

Full Length Research Paper

Effectiveness of communication on epidemic personal protection with community residents via new media during COVID-19 outbreak: Data from China

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Personal protection measures are the key to COVID-19 epidemic control and prevention in the community. Newer forms of media present useful options for such information transmission. By presenting primary data from 420 residents in mainland China, this exploratory study aims to explore the communication mechanism which utilizes new media for disseminating epidemic-related information in the community during the COVID-19 outbreak, and to assess its effectiveness by identifying effects of this communication on perceptions and behaviours accordingly. Results show China-originated mobile social media such as WeChat, rather than FB or TW are predominantly used and preferred compared with the traditional media, on which residents are more reliant for information, and through which both types of general and specialized purpose information take significant effects on individuals' perceptions and behaviors toward personal protection. Particularly, the specialized purpose information is more likely to influence individuals' personal protection behaviours which are also significantly affected by their perceptions. It reveals that information content or new media content can lead to changes in personal protection perceptions and/or behaviours of residents. This article constructs the mechanism framework of COVID-19 epidemic crisis communication on personal protection. Implications and suggestions are then given for more relevant effective community communication strategy making accordingly.

Key words: Community communication, mobile social media, COVID-19, personal protection, media dependency.

INTRODUCTION

Over the last decade, there have been six health crises of Public Health Emergencies of International Concern (PHEIC) in the world, such as H1N1 Influenza virus

outbreak in the U.S in 2009; and presently the novel coronavirus in 2019 (COVID-19). By July 20, 2020, there has been 14,263,202 confirmed cases of COVID-19

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pandemic and 602,244 confirmed deaths among 216 countries, areas or territories, according to the WHO (<https://www.who.int>)*.

To respond to COVID-19 outbreak, the source of the virus infection should be controlled, and its transmission routes should be cut off, especially in the community, as guided by China National Health Commission on January 27, 2020.

According to the Guidance of “Enhanced Community Prevention and Control of Novel Coronavirus Pneumonia” (<http://www.nhc.gov.cn>), the key to community prevention and control (CPC) is to take personal protection (PP) measures (self-protection), such as wearing a face mask, washing hands with soap frequently, no gathering, no personal contact and so on. The importance of self-protection from the epidemic in public lies in the effective avoidance of human-to-human transmission of the virus.

Communication with its residents in the community plays a very important role in the implementation of personal protection measures for COVID-19 prevention and control measures. In such an unprecedented crisis and emergent event this kind of communication is of great challenge for the community. In China, the community, has being the front line of the local government, the responsibility of communication of COVID-19 information to its residents. As a consequence, what information to be delivered, and how best to deliver this information, are serious questions for the relevant crisis communication strategy making.

Studies have looked at the issue of communication in the fields of natural or public hazards (Vieweg, 2012; Feldman et al., 2016; Mileti et al., 2004, 1992; Burby et al., 2003; Basolo et al., 2008; Tanaka, 2005). Communication on hazards information was increasingly relayed to the public through the mass media (Mileti et al., 2004). Social media like Facebook and Twitter (Lindsay, 2011) have been used by a wide variety of international, national, state, and local organizations and government agencies (Mora et al., 2015; Lachlan et al., 2014; Houston et al., 2014) since the last decade. However, less research looks at communication of information on the epidemic personal protection using mobile social media during the pandemic crises, especially the data derived from developing countries. Mobile social media (*MSM*) in this paper refer to mobile internet-based social media *applications* (*app*) or sites installed on the intelligent mobile device (intelligent mobile phone, iPad, etc).

The paper explores the mechanism of pandemic communication of information on personal protection to the community residents via *MSM* during COVID-19 outbreak in China (RQ1, 2, 3), and assesses the effectiveness of this communication (RQ4). Thus this exploratory study addresses the following four main research questions.

RQ1 (mobile social media usage): What are the kinds of *MSM* apps or channels are most utilized in the community?

RQ2 (preference for media sources): Through what kinds of media sources do residents prefer for receiving information or for communicating?

RQ3 (information types): What are the types of information disseminated via *MSM*?

RQ4 (effects of communication): How much does the communication via *MSM* influence residents' perceptions and behaviours towards personal protection?

THEORETICAL FRAMEWORK

Seen as a societal organization, the term “community” has a long history in western political traditions (Delanty, 2010), which has the function of mutual coordination, assistance and communication. In China, every community is a grass-root governmental organization under the jurisdiction of higher government administration. This paper sees the community mainly as a tightly knit territorial organization for residential living, in which communication on information of COVID-19 epidemic protection and control takes place between the community organization and its residents and between individuals within the community mainly via social media under the crisis and threat situation of epidemic outbreak. In this context, the current study starts with literature reviews by drawing on three existing theories about situational crisis communication, media dependency and media uses and gratifications.

Situational crisis communication theory (SCCT)

Crises have impact on an organization's performance, and generate negative outcomes (Coombs, 2007a). If a crisis is not handled well, it can damage reputations of an organization because stakeholders would judge the organization's response to the crisis. Under a crisis situation, SCCT predicts the reputational threat presented by the crisis, and prescribes crisis response strategies designed to protect reputational assets (Coombs, 2007b). SCCT focuses on organization-based actions, concerns and outcomes for protecting stakeholders. The crisis of COVID-19 epidemic harms residents physically, emotionally and financially. Thus, it is important for the community to have effective communication with them in order to eliminate mass panic and ease mass psychological pressure. To do so, relevant how-to information should be given to households or individuals, so that they are aware of the crisis, and are prepared to act against the COVID-19 epidemic crisis. Most stakeholders keep a rational view on organizational decisions and/or measures and efforts against the crisis to mitigate the impacts of crises (Brønn and Wiig, 2005).

Hereby this research addresses the question, what types of relevant information should be delivered to residents so that they are aware of the risk of COVID-19, and willingly get prepared for action against it.

As noted by Liu and Fraustino (2014), it needs to explore whether and how SCCT can be transferred to social media and the extent to which social media can be used by the public in order to counter the messages of organizations. This study attempts to detect whether the residents prefer social media sources for receiving information on the epidemic crisis or not.

Media dependency

Firstly, media systems dependency theory considers that media offer content to audiences in various forms, to meet their needs for information, entertainment, or social activities etc. Likewise, individuals tend to depend on the media in order to fulfill their needs and wants (DeFleur and Ball-Rokeach, 1989). Studies reveal that people show more dependence or reliance on the mass media for information under some conditions or motivational factors, such as the availability of alternative information sources (Ball-Rokeach and DeFleur, 1976; Loges, 1994), and when facing certain crisis or threat.

Such media dependence has been found to predict changes in people's attitudes and behaviors (Lowrey, 2004). The media dependency theory (Ball-Rokeach and DeFleur, 1976) postulates that intrinsic and extrinsic factors influence media users' behaviors in some ways; they are intrinsic factors (attitudes, social norms, and perceived behavior control) and extrinsic factors (media use and dependency). During the pandemic time, communities locked down and everyone had to stay at home and relied heavily on social media for information; they shifted from traditional media use to *MSM*. Hence, it is plausible that communications via *MSM* may have more impact on users' behavior toward the issue of personal protection. This research looks at the question, how much does the communication via *MSM* influence residents' perception and behavior toward their personal protection, and through what kinds of *MSM* apps or outlets?

