 92.2%. Of the 355 valid samples, 86.2% were 18 years old to 25 years old. There are more young users in the sample, which may be explained by the young demographics of WeChat: The Tencent user data report of 2015

indicates that 45.40% of WeChat users are $18 \sim 25$, and 74% are $20 \sim 30$. So the sample used in this study may represent the WeChat user population to some extent. Table 1 displays the demographic information in detail.

Measurement model

The partial least squares (PLS) method is adopted in this research to test the measurement model and structural model. The samples are examined to test their validity, such as reliability, convergent validity, and discriminant validity.

Reliability and convergent validity analysis

Reliability refers to the internal consistency of items constituting constructs, and can be estimated using composite reliability and Cronbach's alpha (Fornell and Larcker, 1981). Convergent validity can be estimated using item loading and average variance extracted (AVE) (Fornell and Larcker, 1981). As shown in Table 2, all item loadings are above the desired level, 0.7, and all the Cronbach's alphas of the constructs exceed 0.8. Meanwhile, CR and AVE both exceed the desired level. Therefore, both reliability and convergent validity are supported.

Discriminant validity

Discriminant validity indicates the extent to which a given latent variable is different from other latent
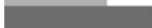
Table 1. Demographics of the research sample.

Characteristics	Range	Number		Percentage (%)
Gender	Male	145		40.8
	Female	210		59.2
Age	18 below	3		0.8
	18~25	306		86.2
	26~30	24		6.8
	31~40	15		4.2
	41~50	6		1.7
	50 above	1		0.3
Income level	1000 below	151		42.5
	1000~3000	85		23.9
	3001~5000	28		7.9
	5001~7000	24		6.8
	7001~10000	38		10.7
	10000 above	29		8.2

Table 2. Scale properties.

Variables	Items	Loadings	Mean	Cronbach's alphas	CR	AVE
Health knowledge adoption behavior	BEH1	0.941	3.319	0.944	0.964	0.899
	BEH2	0.948				
	BEH3	0.955				
Health knowledge adoption intention	INT1	0.918	4.446	0.930	0.956	0.878
	INT2	0.947				
	INT3	0.946				
Fear	FEA1	0.942	5.007	0.952	0.969	0.913
	FEA2	0.958				
	FEA3	0.966				
Perceived vulnerability	PEV1	0.948	3.173	0.932	0.957	0.880
	PEV2	0.920				
	PEV3	0.946				
Perceived severity	PES1	0.967	3.944	0.970	0.980	0.943
	PES2	0.981				
	PES3	0.965				
Self-efficacy	SEE1	0.884	3.869	0.852	0.910	0.771
	SEE2	0.851				
	SEE3	0.899				
Response efficacy	REE1	0.958	3.642	0.944	0.964	0.899
	REE2	0.949				
	REE3	0.937				
Trust	TRU1	0.968	3.183	0.961	0.975	0.928
	TRU2	0.959				
	TRU3	0.964				
Relevance	REL1	0.953	3.396	0.908	0.956	0.915
	REL2	0.960				
Accuracy	ACC1	0.963	2.999	0.919	0.961	0.925
	ACC2	0.961				
Platform	PLA1	0.953	3.014	0.887	0.947	0.898
	PLA2	0.942				
Provider	PRO1	0.974	2.821	0.947	0.974	0.950
	PRO2	0.975				

Table 3. Correlations between constructs.

	BEH	INT	FEA	PEV	PES	SEE	REE	TRU	REL	ACC	PLA	PRO
BEH	**0.948**											
INT	0.547	**0.937**										
FEA	0.261	0.511	**0.955**									
PEV	0.206	0.205	0.348	**0.938**								
PES	0.399	0.391	0.398	0.429	**0.971**							
SEE	0.366	0.313	0.088	-0.051	0.132	**0.878**						
REE	0.779	0.524	0.270	0.180	0.405	0.411	**0.948**					
TRU	0.766	0.410	0.170	0.213	0.421	0.311	0.736	**0.964**				
REL	0.687	0.402	0.261	0.318	0.433	0.318	0.698	0.737	**0.957**			
ACC	0.730	0.379	0.144	0.251	0.374	0.267	0.691	0.835	0.778	**0.962**		
PLA	0.628	0.332	0.128	0.217	0.362	0.244	0.595	0.728	0.611	0.717	**0.948**	
PRO	0.644	0.344	0.168	0.245	0.347	0.249	0.635	0.756	0.652	0.737	0.815	**0.974**

variables (Fornell and Larcker, 1981). Table 3 displays the correlation matrix of the constructs and the square roots of their AVE values (presented on the diagonal). The results imply that every construct has high correlation with itself, indicating satisfactory discriminant validity.

