Changing health compliance through message repetition based on the extended parallel process model in the COVID-19 pandemic

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1   **ABSTRACT**

2   When people are confronted with health proposals during the coronavirus disease 2019
3   (COVID-19) pandemic, it has been suggested that fear of COVID-19 can serve protective
4   functions and ensure public health compliance. However, health proposal repetition and its
5   perceived efficacy also influence the behavior intention toward the proposal, which has not
6   yet been confirmed in the COVID-19 context. The present study examined whether the
7   extended parallel process model (EPPM) could be generalized to a naturalistic context like the
8   COVID-19 pandemic. Additionally, we explored how repetition of a health proposal is
9   involved with the EPPM. In this study, two groups of participants were exposed to the same
10   health proposal related to COVID-19, where one group was exposed once and another group
11   twice. They then filled out a questionnaire consisting of items concerning behavior intention
12   and adapted from the Risk Behavior Diagnosis Scale. Structural equation modeling was used
13   to determine the multivariate associations between the variables. Although the results showed
14   that behavior intention is predicted by perceived efficacy, no significant influence of
15   perceived threat was detected. Furthermore, no significant effect of repetition was found
16   toward either response efficacy or perceived susceptibility. These findings indicate that to
17   promote health compliance during the COVID-19 pandemic, it is more efficient to focus on
18   the perceived efficacy of effective health proposals rather than on the perceived threat of the
19   disease. For future health communication research, the present study suggests improved
20   methods for analysis strategies and repeated manipulation of messages.

INTRODUCTION

One year has passed since the outbreak of the COVID-19, but the situation is still unstable, and the health threat has not been terminated yet. As of February 2nd, 2021, there are over 100 million confirmed cases globally; in Japan, 389,518 cases and 5,722 deaths (1.47%) have been reported (World Health Organization, 2021). During this period, while a heavy loss of both life and economy has been caused, some countries and regions have achieved staged success in the fight against this disease. There is no doubt that public compliance with effective health proposals plays a crucial role in achieving this success.

It is suggested that functional fear, which is explained as one of the negative emotions serving protective functions in certain contexts, has promoted public health compliance during the COVID-19 pandemic (Harper et al., 2020). Nevertheless, this needs to be explored further, especially considering previous studies on health communication and the features of information dissemination in real life. The main question being addressed in our study is to examine how people's health compliance intention is influenced by various factors in the COVID-19 context in an exhaustive way.

It is known that fear has an impact on health compliance. In fact, fear appealing communication is considered an effective way to promote health campaigns and has been widely investigated for promoting health awareness related to various topics, including smoking (Leventhal & Watts, 1966), alcohol use (Wolburg, 2001; Moscato et al., 2001), AIDS (Treise & Weigold, 2001) and so forth. After several initial studies, inconsistent results indicated that a simple monotonic function of fear might not be expected in persuasive health communication. Specifically, despite a large number of studies indicating the positive main effect of fear on persuasion (Leventhal & Watts, 1966; Dabbs & Leventhal, 1966; Leventhal, Singer & Jones, 1965), relatively few report the negative main effect of fear (Janis & Feshbach, 1953; Janis & Terwilliger, 1962). Later research confirmed that the effects of fear appeal interact with various source variables, message variables, and receiver variables and thus cannot be described easily (Miller & Hewgill, 1966).

One of the most recent and prevalent theories on fear appealing communication is the extended parallel process model (EPPM: Witte, 1992, 1994), which is based on former frameworks including the Parallel Response Model (Leventhal, 1970) and protection motivation theory (Rogers, 1975). In the EPPM, there are four main factors, which influence

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the prediction of certain communication outcomes: perceived susceptibility and severity composing perceived threat, self-efficacy and response efficacy composing perceived efficacy. Perceived susceptibility refers to a belief about the risk of experiencing a threat, whereas severity refers to a belief about the magnitude of the threat. On the other hand, self-efficacy is defined as a belief about the ability to perform a recommended proposal to avert the threat; response efficacy is a belief about the effectiveness of the recommended proposal in deterring the threat (Witte, 1996). Concretely, when both perceived threat and perceived efficacy are high, people are most likely to engage in a danger control process, which means conforming to the recommended health proposal. Nevertheless, when perceived threat and perceived efficacy are high and low, respectively, people turn to a fear control process leading to coping responses that reduce fear and danger control responses. Meta-analyses on the results of fear appeal research confirm the validity of the EPPM (Floyd, Prentice-Dunn & Rogers, 2000; Peters, Ruiter & Kok, 2013).