Secondly, MDT dictates that media, audience and social system are linked together in some ways. This means that these three parties have relationships with each other, which are affected by two main facets: (1) at the cognitive level: the audience's consideration about how important to use media, and (2) at the affective level: the audience's motivation and satisfaction caused by their emotion which is stimulated by the content of the media. With both cognitive and affective motivations, people are involved in the process of communication through media.

However, this paper argues that the high involvement in communication by the audience via social media is not just because of media content, and cognitive and

affective motivations, but likely due to other factors; for example, the powerful functions of social media for two way communication (e.g. comment giving, relaying or forwarding and thumb-up).

Uses and Gratifications Theory (UGT)

UGT illuminates that people are active in choosing or using a particular media to satisfy their specific needs while media has limited effect on users when making choice. Individuals choose the media they want to use, and see media as one way to gratify their needs (West and Turner, 2010). Media has no super power to change audiences' choice. On the contrary, audiences opt for the media by themselves.

UGTU can be applied to new media, although possible displacement of older media is made by the Internet (Dimmick et al., 2004). With the availability of mobile internet, people tend to use mobile social media apps or outlets for information in the same way that they used other forms of media for that need. This research is to detect what media sources are utilized in the community, including mobile social media and any other forms of media else.

Ways of communication via social media

One-way or two-way communication: In the past, risk communication was acted mostly as a one-way form of communication (Ng and Hamby, 1997). The one dimensional communication model was largely criticized because of its "information deficit"; information is not viewed as trustworthy, credible, or worthy of reposing confidence by the public (Gross, 1994). So there is little incorporation or interaction of the public in the communication process and little feedback from the public. For sufficient information, interactive and long-term process is necessitated for risk communication, where the public and experts are engaged in a dialog, rather than acting as one dimensional senders and receivers (Bennett, 1999).

Social media provide an effective channel for two-way even multi-way communication. Nowadays, people all over the world rely heavily on social media for social activities and communications. However, due to the diverse populations and emergence of COVID-19 crisis, communication taken place in the community cannot be in a single form. Rather, they should be a fusion of both one-way and two-way communications.

Mobile social media and other channels utilized in communities

Channels utilized for traditional risk information include

print sources (e.g. newspapers, magazines, brochures); electronic sources (e.g. television, radio, telephone, the Internet); and in person communications (Lindell and Perry, 2012; Tang et al., 2015). Past studies have shown that social media have become an effective vehicle for effective two-way communication between citizens and governments (Lachlan et al., 2014; Houston et al., 2014), especially for sharing of formal and informal information to the public. During February to mid April 2020, the China Economic Daily shared a short video titled, "The most warm-hearted official announce" on its WeChat official account (mini public forum). It received 100 million thumb-ups, and was relayed by more than 100 million people (Study time interview group, 2020).

Studies have also discussed the usage and impact of Facebook and Twitter in hazard and emergency fields with focus on its role, functionality and capability during disaster and emergency events since 2008 (Liu and Fraustino, 2014; Houston et al., 2014; Sutton et al., 2008; Imran et al., 2015) in developed countries. Feldman et al. (2016) studied the social media outlet as being a pre-event channel for disseminating risk information in the U.S. Past research presented that information that contributes to situational awareness is reported via Twitter during mass emergencies (Vieweg, 2012). However, little research looks at other kinds of social media outlets which are originated in the developing countries, except Facebook and Twitter. This research looks at the utilization of the China local common used mobile social media in the community for the purpose of communicating information on the epidemic personal protection.

RESEARCH METHODS

Research setting, sampling and population: As this research was carried out from February to April, during the time of COVID-19 pandemic, there was no way to do face-to-face survey and interview. This research conducted an online survey within mainland China through mobile social media WeChat, in which snowball random samples were generated. In order to ensure the quality of the data, participants were required to be more than 18 years old who were considered to be more capable in understanding the information of epidemic control and prevention measures. With ethical consideration, the survey promised to keep data confidential especially about personal information.

Survey procedures: (1) An e-questionnaire was developed via the professional survey platform (www.wenjuan.com) in the form of HTML5 (H5 questionnaire), in which some questionnaires were set at a five-point Likert scale (e.g. 1= Most not agree, 3=Neutral, 5=Most agree). (2) A trail test on the e-questionnaire was done by two college faculty members and three of their students in order to sweep away any problems, including questionnaire questions and how to fill the questionnaire on the mobile device. (3) In order to ensure the representativeness of the data, the survey employed ten investigators who resided in ten different provinces or cities during the COVID-19 outbreak, among them one resided in the epicenter, Wuhan city of Hubei province. They were pre-trained online and were assigned for being responsible for the local samples. (4) The

H5 questionnaire was sent out via WeChat*, firstly by group sending to 20 e-groups entitled Classmate or Colleague, and secondly by forwarding to 400 acquainted friends in person. (5) Data collection was automatically operated under the preset self-close control by the survey platform, from April 1 to 30, 2020. (6) Data collected were filtered following the survey measures: age of respondents should be at least 18; time of answering should be more than 90 s; only one response is effective for the case that two responses or more than two share the same IP address.

Analytical approach: Analysis of data includes four aspects:

(1) basic descriptive statistics to understand demographic variables of participants; (2) chart analysis on general usage of *MSM* and other media and information sources respectively; (3) principal component analysis (PCA) with Promax rotation in Kappa through SPSS 21 to identify components of information types, predominant used media routes of dissemination, and preferred media routes; (4) bivariate correlation analysis to detect the invisible correlations between variables.

RESULTS

The effective participants were 420 (75.5% for effectiveness rate) after invalid responses (N1=136) were cleared away from the total ones (N2=556) according to our survey measures stated above.

Demographic variables

The data (N=420) covers 11 provinces in mainland China. 74.5% of the participants are aged 18-30 (43.8% from the 18-25 age group), and 13.8% (58 participants in total) of them reside in Wuhan city and Hubei province; almost 90% agree they "often or very often use social media" (Table 1).

Communication via mobile social media (*MSM*)

Utilization of mobile social media: *MSM* tools were utilized for communication of information on COVID-19 epidemic control and prevention in the communities; among them WeChat app was the most used communication tool (Figure 1). Three WeChat channels were used, including WeChat-group (by 80% of responses), WeChat-official account (nearly 60%) and WeChat-post (57%). 59% of respondents confirmed they used *MSM* for communication in the community "Frequently" or "Very frequently".

Besides the newer tools, traditional or well-established media sources were also utilized, including drawing a banner (60.4%), broadcasting (49.5%), poster, telephoning, communicating or urging in person, and brochures or guide pamphlet (Figure 2). Results showed that both tools of *MSM* and traditional media were utilized for the epidemic-related communication in the community.

Table 1. Demographic variables of participants.

Variable	Amount	Percentage
Effective sample	420	75.5
Sex	M:274 / F:146	65: 35
Age in years ≥ 61	5	1.2
51-60	15	3.6
41-50	28	6.7
31-40	61	14.5
26-30	127	30.2
18-25	184	43.8
Samples from Wuhan	58	13.8
Province/AR/MCT*	11	N/A

*Mainland China has 23 Provinces, 5 Autonomous regions (AR) and 4 Municipalities (MCT).