Results

This study used a structural model to investigate the strength and direction of the relationship between the theoretical constructs with Smart PLS 2.0 software. With 500 iterations of a bootstrapping procedure, we examined the statistical significance of the weights of sub-constructs and path coefficients (Chin, 1998). The R^2, a primary way to evaluate the explanatory power of the model, RMSEA and GFI are supplied.

Relationship test between intention and behavior

The significant effect of intention on behavior is a premise before we analyze the gap between intention and behavior. We should test that intention can predict behavior first. Only based on this, can we judge whether health knowledge adoption intention predicts adoption behavior well and whether there is a gap between health knowledge adoption intention and behavior. As depicted in Table 4, H1 is supported—health knowledge adoption intention can predict adoption behavior.

Structure model test from the intention perspective

Second, we examine the model from the intention perspective. Result details are depicted in Figure 5 and Table 5. As expected, in the threat appraisal

Table 4. Relationship Test between Intention and Behavior.

Hypothesis	Path coefficient	T-value	Standard error	Result
H1:INT→BEH	0.550***	12.258	0.0447	Supported

process, perceived threat has a positive significant effect on fear ($\beta = 0.442$, $p < 0.001$) and fear has a significant positive effect on health knowledge adoption ($\beta = 0.413$, $p < 0.001$); so H2 and H4 are supported. In the coping appraisal process, perceived efficacy has a significant positive effect on health knowledge adoption intention ($\beta = 0.346$, $p < 0.001$); thus H5 is supported. In the central route process, perceived knowledge quality has a significant positive effect on trust ($\beta = 0.574$, $p < 0.001$); so H9 is supported. In the peripheral route process, perceived source credibility has a significant positive effect on trust ($\beta = 0.344$, $p < 0.001$), and thus H10 is supported. And trust has a significant positive effect on health knowledge adoption intention ($\beta = 0.114$, $p < 0.05$); thus H7 is supported. Furthermore, as the R^2 values show, following the standard developed by Chin (1998), trust ($R^2 = 0.748$) is described as substantial; health knowledge adoption intention ($R^2 = 0.435$) is described as moderate (RMSEA = 0.061 and GFI = 0.938), which means the model has acceptable validity.

Structure model test from the behavior perspective

Third, we examine the model from the behavior perspective. Result details are depicted in Figure 6 and Table 6. In the threat appraisal process, perceived

Figure 5. Model testing results of health knowledge adoption intention.

Table 5. Model testing results of health knowledge adoption intention.