Currently, we are exposed to health proposals concerning COVID-19, in all likelihood, more than once in our daily lives, which makes message repetition an essential factor to be taken into consideration. Although research concerning stimulus repetition first emerged in the 1960s (Zajonc, 1968), there was no study on message repetition in persuasive communication until ten years later. It is suggested that under moderate repetition (less than 3 times), agreement toward persuasive messages rise (Cacioppo & Petty, 1979). The rationale is explained as follows: Scrutiny is reinforced through a moderate level of message repetition, which enhances the understanding of message content and the merits advocated by it, consequently improving supportive attitudes toward the message. Later research revealed that the mechanism mentioned above is applicable only when arguments in the message are perceived as strong, and when the issue is of high personal relevance (Cacioppo & Petty, 1989; Claypool et al., 2004).

In health communication on COVID-19, we assumed that the interpretation of the content of a certain health proposal message might be related to factors in the EPPM. Concretely, response efficacy and perceived susceptibility might be perceived when reading a health proposal message. If the content of a health proposal was supported, high response efficacy should be found, resulting in a decrease in perceived susceptibility. Given the connection between the EPPM and message repetition in persuasive health communication and the actual state we have been through when confronted with health proposals during the COVID-19 pandemic,

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we built an integrative model (Figure 1) to investigate the factors and their associations concerning an individual's behavior intention to conduct effective health proposals to prevent the infection. Our hypotheses are as follows.

1) Hypothesis 1: Perceived efficacy has a positive effect on self-efficacy.

H0: Perceived efficacy has no effect on self-efficacy.

2) Hypothesis 2: Perceived efficacy has a positive effect on response efficacy.

H0: Perceived efficacy has no effect on response efficacy.

3) Hypothesis 3: Perceived threat has a positive effect on perceived susceptibility.

H0: Perceived threat has no effect on perceived susceptibility.

4) Hypothesis 4: Perceived threat has a positive effect on severity.

H0: Perceived threat has no effect on severity.

5) Hypothesis 5: Repetition has a positive effect on response efficacy.

H0: Repetition has no effect on response efficacy.

6) Hypothesis 6a: Repetition has a positive effect on perceived susceptibility.

H6b: Repetition has a negative effect on perceived susceptibility.

H0: Repetition has no effect on perceived susceptibility.

7) Hypothesis 7: Perceived efficacy has a positive effect on behavior intention.

H0: Perceived efficacy has no effect on behavior intention.

8) Hypothesis 8a: Perceived threat has a positive effect on behavior intention.

H8b: Perceived threat has a negative effect on behavior intention.

H0: Perceived threat has no effect on behavior intention.

The present study is unique and necessary in several aspects.

One, considering that COVID-19 is a real-life and ongoing public health emergency, some of its properties are fixed and thus cannot be manipulated. Take perceived threat, for example: In

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previous research, it was always considered together with fear because without extra fear-arousing materials (e.g., explanation of a certain disease in text or video), the perceived threat might not be notable enough to act as an independent variable. Unlike other unfamiliar diseases (e.g., melanoma), even though the degree to which one is influenced by the pandemic may vary, COVID-19 should be one of immediate health threats in several countries and regions, including Japan, where the present study was conducted. Considering that fear-arousing information is no longer needed in the message, we are interested in exploring how perceived threat alone for the COVID-19 affects behavior intention when there is no intentional manipulation of fear arousal.

Two, there is still no research to test a model that combines the EPPM with message repetition. Although studies on similar topics have been conducted (Skilbeck, Tulips & Ley, 1977; Treise & Weigold, 2001; Shi & Smith, 2016), the results have not been analyzed in an integrated way or using structural equation modeling (SEM). To be specific, when supportive arguments toward the content of a recommended proposal are enhanced due to moderate repetition, it can also be interpreted as the change in response efficacy and perceived susceptibility in the EPPM. Nevertheless, this connection between the two research topics has rarely been made clear, causing difficulty in making an exact prediction of the results.