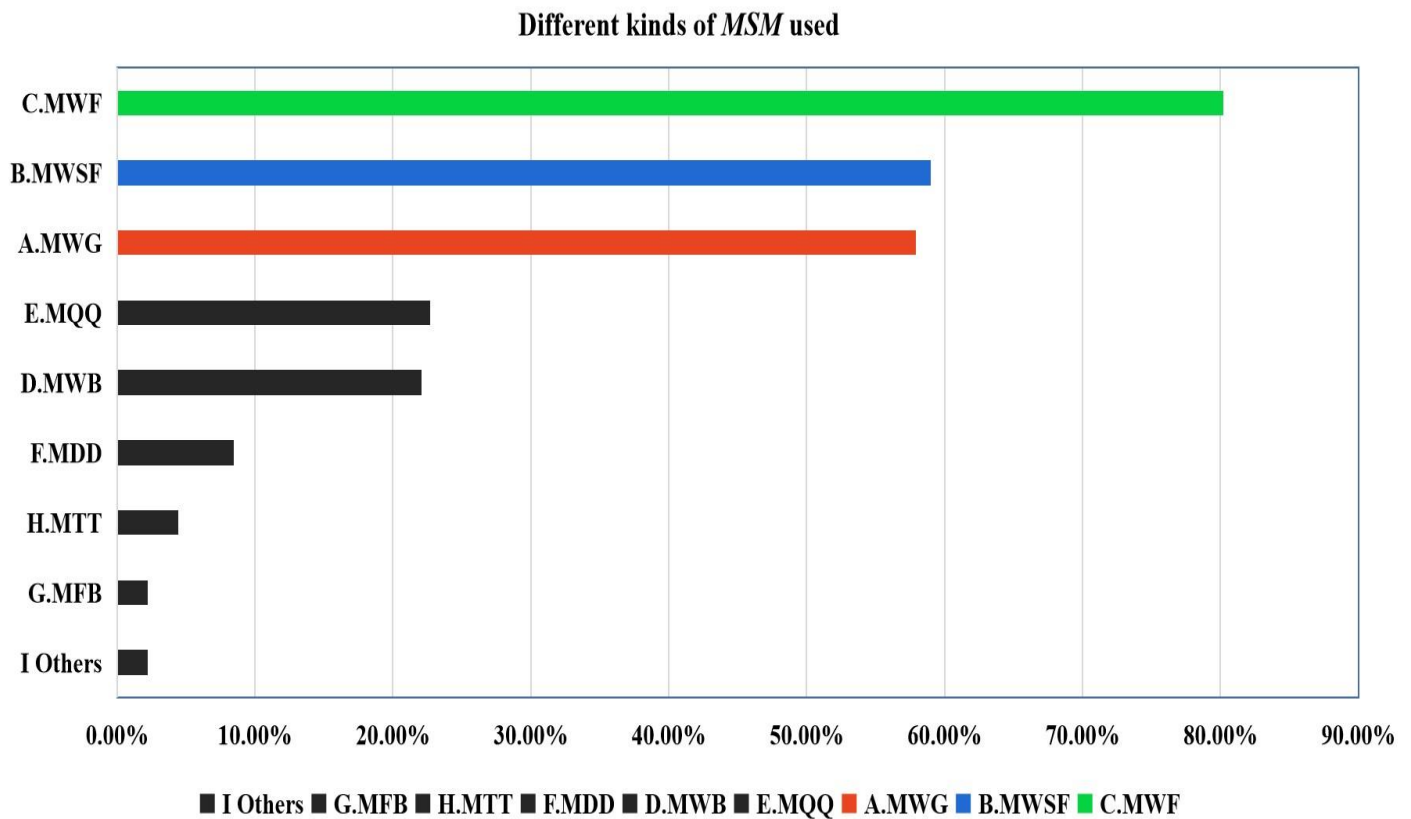


Figure 1. Different kinds of MSMs used. *A=Mobile WeChat-group; B=Mobile WeChat post; C=Mobile WeChat official account; D=Mobile Weibo; E=Mobile QQ; F=Mobile Dingding; G=Mobile Facebook; H=Mobile Twitter; I=Others.

Information types

Different kinds of information were diffused via *MSM* in the community, including Warning or notice (87% of responses), Scientific knowledge about novel coronavirus

(79%), Measures and guidance for PP (77%), advisory or announce of government's prevention and control measures, government's official announce or information forwarded, state media reporting forwarded, interpretation of government's measures, refuting rumors and so on

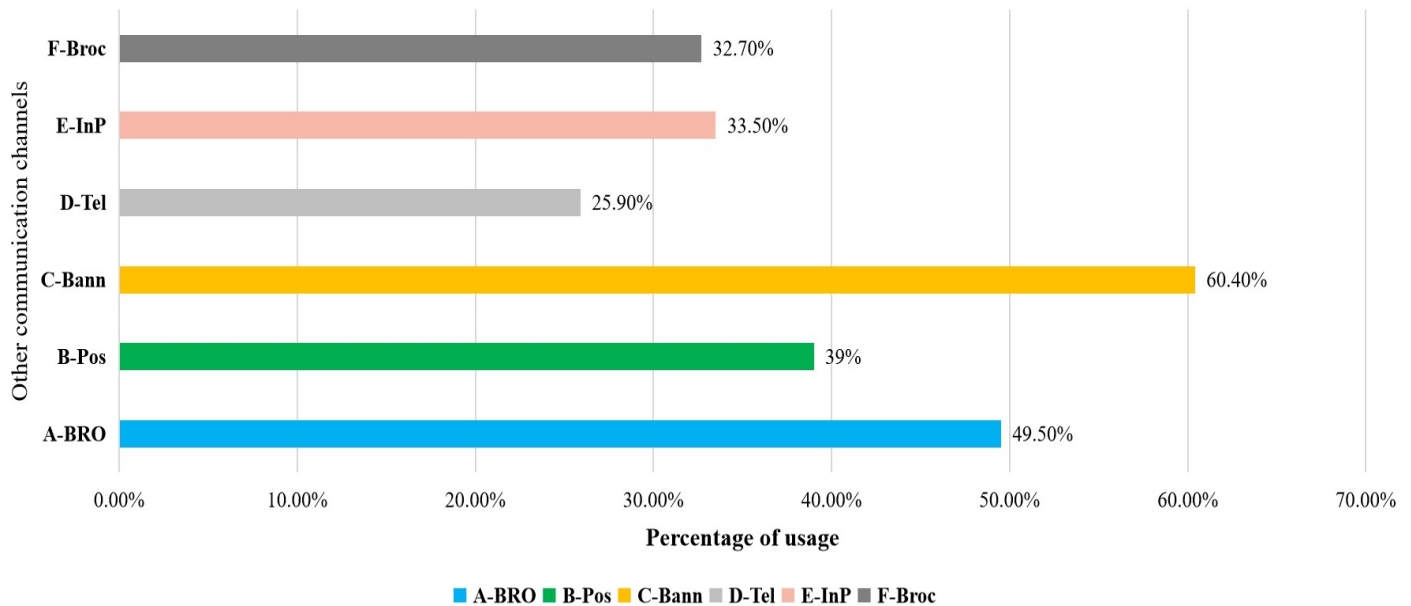


Figure 2. Traditional media tools used. *A-BRO=broadcasting, B-Pos=poster, C-Bann=drawing banner, D-Tel=telephoning, E-InP=Communicating or urging in person, F-Broc=Brochures or guide about personal protection.