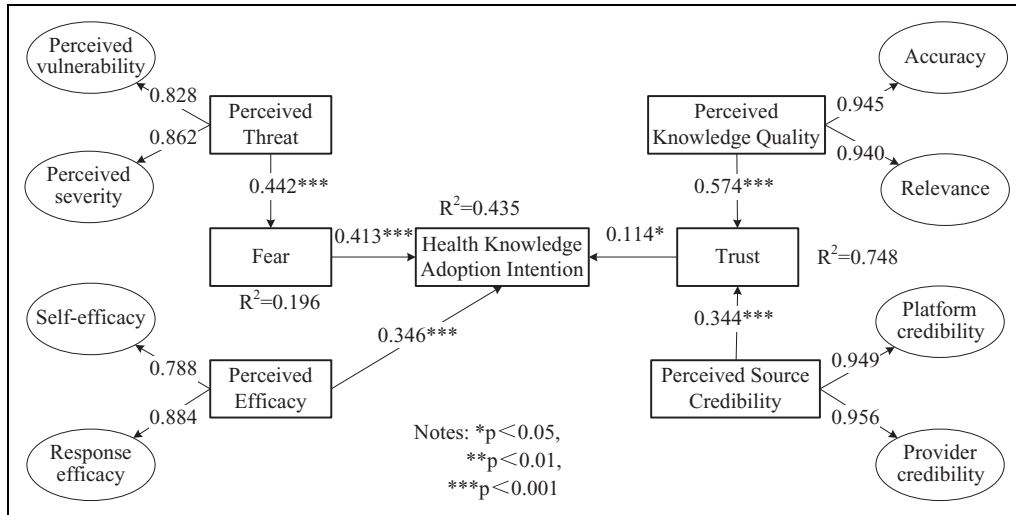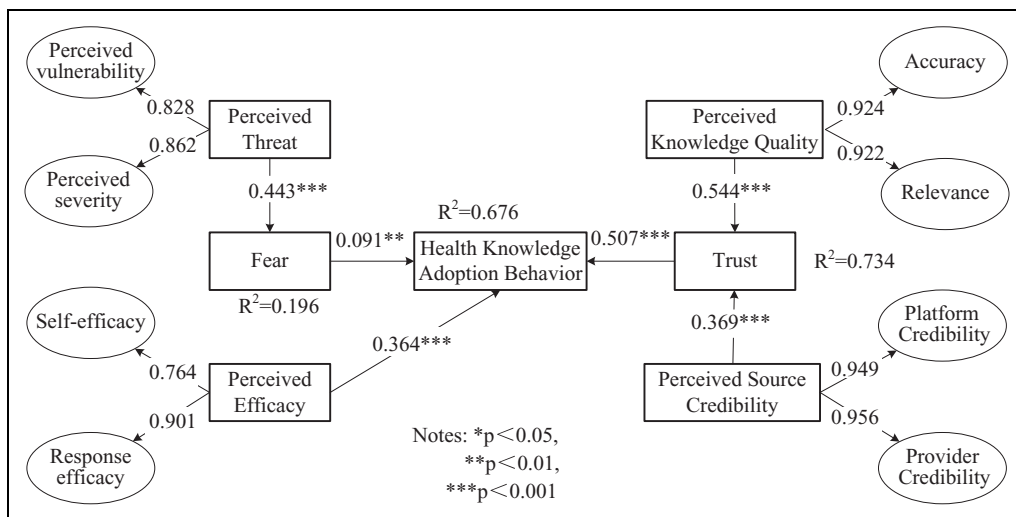| Hypothesis	Path coefficient	T-value	Standard error	Result
H2:FEA→INT	0.413***	8.269	0.050	Supported
H4:PET→FEA	0.442***	9.579	0.046	Supported
H5:PEE→INT	0.346***	5.260	0.062	Supported
H7:TRU→INT	0.114*	1.984	0.057	Supported
H9:PKQ→TRU	0.574***	7.981	0.047	Supported
H10:PSC→TRU	0.344***	13.249	0.046	Supported
Model evaluation	R^2	0.435(> 0.33)		
	RMSEA	0.061(< 0.08)		
	GFI	0.938(< 0.90)		

Figure 6. Model testing results of health knowledge adoption behavior.

Table 6. Model testing results of health knowledge adoption behavior.

Hypothesis	Path coefficient	T-value	Standard error	Result
H3:FEA→BEH	0.091**	3.029	0.030	Supported
H4:PET→FEA	0.443***	9.380	0.047	Supported
H6:PEE→BEH	0.364***	7.449	0.048	Supported
H8:TRU→BEH	0.507***	10.649	0.047	Supported
H9:PKQ→TRU	0.544***	11.740	0.046	Supported
H10:PSC→TRU	0.369***	7.940	0.046	Supported
Model evaluation	R^2	0.676(> 0.67)		
	RMSEA	0.058(< 0.08)		
	GFI	0.981(< 0.90)		

threat has a significant positive effect on fear (β = 0.443), fear has a significant positive effect on health knowledge adoption behavior (β = 0.091); so H3 and H4 are supported. In the coping appraisal process, perceived efficacy has a significant positive effect on health knowledge adoption behavior (β = 0.364, $p < 0.001$), and thus H6 is supported. In the central route process, perceived knowledge quality has a significant positive effect on trust (β = 0.544, $p < 0.001$), so H9 is supported. In the peripheral route process, perceived source credibility has a significant positive effect on trust (β = 0.369, $p < 0.001$) and therefore H10 is supported. Trust has a significant positive effect on health knowledge adoption behavior (β = 0.507, $p < 0.001$), and thus H8 is supported. The model is clearly valid with regard to health knowledge adoption behavior (R^2 = 0.676, RMSEA = 0.058 and GFI = 0.981).