Three, it remains essential to confirm the validity of EPPM's established construction, namely the sub-dimensions of perceived efficacy and perceived threat, to enhance compliance with public health guidelines in the COVID-19 pandemic. We assume better health compliance is due to higher perceived efficacy, but what does perceived efficacy mean? By learning more about its two indicators, self-efficacy and response efficacy, we can better understand why people choose to conform or not to certain health proposals. For instance, even though physical distancing is considered efficient in preventing infection (high response efficacy), the difficulty in conducting it may vary between people based on their socializing needs (divergent self-efficacy), which results in different levels of health compliance. Similarly, if we are aware that perceived threat is indicated by perceived susceptibility and severity, we may know which properties to emphasize in education on COVID-19 to boost public health compliance.

In summary, the present study is of comprehensive significance in revealing the mechanism in the purview of public compliance with effective health proposals in the COVID-19 pandemic.

MATERIALS & METHODS

The present study received approval from the psychological research ethics committee of the Faculty of Human-Environment Studies at Kyushu University (approval number: 2019-034).

Participants

The required sample size of $N = 301$ was set based on our preliminary experiment, using the `findRMSEAsamplesize` function in R (MacCallum, Browne & Sugawara, 1996), with $\alpha = 0.05$, power = 0.95, $rmsea0 = 0.05$, $rmseaA = 0.01$, $df = 70$. In the present study, we recruited 521 participants via Yahoo! Crowdsourcing (<http://crowdsourcing.yahoo.co.jp/>). Since it is impossible to obtain written consent in anonymous online surveys, we explained the details of the online experiments and ethical matters in the instructions. The participants were asked to take part in the experiments only when they agreed to the contents of the instructions. We excluded 195 participants' data based on the following pre-defined data exclusion criteria:

- 1) To identify distracted respondents or satisficers (Chandler et al., 2014; Oppenheimer et al., 2009; Sasaki & Yamada, 2019), we inserted a simple question as an attention check question (ACQ) in the middle of the questionnaire in the second wave. The reason why we did not add an ACQ in the first wave is that the first wave was conducted only to control the frequency of exposure to the message, and thus the data in the first wave was not analyzed. The ACQ in the second wave was: Please choose number "2" from below. Consistent with other items, the ACQ also used a 7-point scale. The data from participants who chose 1 or 3–7 was excluded.

- 2) To ensure that our manipulation on the frequency of exposure to the health proposal message was valid, the data from those who had seen this proposal before was excluded. We asked all participants the following question: "Have you seen this message before?" right after they were exposed to the message for the first time; we asked the question in the first wave of the repetition condition and in the second wave of the no-repetition condition. The data from participants whose answer was "Yes" was excluded.

- 3) For participants in the first wave of the repetition condition, a multiple-choice question concerning the content of the message ("What the message is about") was asked to confirm whether they had read the message carefully enough to capture its meaning. Data from participants who gave a false answer was excluded.

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4) Before analyzing the data, we calculated the standard deviation (*SD*) of each participant's scores on the 13 items in the second wave and excluded data from participants whose *SD* was zero. We performed this data exclusion because an *SD* equal to zero meant the same score on different items measuring divergent properties, which was strange and not possible.

5) As stated in Section 6, data of participants whose nationality was not Japanese and whose age was under 18 was excluded based on their answers to the relevant questions.

6) There was an open-ended question on the experiment's real purpose at the end of the questionnaire under both conditions in the second wave. The question was optional, and the data from participants who gave correct answers (consistent with the experiment's real purpose) was excluded.

After excluding those who met the exclusion criteria, 326 participants' data were included in the data analysis (141 females, 180 males, 5 others, $M_{\text{age}} = 45.8$). Subsequently, participants were allocated to the no-repetition ($N = 166$) and repetition conditions ($N = 160$). In addition, despite not matching the exclusion criteria, we found one person's data suspicious due to the answers provided (i.e., "99 years old," "other gender," and "1 or 2" for all questions in the second wave). Based on the registered data exclusion criteria and the fact that the inclusion of the person's data did not influence the results, we did not exclude it from our analyses.

Measures

Dummy questionnaire. We used the Need for Cognition Scale (Kouyama & Fujihara, 1991) as the dummy questionnaire in the survey's first wave, for both the repetition and no-repetition conditions. We did not analyze the data from the dummy questionnaire because it had no influence on our hypotheses.

Risk Behavior Diagnosis Scale. We adapted twelve items from the Risk Behavior Diagnosis Scale (Witte, 1996) to fit the target health proposal message in the present research and the context of COVID-19 (Table 1, items 1–12), and used the scores for the items as the main dependent variables. Concretely, self-efficacy and response efficacy toward the health proposal message were measured by items 1–3 and 4–6, respectively; perceived susceptibility and severity concerning COVID-19 were measured by items 7–9 and 10–12, respectively. In

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the present study, we checked the convergent validity and discriminant validity for the twelve items. The results met the criteria (Hair et al., 2010), confirming the validity of all items (average variance extracted (AVE) > 0.5; square root of AVE > inter-construct correlations). All items were scored on 7-point scales ranging from 1 (strongly disagree) to 7 (strongly agree).