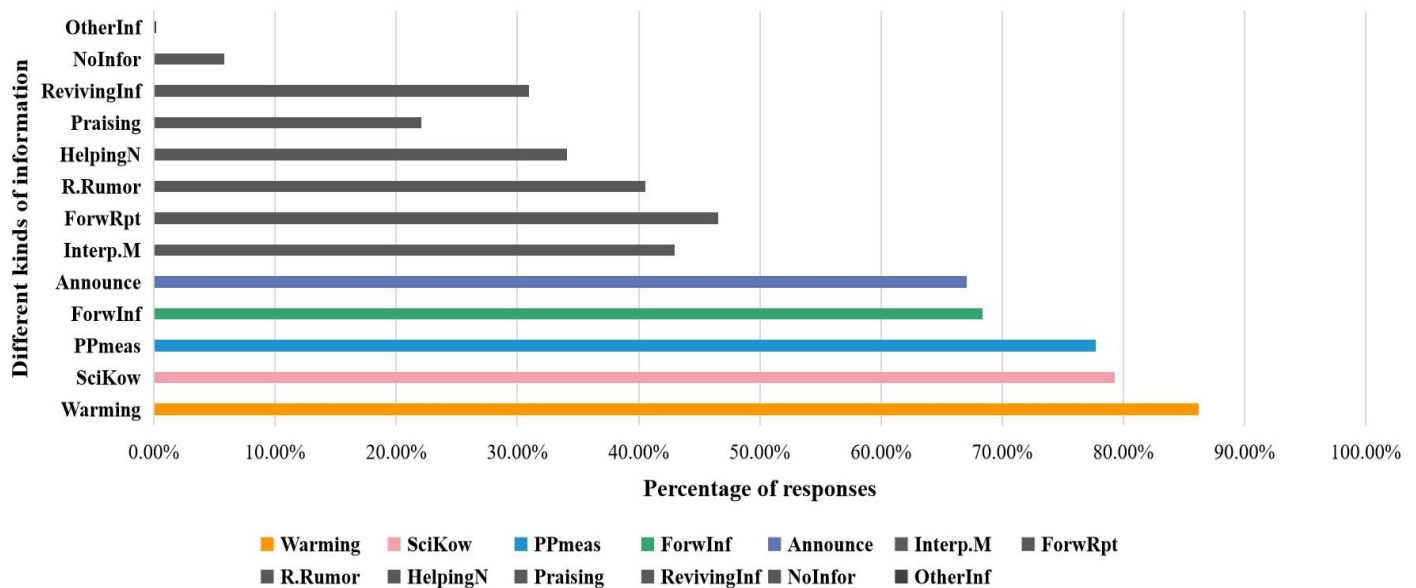


Figure 3. Different types of information diffused through MSM. *SciKow=scientific knowledge; PPmeas=measures and guidance for PP; ForwInf=forwarded government's official information; Interp.M=interpreted protection and control measures; ForwRpt=Forwarded state media's reporting; R.Rumor =refuting rumors; HelpingN=Message of helping residents do shopping; Reviv.Inf=information and measures for reviving.

(Figure 3), especially the first three which were confirmed by more than two third responses. The information types included formal (e.g. notice, announce) and informal (e.g. praising good people and their good deeds); general purpose information for learning about epidemic situation (e.g. state media's reporting forwarded) and special

purpose information for in-depth understanding of PP (e.g. measures and guidance for PP).

Forms of interactive communication via MSM: Interactive communications took place via *MSM* between the community organization and its residents, in which

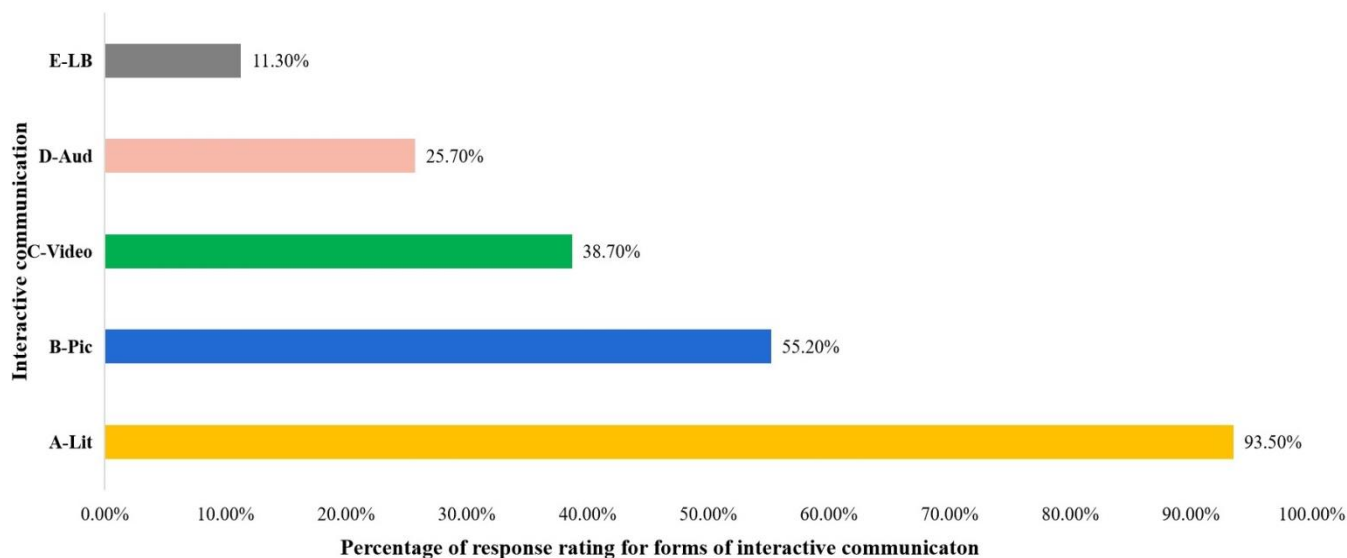


Figure 4. Forms of interactive communicating via MSM. *A-Lit =literal expressing, B-Pic=pictures, C-Video=video or videotelephony, D-Aud=instant audio, E=live-broadcasting.

Table 2. Effect of communication on perceptions toward personal protection.

L-value	M-value	Mean	S-deviation	Variance	T-response
1	5	3.87	1.08	1.16	420
Percentage for each Likert rate from 1 to 5(1=Very insignificant, 3=Neutral, 5=Very significant)					
Item of rate	1	2	3	4	5
RP	5.71%	3.10%	20.71%	38.34%	32.14%
AR	24	13	87	161	135

*L-value=Least value; M-value=Maximum value; S-deviation=Standard deviation; T-response=Total response; RR=Response percentage; AR=Amount of responses.

Table 3. Effect of communication on behaviour changes toward personal protection.

L-value	M-value	Mean	S-deviation	Variance	T-response
1	5	3.80	1.04	1.08	420
Percentage for each Likert rate from 1 to 5(1=Very insignificant, 3=Neutral, 5=Very significant)					
Item of rate	1	2	3	4	5
RR	4.29%	4.76%	25%	37.38%	28.57%
AR	18	20	105	157	120

*L-value=Least value; M-value=Maximum value; S-deviation=Standard deviation; T-response=Total response; RR=response rate/percentage; AR=amount of response.

Literal expression and Pictures were the main forms on line as indicated by 93.5 and 55.2% of responses respectively (Figure 4).