The gap between health knowledge adoption intention and behavior

According to the intention and behavior data, the respondents can be divided into three groups—group 1, whose intention ranks lower than their behavior; group 2, whose intention is equal to their behavior; and group 3, whose intention ranks higher than their behavior. In group 1, the means of intention/behavior are 3.520/4.317; in group 2, the means are 3.771/3.771; in group 3, the means are 4.690/3.157. Thus, 81.65% of the respondents have a gap between intention and behavior, which suggests that health knowledge adoption intention cannot predict adoption behavior absolutely. Details are shown in Table 7.

As to the consistency and the dissimilarity between the intention and the behavior perspective, the gap between intention and behavior is mainly due to the

Table 7. Intention and behavior.

Groups	Group 1 (n = 41) Low intention/ high behavior	Group 2 (n = 84) Intention = behavior	Group 3 (n = 230) High intention/ low behavior
Mean	3.520/4.317	3.771/3.771	4.690/3.157

different impacts of trust and fear on intention and behavior, on the common basis of perceived efficacy. As for consistency, the hypothesis that perceived threat has a positive impact on fear is supported (β = 0.442 and β = 0.443). The hypothesis that perceived knowledge quality has a positive effect on trust is supported (β = 0.574 and β = 0.544). The hypothesis that perceived source credibility has a positive effect on trust is supported (β = 0.344 and β = 0.369). Perceived efficacy has a positive effect on both intention and behavior, although with a little dissimilarity (β = 0.346 and β = 0.364). As to dissimilarity, the results show that fear has significantly different impacts on health knowledge adoption intention versus on health knowledge adoption behavior (β = 0.413 Vs β = 0.091), which means that fear has a much stronger impact on intention than on behavior. On the other hand, trust has a weaker impact on intention than on behavior (β = 0.114 Vs β = 0.507). In other words, we can conclude that intention depends largely on fear, and behavior depends largely on trust for health knowledge adoption. Based on these function mechanisms, any dissimilarity between the fear and trust that users perceive about the health knowledge in social media may result in a gap. As shown in Table 2, fear (Mean = 5.007) is higher than trust (Mean = 3.183), users perceive more fear than trust about the health knowledge, so there is a gap between health knowledge adoption intention and behavior.

Discussion, conclusion, and implications

The purpose of our research is to enhance understanding of what determines health knowledge adoption in social media, such as health knowledge posted by public numbers. Based on the ELM and EPPM, this paper proposes four processes of health knowledge adoption—a threat appraisal process, a coping appraisal process, a central route process, and a peripheral route process—to construct a framework of health knowledge adoption, highlighting the mediating effect of trust in the central route process and the peripheral route process. Furthermore, we examine the framework respectively from the intention perspective and behavior perspective to explore the function mechanisms, and integrate the current situation of health knowledge in social media to explain why there is a gap between intention and behavior based on the positive effect of intention on behavior.

With an empirical test, we find perceived threat has a positive effect on fear, and fear has a more positive effect on the intention to adopt health knowledge than on the actual behavior of health knowledge adoption. This means users arouse the intention to adopt health knowledge mainly by how much fear they experience when they recognize its severity and vulnerability, but these factors usually do not drive users to actually adopt the knowledge and change their behavior. Second, we find that perceived knowledge quality and perceived source credibility both have a positive effect on trust. Contrary to the fear, trust has a more positive effect on actual behavior than does the intention to adopt the health knowledge, which means that actual behavior about health knowledge adoption depends more on trust in health knowledge than on the fear they experienced. In the threat appraisal process, fear acting as an emotional reaction to health knowledge may be more prone to arouse intention at the subjective level than to affect behavior at the objective level. Intention is more about the emotional response without any actual payoff, and practical costs of the health knowledge, unlike behavior, is more about actual active response, implying costs in time, energy and money. The risk of incorrect or misleading health knowledge in social media may also contribute. Therefore, intention follows the fluctuation of emotions, but behavior tends to depend on reasoning. From a psychological perspective, fear and intention are both subjective; one emotion easily leads to another emotion. On the other hand, trust results from objective reasoning cognition, and actual behavior is also an objective practical outcome; objective behavior seems to result from objective cognition.