Behavior intention. We included another item regarding behavior intention toward the health proposal in the questionnaire (“In the future, when sanitizing my hands with alcohol-based hand sanitizer, I will press the pump slowly to the bottom to get a sufficient amount”). This item was also scored on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Materials

We selected the target health proposal message from a pilot study based on its low knowledge rate (40.8%). Furthermore, the attitude toward the message was rated as being considerably favorable (i.e., the scores were significantly higher than 4 on a 7-point scale, $M = 5.35$, $SD = 1.29$, $t(200) = 5.52$, $p < .001$, Cohen’s $d_z = 1.047$), which qualified it as a strong message and enabled us to further explore the effect of message repetition (Cacioppo & Petty, 1989; Claypool et al., 2004).

The content of the message in Japanese was: アルコールは消毒・殺菌効果があると言われています。一方、少量のアルコール消毒液を手にとった場合、消毒効果が低下してしまいます。そこで、アルコール消毒液で手を消毒する際は、少なくともポンプ部分を下までゆっくり押して、たっぷり手に取って使うことをおすすめします。 The English translation of the message is as follows: “While alcohol-based hand sanitizer is useful for preventing COVID-19 infection, the effect will be discounted if not enough amount is used. Therefore, it is recommended to press the pump to the bottom every time to get enough amount of hand sanitizer.”

Procedures

We conducted the two-wave surveys for the no-repetition and repetition conditions from October 22 to November 6, 2020. In the first wave, participants in two conditions answered the same dummy questionnaire of the Need for Cognition Scale. Only participants in the

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repetition condition were exposed to the target health proposal message at the end of the dummy questionnaire. After 24-72 hours (the interval range was set because we could not control the precise time point at which participants answered the second questionnaire), participants in both conditions were exposed to the same message and required to fill out the questionnaire containing 13 items in Table 1. Additionally, two other questions were used as manipulation checks for message repetition. The first question was aimed at all participants, when they were exposed to the message for the first time: “Have you seen this message before?” The other question, was asked only in the repetition condition in the first wave, to ensure the validity of the message’s first presentation: “What is the message about?”

RESULTS

Table 2 presents the correlations among variables with means and standard deviations. We chose a robust maximum likelihood estimator to perform SEM for the model in Figure 1, which produced Satorra-Bentler rescaled χ^2 to correct for non-normality-induced bias. The model yielded an acceptable fit (Kline, 2005; Bentler & Bonett, 1980): χ^2 (34, $N = 326$) = 196.367, $p < .001$; comparative fit index (CFI) = .949; Tucker-Lewis index (TLI) = .934, root mean square error of approximation (RMSEA) = .059 (90% CI .047 – .070, $p > .05$). The p values of the coefficients of concern were adjusted by using the false discovery rate (Benjamini & Hochberg, 1995). The results of the theoretical model are presented in Figure 2.

It was shown that perceived efficacy had positive effects on both self-efficacy ($\beta = .883$, $p < .001$) and response efficacy ($\beta = .726$, $p < .001$). Similarly, perceived threat was found to positively influence perceived susceptibility ($\beta = .522$, $p < .001$) and severity ($\beta = .904$, $p < .001$). However, we did not detect a significant influence of message repetition on either response efficacy ($p = .110$) or perceived susceptibility ($p = .680$). Furthermore, the results confirmed the positive influence of perceived efficacy on behavior intention ($\beta = .766$, $p < .001$), but not the effect of perceived threat on behavior intention ($p = .313$).

DISCUSSION

In the present study, we performed SEM to examine whether the EPPM could be generalized to a naturalistic context like the COVID-19 pandemic. Furthermore, we explored how the repetition of a health proposal is involved with the EPPM. According to the results of our analyses, the sub-dimensions of perceived efficacy toward the target message and perceived threat toward COVID-19 were confirmed, which supported Hypotheses 1–4. There was no

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evidence that message repetition significantly influenced response efficacy (Hypothesis 5) or perceived susceptibility (Hypothesis 6). Furthermore, while we found a positive effect of perceived efficacy on behavior intention (Hypothesis 7), we did not detect a significant effect of perceived threat on behavior intention (Hypothesis 8).