Effect of communication via MSM on perception and behaviour. Results show that communication via MSM noticeably influences individuals' perceptions and

behaviours towards personal protection (Tables 2 and 3), in which the communication has "Significant" (36.91%) or "Very significant" (32.14%) effects on their perceptions (Mean=3.87); while similar responses (70.48%) also took confirmation on the effects on their behaviour changes (Mean = 3.80, "Significant" = 38.34%, "Very significant" =32.14% (Figure 5).

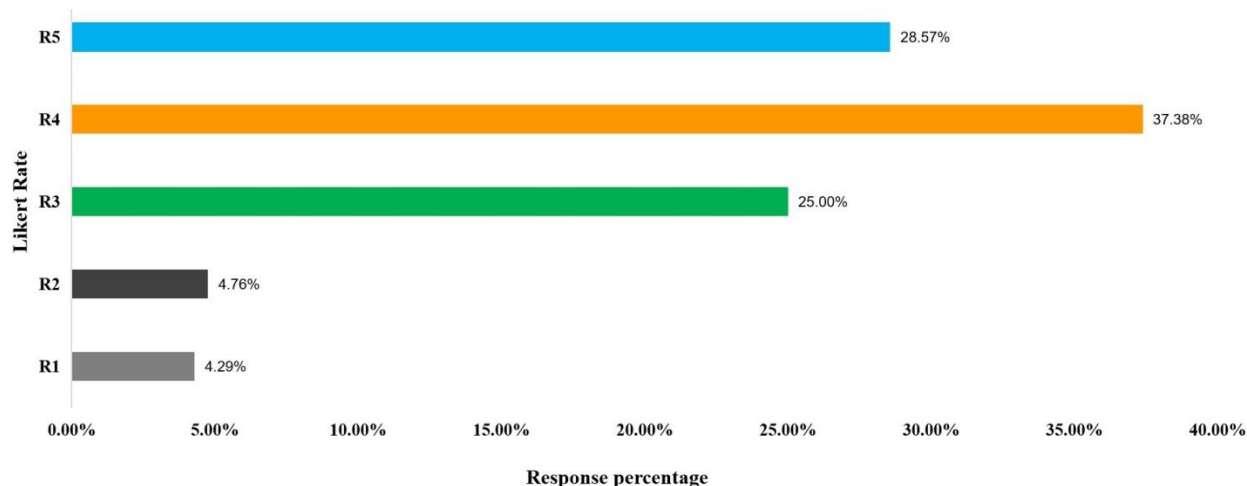


Figure 5. Effects of communication on behaviour changes via MSM. * R1=Very insignificant, R2= Insignificant, R3=Neutral, R4=Significant, R5=Very significant.

Table 4. Preferred media or communication tools by residents.

No.	Tool	L-V	M-V	Mean	S-D	Variance	R.sample
A	MWCg	1	5	3.91	1.10	1.21	420
B	MWCp	1	5	3.56	1.17	1.37	420
C	MWCmf	1	5	3.66	1.16	1.34	420
	DMWB	1	5	2.98	1.41	1.97	420
		1	5	2.68	1.35	1.81	420
E	MQQ		Ave.MSM:	3.36	1.24	1.54	
F	Broadc	1	5	2.98	1.41	2.01	420
G	Poster	1	5	3.00	1.35	1.87	420
H	Banner	1	5	3.29	1.35	1.81	420
I	TEL	1	5	3.04	1.40	1.97	420
J	InP	1	5	3.11	1.42	2.01	420
K	Broc	1	5	3.28	1.37	1.90	420
			Ave.TM:	3.12	1.40	1.93	

*MWCg=mobile WeChat-group; MWCp=mobile WeChat post; MWCmf=mobile WeChat official account; MWB=mobile Weibo;MQQ=Mobile QQ; Broadc=broadcasting; TEL=telephoning;InP=communicating or urging in person; Broc=brochure; R. sample=random sample; Ave.MSM=average Mobile social media, Ave.TM=Average traditional media.

Preference for media source

The results manifest that in general the social media sources (average Mean1=3.36) receive much more preference than the traditional ones (average Mean2=3.12) (Table 4). For the former, three WeChat channels are most preferred to be used, e.g. Mobile WeChat-group (M=3.91. Red square bar in Figure 6), Mobile WeChat official account (M=3.66. Jade-green bar in Figure 6) and Mobile WeChat post (M=3.56. Bright yellow bar in Figure 6); while for the latter, drawing a banner (M=3.29) and brochures (M=3.28) are much more favorably than the rest of the group.

Principal component analysis on media sources and information types

Mobile social media sources are clustered into three components accounting for 53.11% of the total variance (Appendix Table A1). (1) The first component (22.72%) comprises four social media tools, including WeChat Post (0.601), WeChat official account (0.692), Weibo (0.711), and QQ (0.624). (2) Facebook (0.821) and Twitter (0.859) cluster together as the second component (16.85%), while WeChat-group (0.810) is solo as the third component (13.54%). The social media tools except FB and TW are all China originated, in which

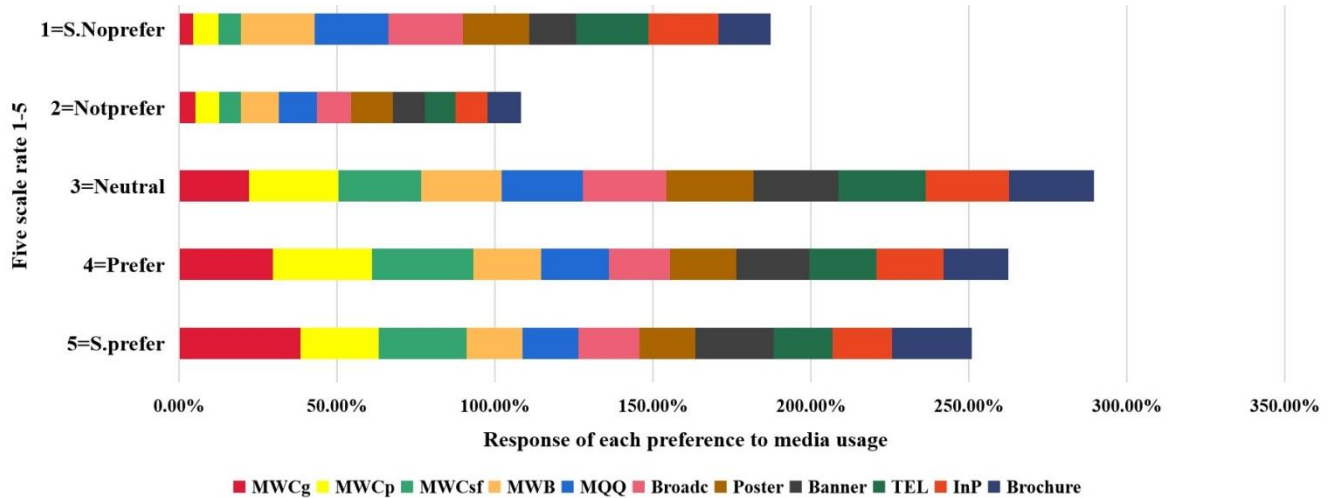


Figure 6. Preference for different media usage by residents. *(1) MWCg=mobile WeChat-group; MWCp=mobile WeChat post; MWCsf=mobile WeChat official account; MWB=mobile Weibo; MQQ=Mobile QQ; Broadc=broadcasting; TEL=telephoning; InP=communicating or urging in person; Broc=brochure; R.sample=random sample. (2)Five-scale Likert rate: 1=Strongly not prefer, 2=Not prefer, 3=Neutral, 4=Prefer, 5=Strong prefer.