Third, we find that perceived efficacy has an almost equivalent effect on intention and actual behavior, which means that whether to arouse users' intention to adopt health knowledge or to drive users to perform the actual recommended behavior, perceived efficacy plays a primary role. Only under the condition of high self-efficacy and high response efficacy will users trust in suggestions to cope with the health challenges and undesirable outcomes implied in the health knowledge and take more coping measures.

We also find that more intention aroused by fear and less behavior inhibited by distrust are more prone to result in a gap between health knowledge adoption intention and behavior. Because intention depends largely on fear and behavior depends largely on trust. With a view to bridging the gap, the more intention needs more behavior, namely, when users perceive more fear about the diseases and potential health risks, they need more trustworthy health knowledge to help them to cope with this fear, otherwise it will result in a gap between adoption intention and behavior.

Research implications

From a theoretical perspective, we integrate EPPM and ELM, two prevalent frameworks in health education and information adoption, to explore health knowledge adoption. First, the current study investigates a neglected area within a knowledge adoption context. As Sussman and Siegal (2003) argued, the concept about knowledge adoption has rarely been investigated, although there has been considerable study on information adoption with the ELM. Furthermore, we integrate the knowledge adoption context with the social media context, focusing on the health contents, and expand the research on health knowledge adoption in social media, while Chou et al. (2015) investigated the framework of knowledge adoption in virtual communities from a social influence perspective. This study focuses on the perspective of knowledge recipients, and explores how users perceive health knowledge in the social media, and how health knowledge is adopted.

Second, this study synthetically examines the threat appraisal process, the coping appraisal process, the central route process, and the peripheral route process—four processes of health knowledge

adoption in social media. In the threat appraisal process, the results indicate that perceived threat has a positive effect on fear, and fear has a positive effect both on intention to adopt health knowledge and adoption behavior of health knowledge, in accordance with previous research in other contexts (Halkjelsvik and Rise, 2015). Although some prior researches pointed out that fear was negligible, and need not be considered in a health education model—for instance, the health belief model—our approach consolidates the function of fear in the threat appraisal process, which is consistent with results in information system security (Boss et al., 2015). In the coping appraisal process, the results indicate that perceived efficacy has an equivalent positive effect on health knowledge adoption intention and health knowledge adoption behavior. The results further confirm the critical role that coping plays in the process of health knowledge adoption, whether intention or actual adoption behavior. These findings imply that efficient coping recommendations embedded in the health knowledge—higher level of response efficacy, and easygoing suggestions that are consistent with recipients' conditions and capacity—higher level of self-efficacy—will promote health knowledge adoption in social media on a large scale. In the central route process and peripheral route process, the results indicate that perceived knowledge quality and perceived source credibility both have a positive effect on health knowledge adoption, via the central route and peripheral route respectively, with the mediator of trust. This finding implies that users tend to adopt health knowledge that they perceive as accurate and health knowledge that is relevant to them. Also, the results indicate that perceived source credibility also contributes to health knowledge adoption in social media. Platform credibility, in particular—whether 'public numbers' or other social-media platforms that post or forward health knowledge, and the credibility of the provider, the content creator, or content forwarder, extensively influence user evaluation of health knowledge.