Regarding the generalization of the EPPM in the COVID-19 context, most of our hypotheses were confirmed, except for the path from perceived threat to behavior intention. According to the EPPM's interpretation, high threat and low efficacy would lead to fear control process where people try to control their fear instead of taking efficient actions, while high threat and high efficacy would result in danger control process where people take efficient actions to avert threat. To the best of our knowledge, there is limited research using SEM to test the EPPM, except for a study conducted by Ort and Fahr's (2018). Considering that the differences in analysis strategies may bring us new insights into the result of the non-significant path from perceived threat to behavior intention, we would discuss the results compared with other analysis strategies mentioned in previous research. Nevertheless, the following discussion was based on several post-hoc analyses, which were not registered in advance; we conducted the analyses simply for the purpose of exploration. Thus, any implication based on them should be treated with caution and confirmed through further investigation.

In several studies (Gore & Bracken, 2005; Witte et al., 1996), the average score of the six threat items was used as the score for perceived threat, and the average score of the six efficacy items was used as the score for perceived efficacy. Then the discriminating value was calculated by subtracting these two scores ($Z_{\text{efficacy}} - Z_{\text{threat}} = \text{discriminating value}$). When the discriminating value was negative (i.e., perceived threat outweighed perceived efficacy), the participant was considered to get involved in fear control process. When the discriminating value was positive (i.e., perceived efficacy outweighed perceived threat), the participant was considered to take danger control actions. In other words, the formula emphasized the comparison between perceived threat and perceived efficacy rather than the variable's isolated level (high/low) in determining health communication's outcomes. Applying this strategy, we divided our participants in the no-repetition condition (which had the same design as the previous research) into two groups— danger control group and fear control group ($N_{\text{danger}} = 70$, $N_{\text{fear}} = 82$)—according to their discriminating values, and then conducted independent samples *t*-test on their behavior intention scores. The behavior intention of participants in the

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danger control group was significantly higher than that in the fear control group ($t(150) = 3.65, p < .001$), which was theoretically consistent with the basic frame of the EPPM. Given that these analyses were not registered beforehand, and that the discriminating value approach has been criticized for its flawed conceptual logic (Ort & Fahr, 2018), we do not consider it appropriate to make a conclusion on the EPPM's validity in the present study. Instead, we suggest treating the result's limited implication as a mere reference or a hint when discussing the relation between perceived threat and behavior intention.

There are also studies using the comparison between scores and the midpoint of the scale (4 in the present research) to determine the level of perceived threat and perceived efficacy (Shi & Smith, 2016). When we applied this strategy, and the results showed that there were only 16 out of 326 participants with low perceived efficacy toward the target health proposal message and 3 out of 326 participants with low perceived threat toward COVID-19. The few participants rating perceived threat low confirmed our expectation of the fixed properties of COVID-19—even with no extra fear-arousing material, its perceived threat stays at a high level. Moreover, in line with our pilot study's results that people have favorable attitudes toward the target message, the message's perceived efficacy was at a high level as well. In other words, we have mainly focused on the high efficacy-high threat condition in the present study.

The exploratory analyses mentioned above provide several possible explanations for the non-significant path between perceived threat and behavior intention in our theoretical model. As one possibility, a perceived threat may act as a kind of judgment criterion, meaning that the danger control process will not start until the perceived threat reaches a certain level. Subsequently, the fluctuation in its value does not influence behavior intention anymore. In this respect, since the perceived threat was already at a high level in the present study, its increase might have no effect on behavior intention. Another possibility is that we have to take perceived threat's interrelation with perceived efficacy into consideration when evaluating its effect on behavior intention. When perceived threat increases and perceived efficacy is controlled to stay constant, three possible changes in the process people get involved in arise when facing a health threat, namely switching from danger control process to fear control process; staying unchanged in the fear control process; or staying unchanged in the danger control process. While behavior intention should decrease in the switch from danger control process to fear control process, it is unclear how it would change when the

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process stays the same. Consequently, the relation between perceived threat and behavior intention would not be monotonic.

In all cases, we should not expect enhancing people's behavior intention through increasing COVID-19's perceived threat. Instead, it is more reliable to count on the effect of perceived efficacy on behavior intention toward efficient health proposals, which is consistent with the results from previous research (Earl & Albarracín, 2007; Mongeau, 1998; Peters, Ruiter, & Kok, 2013; Ruiter et al., 2014; Tannenbaum et al., 2015; Ort & Fahr, 2018).