Table 5. Information types.

Variables of information type
C1-GIT (39.19%): Forwarding official pandemic message(.581); Local announce for protection and control measures(.600), Explanation to protection and control measures(.719), Forwarding official reporting(.725), Message of helping residents do shopping(.615), Refuting rumors(.687); Praising good people(.674), and Measures for reviving(.730)
C2-SIT(11.99%): Pandemic scientific knowledge (.830), and How-to knowledge of personal protection (.850)

*C1-GIT=1st Component=variables of General purpose information type; C2-SIT=2nd component= variables of specialized information for personal protection.*Values in bold indicate which items load to each factors.

WeChat-group (0.810) becomes the most predominant social media used in the community.

The analysis for user preferences for media sources yields three-component structure matrix (Appendix Table A2). Firstly, the six traditional media sources cluster together as the first component (Brochure, Banner, Poster, Telephone, Broadcast, and in-person communication), accounting for 41.56% of the total variance; particularly the first three media dominated the first component, Brochure($V=.830$), Banner(.811) and Poster (.800). The second and third component comprised newer social media sources, in which the four social media (WeChat post, WeChat official account, Weibo, and QQ) cluster strongly as the second component (14.35% of the total variance), and two channels of WeChat media form the third component (WeChat-group and WeChat post, 9.50% of total variance). In terms of the rotated factor values, social media source of WeChat-group is the largest one ($V=.839$). Thus, the results of this analysis show preferred routes for information dissemination are a combination of both traditional and the newer media

sources. The preferred traditional media route includes three predominant information sources, Brochure, Banner and Poster, and the preferred mobile social media route has two predominant sources: WeChat-group ($V=.839$) and Weibo ($V=.821$).

Information variables are clustered into two components with 51.18% of cumulative variance. The six kinds of general epidemic-related Information cluster together (39.19%; Table 5) as one component, while the two kinds of specialized PP-related Information cluster strongly together as another component (11.99%), including information about pandemic scientific knowledge (.830) and How-to knowledge of personal protection (.850). This paper names the first component as the general information types (GIT) and the second one as the specialized information types (SIT).

Bivariate correlations (BC): The correlational analysis is to discover correlations between variables of MSM sources and information types (ITVs), ITVs and variable of personal protection perceptions or perceptions toward PP (PPP), and PPP variable and variable of personal

Table 6. Bivariate correlations between Information type variables and PPP and PPB variables.

	1Infor	2Infor	3Infor	4Infor	5Infor	6Infor	7Infor	8Infor	9Infor	10Infor
PPP	0.166**	0.267**	0.261**	0.210**	0.214**	0.232**	0.248**	0.156**	0.192**	0.125*
PPB	0.057	0.262**	0.0249**	0.220**	0.209**	0.289**	0.216**	0.104	0.203**	0.130**

*PPP=perception of personal protection; PPB=personal protection behaviour. 1Infor=Warning; 2Infor=Scientific knowledge about novel coronavirus; 3Infor=Measures and guidance for Personal protection; 4Infor=Forwarded government's official information; 5Infor=Explanation to protection and control measures; 6Infor=Forwarded state media's reporting; 7Infor=Refuting rumors; 8Infor=Message of helping residents do shopping; 9Infor=Information and measures for reviving, 10Infor=Praising good people and their good deeds.

protection behaviours or behaviours toward PP (PPB). The least level of statistical significance for the correlations between variables is set at $p < .05^*$.

The results show that: (1) Coefficients on three China that originated from MSM sources (WeChat, Weibo and QQ) are significant ($p < .01^{**}$) with different kinds of information, and in these media except FB, TW and Dingding through which epidemic-related information is conveyed (Appendix Table A3). Similarly, both variables of general and specialized information types are significantly correlated with the two clusters of China that originated from MSM channels, including WeChat-post, WeChat-official account, Weibo and QQ as the first MSM channel cluster, and WeChat-group as the second one (Appendix Table A4). Furthermore, specialized information types are more likely associated with these three social media channels ($p < .01^{**}$, see Appendix Tab. A3), WeChat-post, WeChat-official account and Weibo, through which this information reaches the public in the real time. In general, both general and specialized purpose information has significant correlations with the PPP (283**, 309**, Appendix Table A5). To be specific, variables of information except the information about praising good people, are significantly ($p < .01^{**}$) correlated with the variable of PPP (Table 6). Likewise, Specialized purpose information types are strongly associated (311**, $p < .01^{**}$) with PPB. The variable of PPP is significantly associated with the PPB (.683**) (Appendix Tab. A5). This result shows that individuals' perceptions toward personal protection issue have positive influence on their behaviour change.

DISCUSSION

This work presents that communication took place in the community by utilizing media sources especially MSM, and that it has effects on perceptions and behaviours toward personal protection issue.

The results that mobile social media were utilized for dissemination of information on COVID-19 epidemic control and prevention in the communities are consistent with past studies that social media is used by government agencies for communication with their citizens, or as mechanisms for communicating information on disasters or hazards etc. New media sources were more preferred

to the traditional media. For the former the two China originated media, WeChat and Weibo, rather than Facebook or Twitter, were the predominant new media. This showed the fact of localization of new media application in the epidemic crisis communication practice. Populations regardless of age and gender utilized WeChat for everyday social communications. This is different from the study that claimed that age is an important determinant of mass media dependency, but is similar with a study that indicated that age is not significant for social media in the past (Feldman et al., 2016). Thus, we found that COVID-19 epidemic information was conveyed through a mix of media sources, not just merely through the newer media sources, in which the preferred MSM route mainly included the channels of WeChat-group, -post, -official account, and Weibo, while the predominant traditional information sources included Brochure, Banner and Poster. We agreed that social media added or amplified value to the mix of media sources.

Mobile social media were used to deliver more than 10 kinds of information to the residents. General speaking, this information included both formal and informal information and both general purpose and specialized purpose information. Our finding that informal information was mainly conveyed through two way communication via MSM channels supports the claim that social media can connect various informal information sources to diverse groups (Bird et al., 2012). It was more likely that interpersonal communication via MSM was coupled closely with informal communication in this context of significant perceived threat. Our analysis found that different types of information were significantly ($p < .01^{**}$) correlated with the channels of new media especially channels of WeChat post, WeChat official account and WeChat-group and so on. This means that residents relied heavily on the newer media, WeChat, for information regardless of information types in the time of COVID-19 epidemic outbreak. This enhanced dependency on WeChat is influenced intrinsically by the information contents or different types of information, habit of use and familiarity with format of particular media types (Lowrey, 2004), and extrinsically by "the perceived threat in a crisis social context" (Morton and Duck, 2001; Lowrey, 2004) or under conditions of uncertainty and societal disruptions.