Third, this study examines the mediator of trust in both the central route and the peripheral route of health knowledge adoption. The results indicate trust has been a primary factor in the appraisal of health knowledge in the social media, and trust has a positive effect on both intention to adopt the health knowledge and the actual behavior. These findings imply the important role of trust when users evaluate health knowledge in social media. Contrary to previous studies of health education and health promotion that paid little attention to trust, we show that trust is a critical factor before users choose to adopt health knowledge in social media. Of course, the focus in those earlier studies was on traditional channels and authority platforms, where credibility has already been established, such as television series, hospital information, and so on. But in the social media context, misleading health information and excessive health knowledge that is hard to evaluate reduce user trust in health information. Our findings indicate that ELM is also applicable to knowledge adoption, as implied in information adoption.

More importantly, this study attempts to explain the gap from the perspective of independent variables, and the results confirm it in some points—although they may be also influenced by other factors. Fear has a stronger effect on intention than on behavior, which means that fear leads users to intentions, but not to execution. On the other hand, trust has a stronger effect on behavior than on intention, which means that before the actual health knowledge adoption behavior, users are more prone to evaluate the credibility of the knowledge, rather than be motivated by fear. These findings contribute to a deep understanding about the gap between intention and behavior in some points. Fear of undesirable outcomes may incur an intention to adopt protective health knowledge, but fear loses efficacy when users choose not to perform the actual behavior, resulting in a gap between intention and behavior. Furthermore, users actually adopt the health knowledge based mainly on whether they trust the health knowledge—although trust has little effect on adoption intention. This represents another gap between intention and behavior due to the gap between the contribution of trust to intention and to behavior.

Practical implications

From a practical perspective, the research findings also provide some insights for practitioners. For producers of social media content, the primary problems are to identify who is paying attention to what they post, and how to promote content consumption (Rader et al., 2012). This empirical research illuminates the process of how users adopt health knowledge in social media, and the results may contribute to content design and advertising placement. As noted, trust has been a mediator or a barrier to health knowledge adoption, whether via the central route or the peripheral route, and also the most effective factor in

bridging the gap between intention and behavior. As a producer, if you want users to adopt your health knowledge, you must be seen as trustworthy to users.

As noted, perceived knowledge quality makes a big contribution to trust in health knowledge. So a content producer should pay attention to knowledge quality. Only high-quality knowledge with high accuracy and high relevance to users and their issues will users trust. Furthermore, as proposed in the framework, perceived source credibility is also important in inspiring trust. This finding implies that an authoritative provider of knowledge and a credible platform are very important when posting health knowledge in social media. Therefore, a 'public number' or platform with a large number of fans may not always be the best choice to communicate health knowledge or perform a health education campaign. For health knowledge, what is most important is the credibility of the platform. Content producers should reference real medical reports and authoritative experts, or forward health knowledge from credible providers to make full use of the authority effect and platform effect in generating trust. More importantly, perceived knowledge quality has a stronger impact on trust than perceived source credibility, which means knowledge quality still occupies the central route in trust evaluation. For content producers, knowledge quality is more important than source credibility.

Health knowledge producers and propagators can also make use of fear appeals to guide knowledge recipients to health knowledge adoption and lead them to a healthier life. Fear is always an effective emotion to motivate people. So undesirable outcomes and fearful results may be presented in the health knowledge in social media to arouse fear. As examined in the framework, perceived vulnerability and perceived severity both support a perceived threat. Therefore, content designers and propagators can drive people to perceive the threat from a perspective of vulnerability and severity.

In addition, the perceived efficacy resulting from response efficacy and self-efficacy may be the primary factor behind creating a fear appeal. Just as prior research shows, a low level of response efficacy will affect recipients like maladaptive rewards, and a low level of self-efficacy will influence recipients to ignore the suggestions and recommendations (Boss et al., 2015). Therefore, a higher level of perceived efficacy embedded in the health knowledge may help keep recipients' attention focused on the health knowledge so that they can be reached by the fear appeals, and consider if they trust the message. Furthermore, content producers should produce and forward health knowledge that is easy to follow and adopt in the context of social media. For instance, hand-washing tips are more suitable than cancer cures.

Limitations and future research

In interpreting the findings, we recognize several limitations of our study. First, we examine the impact of fear on health knowledge adoption without comparing different impacts from different levels of fear. Future research should examine how people respond to health knowledge and how to adopt it in social media under different levels of fear. And for different health knowledge, different groups may have different health knowledge adoption. Such as male group, female group, the younger group, the older group, the high income group and low income group toward health knowledge about high blood pressure, spondylopathy and losing weight. Future research can focus on specific health knowledge or specific groups.