Regarding message repetition, neither response efficacy nor perceived susceptibility were found to be influenced by it. Based on the differences in message repetition manipulation between the present study and previous studies, there may be several possibilities accounting for the results. First of all, considering that there are 24–72 hours between exposure to the messages, the stimulus was too simple to be impressive, which makes the manipulation of message repetition invalid. For example, in Cacioppo and Petty (1979), a simple message was repeated several times in one experiment section with almost no interval. In the studies where the interval lasted for several days or weeks (Shi & Smith, 2016; Horowitz, 1969; Skilbeck, Tulips & Ley, 1977), the materials serving as stimuli were more complicated (e.g., 5-minute video clip; 8-page pamphlet; 20-minute lecture). Similarly, in a recent study investigating the relation between short health reminders and the change in behavior intention during the COVID-19 pandemic (Yonemitsu et al., 2020), no effect of the reminders was reported with a one-week interval. Therefore, it is reasonable to conjecture that in the present study, the complexity of the health proposal message and the length of time interval did not make a good match to test the message repetition's effect. Furthermore, considering that COVID-19 has been a severe health threat in Japan—where the present study was conducted—the large amount of relevant information people received from sources other than the survey may have become an extraneous variable. In any case, it was not detected that mere repetition of a short piece of health proposal at 24–72 hours interval significantly influenced its response efficacy and perceived susceptibility.

CONCLUSIONS

Practical implications

Before the present study, only one other study (Ort & Fahr, 2018) had used SEM to show the inter-dependencies within EPPM and to investigate it as a whole. This study confirmed the

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validity of this approach for data analysis in the health communication field. Additionally, it is indicated that the EPPM can also provide precious insights into health compliance in the COVID-19 context and for the Japanese population.

The sub-dimensions of perceived efficacy were confirmed in the COVID-19 context. Combined with the effect of perceived efficacy on behavior intention, it is essential to improve both people's self-efficacy and proposal's response efficacy to achieve health compliance. Concretely, for a health proposal considered to be efficient, "it can be easily carried out" and "it works well for preventing COVID-19's infection" are the points that needs to be emphasized. Meanwhile, it was also confirmed that perceived threat consists of perceived susceptibility and severity. However, when public's perceived threat for COVID-19 has already been at a high level, it may not help promote health compliance to show people how threatening it is or how easily they can get infected.

Limitations and Future Studies

Harper et al. (2020) suggest that fear promoted public health compliance during the COVID-19 pandemic. In contrast to this result, we did not find perceived threat's effect on behavior intention toward the target health proposal in this study. While perceived threat may contribute to fear, they are not exactly the same. Therefore, future research should add fear in the model to confirm whether fear has effect on health compliance or not. Rather than actual behavior change, the main dependent variable in the model was behavior intention toward the target message. Since it is pointed out that there are cases where behavior intention was not a good approximation to actual behavior (Leventhal, Singer & Jones, 1965; Evans et al., 1970), future studies should try to include actual behavior index in the model. Moreover, since only one health proposal was used as stimulus material in this study, we suggest that the effect of various health proposals should be addressed in subsequent studies. Specifically, considering that there was no relation between message repetition and the EPPM in this study, one important task will be to explore the balance among message's complexity, the length of time interval, and even the times of exposure to confirm the results.

In the exploration of public's irrational panic and response to major emergencies, a phenomenon called "psychological typhoon eye" effect has been reported (Li et al., 2009). This phenomenon is defined as a tendency that residents living closer to the center of the devastated areas show less concern about safety and health. Former researchers have detected

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the psychological typhoon eye effect in the COVID-19 pandemic in China, showing a negative correlation between exposure level and mental health problems (Wang et al., 2020; Zhang et al., 2020). Moreover, it is indicated that the differences among residents in various areas were only found in the indicator, “wanting to have a physical investigation,” but not in other behavioral response indicators (e.g., frequently washing or cleaning hands; taking the initiative to avoid strangers). Since the present study did not collect the information about participants’ residence, we could not compare the results of participants living in areas with various levels of exposure to COVID-19. To better understand the mechanism of responses toward major emergencies like the COVID-19 pandemic, and as a result, promote public compliance with effective health proposals, we suggest future studies take participants’ residence into consideration when discussing the interrelation among variables.

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