According to Information Deficit Model, individuals are in need of prompt scientific and official information to learn about the novel coronavirus and the risk of its infection especially at the initial stage. This research found that coefficients on the channel of WeChat-group, for example, were significant for the emergent and official information on the epidemic and personal protection. The community (authority unit on behalf of government) then utilized WeChat-group as an effective platform to engage with the residents in communicating relevant information. New media sources possessed intrinsic qualities, such as immediacy, ease of use, no limit to information capacity and being illustrated in the form of a combination of visual and textual symbols that lent themselves to the COVID-19 pandemic event. As affirmed by respondents, two-way communication in forms of a mix of text, picture and audio information took place via *MSM* in the communities. Thus, interaction of the residents and interpersonal communication took place via WeChat-group within the community e-circle. This online interpersonal communication appears to be also important in the e-community acquaintance social group because “intense social concerns or fears tend to bring people together” (Lowrey, 2004). Due to the emotional nature and intensified sense of risk of COVID-19 epidemic, people seek for comforts from acquaintances in the online social circle given the situation of no face to face contact, and are in need of useful information which is authoritative, specialized or scientific about the COVID-19 epidemic personal protection because of asymmetric information (Ball-Rokeach, 1985). As people are familiar with the format of communication of WeChat, at the community level, the community or experts use WeChat channel to transfer information on personal protection measures to individuals (non-experts), while at the individual level individuals are then more reliant on WeChat for specialized, in-depth and useful information on personal protection. This research amplifies the importance of the specialized information types toward personal prevention, and also the importance of new media sources in terms of their transmission of these information types.

This research found that the communication of the epidemic crisis information via *MSM* had noticeable effects on individuals’ perceptions and behaviours toward their personal protection. As analyzed above, residents were heavy dependent on mobile social media for communication. Our finding was coincident with the study (Lowrey, 2004) that showed media dependency by individuals significantly led to changes in their attitudes and/or behaviors during the September 11 terrorist attacks. The result that both two information types (general purpose information and specialized purpose information) had significant correlations with individuals’ perceptions (.283**, $p < 0.01$ **) and behaviors (.309**) toward personal protection showed that relevant information content or media content not only satisfied

the individuals’ (users) needs, but also led to influences on their perceptions and/or behaviours. Particularly, the types of specialized purpose information were more likely to influence individuals’ personal protection behaviours. Furthermore, we found that individuals’ perceptions toward personal protection had significant effects on (.683**) their behaviour changes. One of the reasons might be that “perceived threat is the dominant predictor of attitude change” (Lowrey, 2004). This finding confirms the importance of perceptions toward personal protection to the effective COVID-19 crisis communications through *MSM* provided not accounting for other relevant predictors (e.g. personality, culture, literacy). If the public do not genuinely perceive threat and risk of coronavirus (cognitive level), they may not positively consider the importance of personal protection (affective or attitude level), let alone follow the personal protection measures and change their behaviors accordingly (Figure 7).

Implications, suggestions and limitations of the study

This paper constructs the framework of the epidemic crisis communication on personal protection (Figure 7). Communication of information on personal protection measures helps to change individuals’ behaviours. To do this, it is important to change individuals’ perceptions which are influenced by the media content or information conveyed through media sources. In the context of this paper, the effective communication strategy making should pay much attention to the well organization of the information content and types; both types of general purpose and specialized purpose information should be closely related to COVID-19 epidemic and personal protection measures. It should pay close attention to take advantages of the local new media tools and traditional media sources through which the information content reaches individuals in time.

Media dependence theory assumes that the three parties of media, user and social system, are linked together, e.g. media sources, residents, and social system (community as authority source, information types and contents, other information sources, personal protection issue, panic, rumor, etc). From a broader perspective of ecology of communication, this paper considers that these three parties constitute the network circle of communication of epidemic information in the community, in which variables, including media, user, community, information types (contents), are closely interrelated and interacted in a state of symbiosis. Hence, the community organization should take different variables or elements into account as a whole for the COVID-19 pandemic crisis community communication strategy making.

The current research was conducted when COVID-19 epidemic outbreak took place in China during February to April. With the validity of data ($N=420$), we feel that our findings are generalizable to other cases in the field of

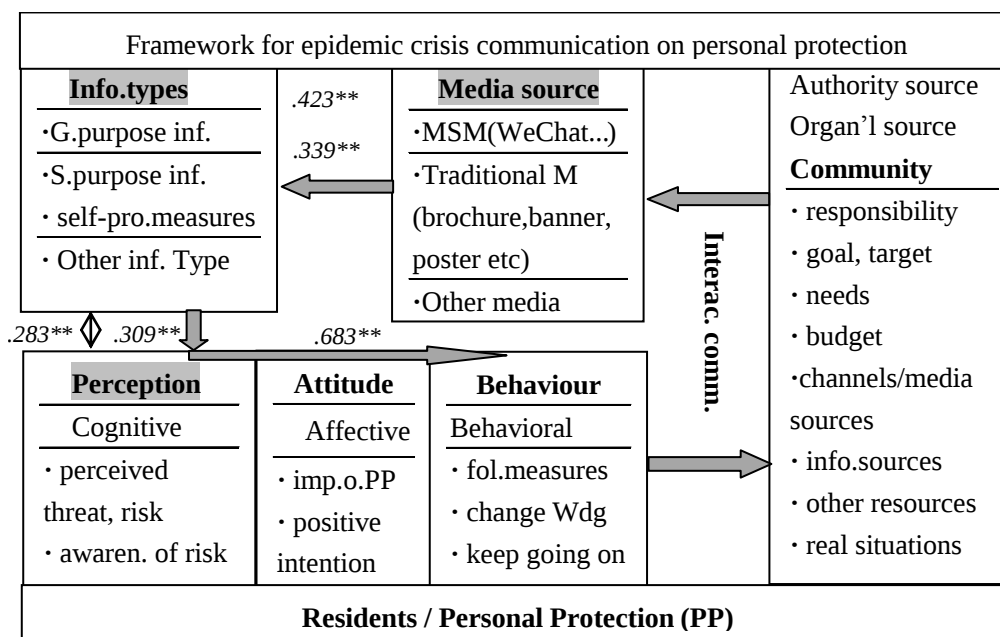


Figure 7. Framework of variables for epidemic crisis communication on personal protection. *Organ'l source=organizational source; info.sources=information sources; info.content=information content. Traditional M=traditional media; Info.Type=information type; G.purpose inf.=general purpose information; purpose inf.=specialized purpose information; self-pro. measures=self-protection measures; awaren.= awareness; imp.o.PP=importance of PP; fol.measures=follow measures; change Wdg=change wrongdoing; Interac. Comm. =interactive communication. Coefficients: (1) 0.423**=Correlations between (CB) 1st MSM component (WeChat post, WeChat official account, Weibo, QQ) and General Information types;(2) 0.339**=CB 1st MSM component and Specialized Information types;(3) 0.283**=CB General Information types and personal protection Perceptions; (4) 0.309**=CB Specialized information types and personal protection Perceptions; (5) 0.683**=CB personal protection Perceptions and personal protection Behaviours. $p<0.05^*$, $p<0.01^{**}$.

the pandemic event or PHEIC crisis community communication, due to the increasing number of communities which need to, or which are still dealing with the communication of COVID-19 epidemic information to demographically diverse communities in the world, especially in the developing countries.

However, effective COVID-19 epidemic crisis community communication is a significant and complex information dissemination system which demands more further researches. As being the limitations of this research, further research need to conduct face to face interview and improve the representativeness of the research samples, with a hope to construct a relevant communication model. More issues which have not been addressed by this research need to be looked at, such as specific needs and values of residents (Fekete, 2012; Höppner et al., 2010), organizational goals of the community, capabilities of every media tool, timing of information delivery, relationship of trust (Feldman et al., 2016), user habit of MSM or social media use stickiness, interpersonal communication, and information contents, etc. For example, how does interpersonal communication via MSM affect people's perception and behaviour? Are

there any differences between the responses from larger, more atomized communities and smaller, more socially cohesive communities, or between the urban communities and rural ones? It also may focus on the variable of information types to find out the needs of specific information in terms of the information content, length or number of words, and formats etc, with considerations of the special use habit of MSM.