Second, we explore the determinants of health knowledge adoption respectively from the intention perspective and behavior perspective, to explain the gap between intention to adopt health knowledge and health knowledge adoption behavior. Although the contrastive analysis explains the gap in some points, there may be also some other variables that influence the gap between intention and actual behavior, such as health concerns, health knowledge involvement and health status. Furthermore, when we analyze the gap between intention and behavior, there are some participants whose intentions rank lower than their behaviors (Table 7), which suggests that some participants' behaviors are going against or exceeding those intentions. Future research should try to explore what results in such phenomenon, such as the time pressure, social presence, health status and perceived behavioral control.

Third, this study tests the impact of knowledge quality and source credibility on health knowledge adoption, and examines the mediator of trust in the central route and peripheral route of health knowledge adoption. Future research should examine the impact of knowledge content richness on recipients' attitudes and behaviors.

Finally, we examine health knowledge adoption in the social media in the context of China and Chinese cultures. The majority of our sample came from

young users, due to the young demographics of WeChat. Future studies should focus on older users with more maturity, and extend the research scope to other countries and cultures, to explore the generalizability of the findings.

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Appendix A. Scale

Health knowledge adoption behavior (Chou et al., 2015)

BEH1: I usually adopt the health knowledge in the social media posted by the public number
BEH2: I often follow the argument made in the health knowledge in the social media posted by the public number and think or do what
BEH3: I always follow the recommendations and suggestions embedded in the health knowledge in the social media posted by the public number

Fear (Boss et al., 2015)

FEA1: I am afraid of disease
FEA2: I am afraid to be unhealthy
FEA3: I am afraid of potential health problems

Perceived vulnerability (Boss et al., 2015)

PEV1: My body is at risk for becoming infected with disease
PEV2: It is likely that my body will become infected with disease
PEV3: It is possible that my body will become unhealthy

Perceived severity (Boss et al., 2015)

PES1: If my body is infected with disease like posted in the social media by the public number, it would be severe
PES2: If my body becomes unhealthy like posted in the social media by the public number, it would be serious
PES3: If my body becomes unhealthy like posted in the social media by the public number, it would be significant

Self-efficacy (Boss et al., 2015)

SEE1: It is easy for me to get off the disease posted in the social media by the public number
SEE2: I have the ability to get off the disease posted in the social media by the public number
SEE3: I am able to get off the unhealthy factors posted in the social media by the public number without much effort

Response efficacy (Boss et al., 2015)

REE1: The health knowledge posted in the social media by the public number works for the protection
REE2: The health knowledge posted in the social media by the public number is effective for protection
REE3: When follow the recommendation and suggestion in the health knowledge, my body is more likely to be protected

Trust (Cazier et al., 2007; Awad and Ragowsky, 2008)

TRU1: The health knowledge posted in the social media by the public number is trustworthy
TRU2: The health knowledge posted in the social media by the public number deserves my trust
TRU3: I trust the health knowledge posted in the social media by the public number

Accuracy (Cheung et al., 2008)

ACC1: The health knowledge posted in the social media by the public number is accurate.
ACC2: The health knowledge posted in the social media by the public number is correct.

Relevance (Citrin, 2001)

REL1: The health knowledge posted in the social media by the public number is relevant with me.

REL2: The health knowledge posted in the social media by the public number is applicable to me

Platform (Chou et al., 2015)

PLA1: The public number posting health knowledge is authoritative

PLA2: The public number posting health knowledge is trustworthy

Provider (Chou et al., 2015)

PRO1: The provider posting health knowledge is an expert on this topic

PRO2: The provider posting health knowledge is trustworthy

Health knowledge adoption intention (Liao, 2012; Chirawattanakij and Vathanophas, 2016 and Chou et al., 2015)

INT1: I prone to adopt the health knowledge in the social media posted by the public number

INT2: I will follow the argument made in the posted health knowledge and think or do what

INT3: I intend to follow the recommendations and suggestions embedded in the health knowledge posted in the social media by the public number