Conclusion

This exploratory study presents the data derived from an online random survey (N=420) assessing the mechanism of communication of epidemic personal protection information taken place in the community by utilizing mobile social media in the time COVID-19 epidemic outbreak in China; they include communication methods (media sources, forms of interactive communication), preferred media sources, information types and their relevant correlations. The study also identifies the effects of this communication on individuals' personal protection perceptions and behaviours.

It reveals that residents rely more heavily on the newer media than the traditional one for information regardless of the types of information. China-originated mobile social media WeChat, rather than FB or TW is the predominant information source used and the most preferred media source. However, both forms of media sources should be made good use for effective community communications. Information content or media content can lead to influences on perceptions and/or behaviours of residents. Both types of general and specialized purpose information have significant effects on individuals' perceptions and behaviors toward personal protection. Particularly, the specialized purpose information is more likely to influence individuals' personal protection behaviours. Furthermore, individuals' perceptions have significant influences on their behaviour changes toward the personal protection issue.

This research amplifies the importance of the media content (especially the specialized purpose information), local new media sources (e.g WeChat) and individuals' perceptions toward personal protection to the effective COVID-19 epidemic communication.

Bringing all together, this paper constructs the framework for the epidemic crisis communication on personal protection as the underlying mechanism of COVID-19 epidemic communication taken place in the community, in which variables of media, user, community, information types (contents) are closely interrelated under a state of symbiosis as illustrated in Figure 7. We consider findings of this study contribute to the existing and future studies and researches by providing additional contexts and insights to the field of media dependency, and uses and gratifications. While caution may be exercised in generalizing the results of this study to the population in other countries beyond China due to the differences of culture and politics, our findings provide useful insights about utilization of media sources and information types for epidemic crisis communication strategy making, especially toward the issue of personal protection.

Due to COVID-19 pandemic, the first limitation of this study lies in that there was no instance to do any face-to-face interview. There are issues which have not been addressed by this study. Our suggestions are given in the discussion section for further investigations and researches. We hope that a hypothesized model for the pandemic or PHEIC crisis community communication is constructed and verified with further empirical studies.

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CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Note:

- **1. Data from WHO website. Available at: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>
2. WeChat (www.wechat.com/en) is one kind of China-originated social media, having channels (functions) of WeChat group, post and official account, etc.
3. "Enhanced Community Prevention and Control of Novel Coronavirus Pneumonia" (The original language is Mandarin). See website of National Health Commission of the People's Republic of China. Available at: <http://www.nhc.gov.cn/jkj/s3577/202001/dd1e502534004a8d88b6a10f329a3369.shtml?from=groupmessage>

Appendix

Table A1. Mobile social media source variables and factor structure.

Rotated factor loading of variance (%)	Structure matrix component = 53.10%		
	1	2	3
	22.72	16.85	13.54
M.WeChat group	0.064	-0.121	0.810
M.WeChat post	0.601	0.086	0.356
M.WeChat Sf	0.692	-0.009	-0.120
M.Weibo	0.711	0.304	0.023
M.QQ	0.624	-0.043	0.171
M.Dingding	0.425	-0.010	0.110
M.Facebook	0.133	0.821	-0.006
M.Twitter	0.001	0.859	-0.053

*Values in bold indicate which items load to each factors. *M=mobile, T=Traditional.

Table A2. Preferences for media sources variables and factor structure.

Rotated factor loading of variance (%)	Structure Matrix Component = 65.41%		
	1	2	3
	41.56	14.35	9.50
M.WeChat group	0.176	0.215	0.839
M.WeChat post	0.230	0.631	0.626
M.WeChat Sf	0.342	0.709	0.309
M.Weibo	0.320	0.821	0.030
M.QQ	0.390	0.706	0.251
T.Broadcasting	0.689	0.557	-0.119
T.Poster	0.800	0.488	-0.062
T.Banner	0.811	0.480	-0.036
T.Telephoning	0.749	0.292	0.363
T.In-person communicating	0.774	0.213	0.323
T.Brochure	0.830	0.294	0.126

*Values in bold indicate which items load to each factors. *M=mobile, T=Traditional.

Table A3. Correlations between MSM source variables and information type variables

MSM	Information type variables										
	1Inf	2Inf	3Inf	4Inf	5Inf	6Inf	7Inf	8Inf	9Inf	10Inf	12Inf
WCg	0.147**	0.130**	0.095	0.121**	0.091	0.083	0.187**	0.055	0.095	-0.146**	0.128**
WCp	0.93	0.243**	0.257**	0.157**	0.312**	0.211**	0.000	0.200**	0.124*	0.114*	0.146**
WCf	0.088	0.263**	0.223**	0.198**	0.308**	0.244**	-0.065	0.197**	0.130*	0.042	0.225**
WB	0.059	0.209**	0.144**	0.174**	0.294**	0.153**	0.012	0.222**	0.078	0.023	0.126**
QQ	0.062	0.131*	0.167**	0.194**	0.290**	0.229**	0.090	0.247**	0.156**	-0.014	0.193**
DD	-0.001	0.052	0.110**	0.018	0.115*	0.008	0.083	0.083	0.126*	0.045	0.107*
FB	0.055	0.023	0.023	-0.046	0.034	0.062	-0.048	0.031	-0.010	0.062	-0.009
TW	0.002	-0.063	-0.111*	-0.115*	-0.068	-0.043	-0.059	-0.029	-0.071	-0.035	-0.600

*1Info=warning; 2Info=scientific knowledge; 3Info=measures and guidance for PP; 4Info=Forwarded government's official information; 5Info=Announce of implementation of protection and control; 6Info=Exploration to protection and control measures; 7Info=Forwarded state media's reporting; 8Info=Message of helping residents do shopping; 9Info=Refuting rumors; 10Info=Praising good people; 12Inf=Information and measures for reviving. *Values in bold indicate which items load to each factors. * $p < 0.01$ **, $p < 0.05$.*

Table A4. Bivariate correlations between MSM component variables and Information type component variables

No.	Component	1	2	3	4	5
1	C1GIT	1				
2	C2SIT	0.521**	1			
3	MSMC1	0.423**	0.339**	1		
4	MSMC2	-0.040	-0.042	0.118*	1	
5	MSMC3	0.124*	0.128*	0.120*	-0.016*	1

*Comp.=Component; C1GIT=1st Component of General Information type; C2SIT=2nd component of Specialized Information for personal protection; MSMC1=1st MSM component (WeChat post, WeChat mini-public forum, Weibo, QQ); MSMC2=2nd MSM component (Facebook, Twitter); MSMC3=3rd MSM component (WeChat group). * $p<0.01$ **, $p<0.05$.*

Table A5. Bivariate correlations between information type components and PPP and PPB

Component	1	2	3	4
1-InforC	1.00			
2-InforC	0.476**	1.00		
PPP	0.283**	0.309**	1.00	
PPB	0.286**	0.3.11**	0.683**	1.00

*1-InforC=1st component of general information types; 2-InforC=2nd component of Specialized information types; PPP=personal protection perception; PPB=personal protection behaviour. *Values in bold indicate which items load to each factors. * $p<0.01$ **, $p<0.05$.*